

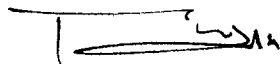
PROGRAMME PROJECT REPORT (PPR)

MSCPH (M.Sc. PHYSICS)

DEPARTMENT OF PHYSICS

UTTARAKHAND OPEN UNIVERSITY

HALDWANI (NAINITAL)



DIRECTOR (I/C)

PROF.P.D.PANT

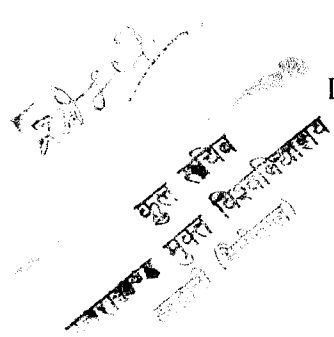
SCHOOL OF SCIENCES



COURSE COORDINATOR

DR. KAMAL DEOLAL

DEPARTMENT OF PHYSICS



Programme Project Report (PPR) M.Sc. Physics

The content of the programme project report are as:-

Programme Mission & objectives:- Uttarakhand state is a state of remote geographical area. A large number of student cannot attend the college due to geographical and financial problems. These student can get higher education through ODL system. The mission of programme is to provide education through ODL mode to the society.

Relevance of the Programme with HEI's Mission and Goals: - Science programme are again popular now a days. In the state like Uttarakhand, a large group of students are interested in science subject rather than humanities and other professional programme. Thus programme of B.Sc. and M.Sc.(physics) are useful for the students.

Nature of Prospective Target group of Learners:- The target group of learners are all Science graduate of the Society, the teacher of the different Schools those want to enhance their education & workers of different corporate society those couldn't completed their education and want to get higher education.

Appropriateness of the Programme to be conducted in ODL mode to acquire still competence:-

The M.Sc. (physics) programme can be offered in ODL system. A science student can use or apply science and technology very effectively. By using modern technology the students can get all the quality materials. A lot of study material and online lectures are available in the net. Many international scientific institutions are providing their lectures and other material to the society. Learners can avail this facility. The learners those fulfill all the programme requirements shall be highly trained and skilled through the year by counselling and special workshop. It seems they should be competence enough for further requirements.

Instructional Design: - The curriculum designed for M.Sc. Programmes are entirely different than other programmes. The curriculum designed for M.Sc. Programmes are as per the scientific requirements at presents. Un curriculum there is a provision of Two days regular weakened counseling special practical workshop, Induction Programme, Video lectures of reputed open learning links etc. A large material (audio visual print) in scientific development is available in the

different electronic medium (Internet mobile E-portal, Face book, youtube etc), The instructional design of science programme includes these technologies and encourage the student for using these tools of learning.

PHY501 MATHEMATICAL PHYSICS AND CLASSICAL MECHANICS

Programme: Master of Science Physics MSCPHY12

Year / Semester: 1st Year

Credits: 6

BLOCK – 1 : SPECIAL FUNCTIONS

UNIT 1 : Legendre's

Polynomials

UNIT 2 : Bessel Functions

UNIT 3 : Hermite Polynomials

UNIT 4 : Laplace Equation and Wave Equation

BLOCK – 2 : INTEGRAL TRANSFORMS

UNIT 5 : Fourier Transforms and Application

UNIT 6 : Laplace Transforms and Applications

BLOCK – 3 : TENSOR ANALYSIS

UNIT 7 : Tensor Algebra

UNIT 8 : Metric Tensor & Christoffel Symbols

BLOCK – 4 : MECHANICS OF SYSTEM OF PARTICLES

UNIT 9 : Lagrangian Mechanics

UNIT 10 : Lagrange's Equations

UNIT 11 : Hamilton's Principle

UNIT 12 : Hamiltonian Mechanics

UNIT 13 : Canonical Transformations and Hamilton – Jacobi Theory

UNIT 14 : Poissons Brackets

BLOCK – 5 : NUMERICAL METHODS

UNIT 15 : Numerical Interpolation

UNIT 16 : Numerical Differentiation

UNIT 17 : Numerical Integration

UNIT 18 : Solutions Integration

UNIT 19 : Numerical Solutions of Ordinary Differential Equations

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वाराणसी (उत्तर प्रदेश)

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PHY502

Statistical Mechanics and Quantum Mechanics

Programme: Master of Science Physics MSCPHY12

Year / Semester: 1st Year

Credits: 6

BLOCK – I : INTRODUCTION TO STATISTICAL MECHANICS

- Unit –1 : Statistical Mechanics – Thermo dynamics
- Unit –2 : Ensembles
- Unit –3 : Density Distribution – Liouville's Theorem
- Unit –4 : Postulates of classical Statistical Mechanics
- Unit –5 : Micro canonical Ensemble
- Unit –6 : Maxwell – Boltzmann Statistics
- Unit –7 : Canonical and grand canonical ensembles

BLOCK – II : QUANTUM STATISTICS

- Unit –8 : Postulates of Quantum Statistical Mechanics
- Unit –9 : Quantum Statistics – Be and F-D Statistics

BLOCK – III : PRINCIPLES OF QUANTUM MECHANICS

- Unit –10 : Birth of quantum mechanics
- Unit –11 : Eigen values and eigen functions
- Unit –12 : Dirac's bra and ket vectors
- Unit –13 : Eigen functions and uncertainty principle

BLOCK – IV : SCHRODINGER EQUATIONS AND ANGULAR MOMENTUM THEORY

- Unit –14 : Schrodinger wave equation
- Unit –15 : Application of Schrodinger's equation to one dimensional Problem
- Unit –16 : Angular momentum
- Unit –17 : Application of schrodinger's equation to three Dimensional problems
- Unit –18 : Hydrogen atom
- Unit –19 : Spin angular momentum
- Unit –20 : Addition angular momenta

BLOCK – V : APPROXIMATION METHODS

- Unit –21 : Time independent perturbation theory
- Unit –22 : Variation method
- Unit –23 : Time dependent perturbation theory

BLOCK – VI : RELATIVISTIC QUANTUM MECHANICS

- Unit –24 : Klein Gordon relativistic equation and applications

20/05/2019
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Unit -25 : Dirac's relativistic equation and applications

PHY503 SOLID STATE PHYSICS

Programme: Master of Science Physics MSCPHY12

Year / Semester: 1st Year

Credits: 6

BLOCK 1 CRYSTALLINE STATE AND CRYSTAL STRUCTURE

Unit -1 : CRYSTALLINE STATE AND CRYSTALS STRUCTURE

Unit -2 : NON CRYSTALLINE STATE

Unit -3 : ELEMENTS OF X-RAY DIFFRACTION

Unit -4 : EXPERIMENTAL TECHNIQUES FOR STRUCTURED DETERMINATION

BLOCK 2 IMPERFECTIONS IN CRYSTALS

Unit -5 : IMPERFECTIONS IN CRYSTALS

Unit -6 : DIFFUSION

Unit -7 : DISLOCATIONS

BLOCK 3 FREE ELECTRON THEORY BAND THEORY OF SOLIDS

Unit -8 : FREE ELECTRON THEORY

Unit -9 : BAND THEORY OF SOLIDS

Unit -10 : SEMICONDUCTORS

Unit -11 : SOLID STATE LASERS

BLOCK 4 LATTICE VIBRATIONS AND THERMAL PROPERTIES

Unit -12 : ELASTIC WAVES IN SOLIDS

Unit -13 : INFRA-RED ABSORPTION IONIC CRYSTALS

Unit -14 : LATTICE HEAT CAPACITY

BLOCK 5 DIELECTRONICS AND FERROELECTRICS

Unit -15 : MACROSCOPIC DESCRIPTIONS OF DIELECTRICS

Unit -16 : MEASUREMENT OF DIELECTRIC CONSTANT

Unit -17 : FERROELECTRICS

BLOCK 6 MAGNETISM & SUPERCONDUCTIVITY

Unit -18 : MAGNETISM

Unit -19 : SPONTANEOUS MAGNETIZATION

Unit -20 : OCCURRENCE OF SUPERCONDUCTIVITY

Unit -21 : SUPERCONDUCTIVITY - THEORETICAL EXPLANATIONS

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PHY504

Semiconductor Devices, Analog and Digital Electronics

Programme: Master of Science Physics MSCPHY12

Year / Semester: 1st Year

Credits: 6

BLOCK – I SEMICONDUCTOR DIODES, TRANSISTORS AND AMPLIFIERS

- Unit –1 : Semiconductor Diodes
- Unit –2 : Transistors
- Unit –3 : Power Supplies
- Unit –4 : Feedback Amplifiers
- Unit –5 : RC coupled amplifier and its frequency response
- Unit –6 : Oscillators (Using Transistors)
- Unit –7 : Multivibrators (Using Transistors)

BLOCK – II OPERATIONAL AMPLIFIERS

- Unit –8 : Operational Amplifier and its characteristics parameters
- Unit –9 : Operational Amplifier – Configurations
- Unit –10 : Operational Amplifier – Frequency Response
- Unit –11 : Operational Amplifier – Linear Applications
- Unit –12 : Operational Amplifier – Non-Linear Applications
- Unit –13 : Operational Amplifier – Wave form generators

BLOCK – III DIGITAL ELECTRONICS

- Unit –14 : Introduction to Digital Electronics and Logic Gates
- Unit –15 : Applications of EX-OR gate
- Unit –16 : De-Morgan's Theorems Fundamental Products, Karnaugh map
- Unit –17 : Flip-flops
- Unit –18 : Shift Registers
- Unit –19 : Counters
- Unit –20 : Multiplexer and Demultiplexer

BLOCK – IV CONVERTERS

- Unit –21 : Digital –to – Analog Converters
- Unit –22 : Analog – to- Digital Converters

20/09/20
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PHY505LLABORATORY COURSE

Programme: Master of Science Physics MSCPHY12

Year / Semester: 1st Year

Credits: 8

	Name of the Experiment
Unit -1	: Errors
Unit -2	: Thermal Conductivity of a bad conductor – Lees Method
Unit -3	: Determination of Melting Point of Wax – Thermo E.M.F. diagram Potentiometer
Unit -4	: Study of Variation of Specific Heat of Graphite with Temperature
Unit -5	: Stefan's Constant
Unit -6	: Coefficient of Viscosity – Meyer's Formula
Unit -7	: Elastic Constants of the Material of a Spiral Spring
Unit -8	: Energy Gap of a Semi Conductor
Unit -9	: Ultrasonic Velocity in Liquids De bye – Sears Method
Unit -10	: Ultrasonic Velocity in Liquids Ultrasonic / Interfero Meter
Method	
Unit -11	: Fibre Optics – Determination of Numerical Aperture And losses
Unit -12	: Fibre Optics – Conversion of Electrical to Optical and Optical To Electrical
Signal	
Unit -13	: Biprism – λ of Sodium Light
Unit -14	: Biprism – Thickness of a Thin Mica Sheet
Unit -15	: Cauchy's Constants
Unit -16	: Determination of Wavelength and Difference in Wavelength of Sodium Source using Michelson Interferometer
Unit -17	: Y-of a Glass Plate – Newton's Rings Method
Unit -18	: Determination of Photoelastic Constant of Transparent
Material	
Unit -19	: Study of Dispersion Spectra – Double Refraction
Unit -20	: Verification of Malus Law
Unit -21	: Determination of Wavelength of Laser Using Diffraction Grating
Unit -22	: Hart Mann's Dispersion Formula
Unit -23	: Study of Led Characteristics and Determination of Planck's Constant
Unit -24	: Determination of Rydberg Constant

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PHY551 NUCLEAR PHYSICS AND ANALYTICAL TECHNIQUES

Programme: Master of Science Physics MSCPHY12

Year / Semester: 2nd Year

Credits: 6

Block – I NUCLEAR DECAY PROCESSES

Unit –1 : Alpha Spectrum, Gamow's theory of α -decay

Unit –2 : Beta Spectrum, Neutrino hypothesis, Fermi theory of α -decay, Fermi-Kurie Plots, selection rules for β -decay

Unit –3 : Gamma emission-Multi-pole radiation-selection rules for γ -decay

Unit –4 : Classification of elementary particles – Fundamental Interactions – Conservation laws

Unit –5 : Interaction of charged Particles and Gamma Radiation with matter

Unit –6 : Radiation Detectors

Block – II NUCLEAR FORCES AND NUCLEAR MODELS

Unit –7 : Properties of Nucleus-Nuclear radius, Nuclear Mass and Binding Energy, Angular Momentum, Nuclear statistics, Parity And Symmetry, Magnetic dipole moment, Electric quadrupole Moment.

Unit –8 : Nature of nuclear forces, two body problem, Bound and Spin states of two nuclear, Theory of deuteron, Tensor forces, Exchange forces, meson theory of nuclear forces

Unit –9 : Nuclear models, Liquid model, Formula for total binding Energy of the nucleus, Wezsacher's semi empirical Mass formula, Values of the empirical coefficients

Unit –10 : Shell Model-Experimental Evidence Predictions, Spin Orbit Coupling and Achievements of the Shell-model

Block – III NUCLEAR REACTIONS

Unit –11 : Types of Nuclear reactions, Conservation laws, Kinematics of Nuclear reactions, Q-value, Nuclear cross section, Compound Nucleus, Discrete energy levels of nucleus, Breit-Wigner formula .

Unit –12 : Basic properties of neutrons, classification of neutrons, Slowing down of neutrons, logarithmic decrement in energy, Moderating ratio, neutron diffusion-neutron current density, Neutron leakage current, Fermi age equation, Bohr and Wheeler Theory of fission, four – factor formula

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(विभाग)

K. D. Chahal
20/11/17

PHY552 ELECTROMAGNETIC THEORY AND SPECTROSCOPY

Programme: Master of Science Physics MSCPHY12

Year / Semester: 2nd Year

Credits: 6

BLOCK – I ELECTRO MAGNETIC THEORY

- Unit –1 : Electrostatic Field
- Unit –2 : Magneto Statics
- Unit –3 : Electro Dynamics
- Unit –4 : EM Waves in Matter
- Unit –5 : Electro Magnetic Radiation
- Unit –6 : Lienard-Wiechert Potentials
- Unit –7 : Radiated Power

BLOCK – II ATOMIC SPECTRA

- Unit –8 : Fine Structures
- Unit –9 : Zeeman, Paschen-back and stark Effects
- Unit –10 : Vector Atom Model L-s and Jj Coupling of Two Electron States
- Unit –11 : Two Electron System, Lande 'G' Factor

BLOCK – III MOLECULAR SPECTRA

- Unit –12 : Rotational Spectra of Diatomic Molecules
- Unit –13 : Vibrational Spectra
- Unit –14 : Electronic Spectra
- Unit –15 : Franck-Condon Principle, Dissociation Enalgies
- Unit –16 : Frank Condon Principle

PHY553 MEMORY DEVICES AND MICROPROCESSORS

Programme: Master of Science Physics MSCPHY12

Year / Semester: 2nd Year

Credits: 6

BLOCK – I LOGIC FAMILIES

- Unit –1 : Logic families and their performance characteristics
- Unit –2 : Emitter Coupled Logic (ECL, PMOs, CMOs Logic and Tri state Logic)
- Unit –3 : Comparisons of Logic families

BLOCK – II SEMI CONDUCTOR MEMORIES

- Unit –4 : Classification and Characteristics of Memories
- Unit –5 : Memory organization and expansion

BLOCK – III INTELL 8085 MICROPROCESSOR ORGANIZATION AND ARCHITECTURE

- Unit –6 : Micro processor Organization and Architecture
- Unit –7 : Pin configuration of Intel 8085 Micro processor
- Unit –8 : Timing diagrams

BLOCK – IV ADDRESSING MODES AND PROGRAMMING OF 8085 MICRO PROCESSORS

- Unit –9 : Addressing modes and instruction set of Intel 8085
- Unit –10 : Programming of Micro processor Intel 8085
- Unit –11 : Assembly Language Programming using Loops

BLOCK – V PERIPHERAL DEVICES AND INTERFACING

- Unit –12 : I/O Interfacing & Data Transfer Schemes
- Unit –13 : Intel 8053 Programmable interval Timer
- Unit –14 : Programmable Peripheral Interface (8255)
- Unit –15 : Priority Interrupt Controller (8259)

BLOCK – VI INTEL 8086 MICROPROCESSOR

- Unit –16 : Intel 8086 Micro processor
- Unit –17 : Addressing Modes and Instruction set of Intel 8086 Micro Processor
- Unit –18 : Pin Configuration of Intel 8086 Micro Processor

BLOCK – VII ADVANCED MICRO PROCESSORS

- Unit –19 : Architecture of Micro Processors 80286, 80386, 8086
- Unit –20 : The Pentium Microprocessor

PHY554 MICROWAVE DEVICES AND COMMUNICATION SYSTEM

Programme: Master of Science Physics MSCPHY12

Year / Semester: 2nd Year

Credits: 6

BLOCK – I PASSIVE DEVICES – WAVE GUIDES

- Unit –1 : Passive Devices – Wave – guides
- Unit –2 : Cut off wavelength
- Unit –3 : Rectangular Wave guides

BLOCK – II S-MATRIX

- Unit –4 : Scattering matrix
- Unit –5 : S-Matrix of E-Plane H-Plane and magic tee

BLOCK – III WAVE GUIDE COMPONENTS

- Unit –6 : Waveguide Components
- Unit –7 : Phase Shifters

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BLOCK – IV MICROWAVE SEMICONDUCTOR DEVICES

- Unit –8 : Microwave Semiconductor Devices
- Unit –9 : Parametric Devices

BLOCK – V MICROWAVE TUBES

- Unit –10 : Two Cavity Klystron
- Unit –11 : Magnetron
- Unit –12 : Travelling Wave tube (TWT)

BLOCK – VI MODULATION & DEMODULATION

- Unit –13 : Modulation
- Unit –14 : Demodulation

BLOCK – VII ANTENNAS

- Unit –15 : Antenna Fundamentals
- Unit –16 : VHF antennas
- Unit –17 : Microwave antennas

BLOCK – VIII RADARS

- Unit –18 : Radars 184
- Unit –19 : Types of Radars
- Unit –20 : Tracking radar

PHY555LLABORATORY COURSE

Programme: Master of Science Physics MSCPHY12

Year / Semester: 2nd Year

Credits: 8

Name of the Experiment

- Unit –1 : POWER SUPPLIES
- Unit –2 : ZENER DIODE AS A VOLTAGE REGULATOR
- Unit –3 : RC-COUPLED AMPLIFIER
- Unit –4 : RC-PHASE SHIFT OSCILLATOR
- Unit –5 : COLPITS OSCILLATOR
- Unit –6 : OPERATIONAL AMPLIFIER (OP-AMP) CHARACTERISTICS
- Unit –7 : OPERATIONAL AMPLIFIER (OP-AMP) AS AN INVERTING & NON- INVERTING AMPLIFIER
- Unit –8 : WEIN BRIDGE OSCILLATOR
- Unit –9 : TRIANGULAR WAVE GENERATOR
- Unit –10 : SCIMITT TRIGGER USING IC 741 (OP AMP)
- Unit –11 : ASTABLE MULTIVIBRATOR USING IC 555
- Unit –12 : MONOSTABLE MULTIVIBRATOR WITH IC 555
- Unit –13 : VERIFICATION OF BOOLEAN AND DEMORGAN THEOREMS

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- Unit -14 : HALF ADDER / HALF SUBTRACTOR
- Unit -15 : FULL - ADDER
- Unit -16 : VERIFICATION OF FLIP-FLOPS
- Unit -17 : IMPLEMENTATION OF RING COUNTER AND JOHNSON COUNTER
- Unit -18 : COUNTERS (PART-A)
- Unit -19 : DECADE COUNTER
- Unit -20 : DIGITAL TO ANALOG CONVERSION
- Unit -21 : CRYSTAL OSCILLATOR
- Unit -22 : HISTORY OF THE 'C' PROGRAMMING LANGUAGE
- Unit -23 : EVALUATION OF FUNCTIONS
- Unit -24 : EVALUATION OF DETERMINANT OF MATRIX
- Unit -25 : SOLUTION OF NON-LINEAR EQUATIONS
- Unit -26 : NUMERICAL INTEGRATION
- Unit -27 : SOLUTIONS FOR DIFFERENTIAL EQUATIONS
- Unit -28 : SOLUTIONS TO SYSTEM OF LINEAR EQUATIONS

Procedure of Admission curriculum transaction and evolution:- The learners may apply in the course run by the University by getting themselves enrolled in the various study centers run by the university. The criteria to be met by the student intending to take admission in B.Sc. & M.Sc. physics courses run by the University's is as follows:

For Post Graduate Programme (M.Sc. Physics):-

Graduation with Physics as one of the major subject.

Examination is conducted in the various examination centers decided by the University. Further, the examination copy is to be evaluated by various evaluators of the concern subject approved by Hon'ble Vice -Chancellor.

Requirement of the laboratory support and Library Recourses: - The M.Sc. programmes have practical components also. Practical work is very important in science programmes. In general the science study centers have laboratory facility for M.Sc. and B.Sc. level. After providing the course material, students perform practical work on each Saturday and Sunday during counselling sessions. In master, students have to perform minimum 16 experiments in year (8 per semester). Beside this practice, 10 days compulsory practical workshop is to be organized by the university for the learners. The aforesaid workshop comprises of combined theory and practical session specifically designed for the learners. A comprehensive soft copy of the study material is provided to the learners through the online library in the University website and the learners can also avail the facility of the books available in the University Library.

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Cost Estimate of the Programme and Provision:-Fee deposited by the student registered in B.Sc. Programme is as:-

M.Sc. Physics programme:

The approximate cost of development of study material

8 units x 20 courses =160 units

Cost of development if 160 units (Rs 1000000 writing + Rs 500000) = Rs 1500000

Number of students getting admission each year= nearly 300


Annual Fee deposited by each M.Sc. students = 19600

Total fee deposited by all students (300) = Rs. 5880000

Total expenditure for Editing =112500/-

Total B.Sc. Programme Unit editing expenditure = 337500/-

Quality Assurance Mechanism& Expected Programme outcome:-The course material for M.Sc. and B.Sc. Programme run by the University is of high quality material. The department always reviews the material and modifies it time to time. The science study centers are also visited and monitored regular counselling.


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