REVISED SYLLABI AND SCHEME OF EXAMINATIONS FOR SKILL ENHANCEMENT COURSES FOR UNDER GRADUATE PROGRAMS B.Sc. PHYSICAL SCIENCES (SINGLE MAJOR / MULTIDISCIPLINARY PROGRAMS)

B.Sc. (Physical Sciences) Electronics

(Based on Curriculum and Credit Framework for UG Programs under NEP)

WITH EFFECT FROM THE SESSION 2026-27

MAHARSHI DAYANAND UNIVERSITY ROHTAK (HARYANA)

Credit structure for skill enhancement courses for
Under graduate single major/multidisciplinary programs/ single major program after 2nd semester of multidisciplinary program

Skill Enhancement Course (SEC)	Nomenclature of Course	Course Code	Credits Distribution			Total Credits	Workload			Total Workload	Marks			
			L	T	P		L	T	P		Theory		Practical (Internal)	Total Marks
											Internal	External		
SEMESTER 1 (2026-27)														
SEC 1 @ 3 credits	Electrical Circuit & Instrumentation Skills	24PHY401SE01	2	0	1	03	2	0	2	04	15	35	25	75
SEMESTER II (2026-27)														
SEC 2 @ 3 credits	Optical Fibre Communication	24ELE402SE01	2	0	1	03	2	0	2	04	15	35	25	75
SEMESTER III (2027-28)														
SEC 3 @ 3 credits	Workshop Skills in Physics	25PHY403SE01	02	0	01	03	02	0	02	04	15	35	25	75
SEMESTER VI (2028-29)														
SEC 4 @ 2 credits (offered only in case of Single Major Programme)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEMESTER VI1 (2029-30)														
SEC 5 @ 4 credits (if offered as an option)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEMESTER VII1 (2029-30)														
SEC 6 @ 4 credits (if offered as an option)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

L: Lecture; T: Tutorial; P: Practical

Syllabi for B.Sc. (Physical Sciences) Electronics

Semester -I

Session: 2026-27

Name of Program	B.Sc. (Physical Sciences)	**Program Code**	UMPS4
Name of the Course	Electrical Circuit & Instrumentation Skills	**Course Code**	24PHY401SE01
Hours per Week	04(2+2)	**Credits**	03
Maximum Marks	Theory: 15+35 Practical: 25 Total: 75	**Time of Examinations**	Theory: 03 Hours Practicals: 03 Hours

Note:

Examiner will set nine questions of seven marks each and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing short answer type questions from all units. Further, examiner will set two questions from each unit and the candidates will be required to attempt one question from each Unit. All questions will carry equal marks

Course Learning Outcomes (CLO):

After completing this course, the learner will be able to:

CLO1: understand basic physics and applications of CRO

CLO2: understand working and usage of digital multimeter, LCR meter, CRO and ac voltammeter

CLO3: Appreciate and learn importance of specifications of various measuring instruments

CLO4: understand working and operational aspects of Signal Generators

Unit 1:

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter, Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. Electronic Voltmeter: Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. AC milli-voltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac milli-voltmeter, specifications and their significance.

Unit 2:

Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. (6 Lectures) Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block

diagram and principle of working.

Unit 3:

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter. (3 Lectures) Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution. Voltmeter. (3 Lectures) Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.

Unit 4:

Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources Generators and Transformers: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers. Electric Motors: Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor.

Practicals:

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3. To measure Q of a coil and its dependence on frequency, using a Q- meter.
4. Measurement of voltage, frequency, time period and phase angle using CRO.
5. Measurement of time period, frequency, average period using universal counter/frequency counter.
6. Measurement of rise, fall and delay times using a CRO.
7. To study characteristics of Zener diode.
8. To find high resistance by substitution method
9. Measurement of R, L and C using a LCR bridge/ universal bridge.
10. To study Diode characteristics (I – V).
11. Designing of regulated power supply of 15Volts.
12. To test a diode and transistor using multi-meter and CRO.
13. Designing of B-H loop tracer

Note: A student has to perform at least eight (08) experiments from the above list.

References:

1. A text book in Electrical Technology - B L Theraja - S Chand and Co.
2. Performance and design of AC machines - M G Say ELBS Edn.
3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
4. Logic circuit design, Shimon P. Vingron, 2012, Springer.
5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.

6. Electronic Devices and circuits, S. Salivahanan & N. S. Kumar, 3rd Ed., 2012,
7. Tata Mc-Graw Hill
8. Electronic circuits: Handbook of design and applications, U. Tietze, Ch.Schenk, 2008, Springer
9. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India

Semester -II
Session: 2026-27

Name of Program	B.Sc. (Physical Sciences)	**Program Code**	UMPS4
Name of the Course	Optical Fibre Communication	**Course Code**	24ELE402SE01
Hours per Week	04(2+2)	**Credits**	03
Maximum Marks	Theory: 15+35 Practical: 25 Total: 75	**Time of Examinations**	Theory: 03 Hours Practicals: 03 Hours

Note:
Examiner will set nine questions of seven marks each and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing short answer type questions from all units. Further, examiner will set two questions from each unit and the candidates will be required to attempt one question from each Unit. All questions will carry equal marks

Course Learning Outcomes (CLO):
CLO1: To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
CLO2: To understand the different kind of losses, signal distortion, SM fibers.
CLO3: To learn the fiber optical receivers and noise performance in photo detector
CLO4: understand the principles and working of optical amplifiers

Unit 1: Electromagnetic spectrum used for optical communication, block diagram of optical communication system. Basics of transmission of light rays. Advantages of optical fiber communication. Optical fibers structures and their types, fiber characteristics: attenuation, scattering, absorption, fiber bend loss, dispersion; fiber couplers and connectors

Unit 2: Characteristics of light sources (LED and LASER) used in optical communication, principle of operation of LED, LED structures (brief description), Injection laser diode, principle of operation, different injection laser diodes, Comparison of LED and ILD.

Unit 3: Principles of optical detection, quantum efficiency, responsively, general principles of PIN photo detector, impulse and frequency response of PIN photodiodes, multiplication process, avalanche photo diode (APD) Design, bandwidth and noise

Unit 4: Types of optical amplifiers, semiconductor & fiber optical amplifiers, principle of operation of SOA, types of SOA. EDFA, Raman amplifiers. Comparison of SOA, EDFA and Raman Amplifiers.

Practicals:

List of experiments:

1. To setup a fiber optic Analog link.
2. To study propagation losses in optical fiber
3. To study bending losses in optical fiber.
4. To measure the numerical aperture of an optical fiber.
5. To study frequency modulation and demodulation using optical fiber.
6. To study the characteristics of Light Emitting Diode.
7. To study the characteristics of PIN photodiode.
8. To study the characteristics of Phototransistor.
9. Measurement of rise, fall and delay times using a CRO.
10. To study characteristics of Zener diode.

A student has to perform at least eight (08) experiments from the above list.

References:

1. Optical Fiber Communications: John M Senior; PHI.
2. Optical Communication Systems : John Gowar; PHI
3. Optical Fiber Communications : Gerd Keiser; TMH
4. Optical fiber Communication : Selvarajan, Kar, Srinivas; TMH

Semester -III
Session: 2027-28

Name of Program	B.Sc. (Physical Sciences)	**Program Code**	UMPS4
Name of the Course	Workshop Skills in Physics	**Course Code**	25PHY403SE01
Hours per Week	04(2+2)	**Credits**	03
Maximum Marks	Theory: 15+35 Practical: 25 Total: 75	**Time of Examinations**	Theory: 03 Hours Practicals: 03 Hours

Note: Examiner will set nine questions of seven marks each and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing short answer type questions from all units. Further, examiner will set two questions from each unit and the candidates will be required to attempt one question from each Unit. All questions will carry equal marks

Course Learning Outcomes (CLO):

After completing this course, the learner will be able to:

CLO1: Develop skills to measure dimensions, volume, and distances using basic instruments and units.

CLO2: Analyze and build electrical circuits using multimeters, soldering, and network theorems.
CLO3: Understand the working of power supplies and apply voltage regulation and ripple reduction techniques.
CLO4: Operate and utilize a Cathode Ray Oscilloscope (C.R.O.) for measurements and circuit troubleshooting.

Unit 1: Introduction: Measuring units. conversion to SI and CGS. Familiarization with meter scale, Vernier calliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

Unit 2: Electrical and Electronic Skill: Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer Theorem

Unit 3: Power Supplies: Basics of Power Supplies, AC Power Supplies: Characteristics, use in basic circuits. DC Power Supplies: Fixed voltage vs. variable voltage supplies. Components of power supplies: Transformers, rectifiers (half-wave, full-wave), filters, and regulators. Voltage Regulation and Ripple Reduction, Concepts of regulation, ripple, and stability. Use of capacitors, Zener diodes, and IC voltage regulators (e.g., LM317).

Unit 4: Cathode Ray Oscilloscope (C.R.O.): Introduction to C.R.O., Basic structure and working of a C.R.O. Electron gun, deflection system, and phosphor screen. Block diagram and function of each component. Operating a C.R.O. Adjusting controls: Time base, volts/div, focus, intensity, and trigger. Connecting probes and setting ground reference. Applications of C.R.O. Measurement of voltage, frequency, and phase difference. Observation of waveforms: Sine, square, and triangular waves. Troubleshooting electrical circuits.

Practicals:

A student has to perform at least eight (08) programs from the above list.

1. Measurement of thickness of a wire using screw gauge.
2. Measurement of length (or diameter) using Vernier Caliper travelling microscope
3. To determine height of an object using sextant
4. To determine the area of window using a sextant.
5. To learn the use of multimeter.
6. To learn the use of soldering various components on PCB
7. To design a regulated power supply.
8. Determine the waveform of a given oscillator using a cathode ray oscilloscope.
9. Demonstrate the action of a junction diode as: (a) Half-wave rectifier (b) Full-wave rectifier using a cathode ray oscilloscope.
10. Measure the A.C. voltage using a cathode ray oscilloscope and calculate the deflection sensitivity in mm per RMS volt.
11. Measure D.C. voltage using a cathode ray oscilloscope.
12. Demonstrate the phase difference in a circuit due to resistance, inductance, and capacitance, and measure their values using a cathode ray oscilloscope.
13. Measure the phase difference between current and voltage in (a) A C-R circuit (b) An L-R A.C. circuit using a cathode ray oscilloscope.
14. Compare the frequencies of oscillations produced by two audio oscillators using Lissajous figures.

15. Determine the frequency of an electrically maintained tuning fork using a cathode ray oscilloscope.

References:

1. A text book in Electrical Technology - B L Theraja – S. Chand Publishing.
2. Electronic Instrumentation and Measurements by David A. Bell
3. Basic Electronics: Solid State, By BL Theraja, S. Chand Publishing.
4. Electronic Measurements and Instrumentation, by K. Lal Kishore, Pearson India
5. B.Sc. Practical Physics – By, CL Arora, S. Chand Publishing.