MUSLIM ARTS COLLEGE

(Accredited by NAAC with B+ grade & Affiliated to ManonmaniamSundaranar University, Tirunelveli; Recognized US 2(f) 12 (B) of UGC Act.)

Thiruvithancode, Kanyakumari District, Tamil Nadu - 629174.

DEPARTMENT OF PHYSICS

CBCS SYLLABUS

Learning Outcome-based Curriculum Framework for

PHYSICS (M.Sc.)

Applicable for students admitted from June 2026 as per the Resolutions of the Academic Council Meeting held on 01.06.2026

Vision

- To be a centre of excellence in teaching, research, and outreach, advancing knowledge in physics and preparing professionals who contribute meaningfully to society in a dynamic global environment.

Mission

1.To enhance and extend knowledge in physics through teaching and research
2.To develop scientific thinking and analytical skills among students
3.To promote research and innovation in emerging areas
4.To prepare students to contribute effectively to society and industry

Academic and Professional Attributes of the Graduates

1. **Scientific Knowledge and Intellectual Competence**
   Demonstrate comprehensive knowledge of classical, quantum, mathematical, computational, and modern physics with strong analytical and problem-solving abilities.
2. **Experimental and Technical Skills**
   Acquire proficiency in experimental techniques, scientific instrumentation, laboratory practices, data acquisition, and interpretation using modern tools and technologies.
3. **Critical Thinking and Analytical Ability**
   Apply scientific reasoning, mathematical methods, and computational techniques to analyze, interpret, and solve complex physical problems.
4. **Research and Innovation**
   Develop research aptitude through scientific inquiry, experimental design, computational modeling, and innovative approaches to emerging areas of physics.
5. **Communication Skills**
   Communicate scientific concepts, research findings, and technical information effectively through oral presentations, technical reports, and academic writing.
6. **Ethical and Professional Responsibility**
   Practice integrity, ethical values, environmental consciousness, and professional responsibility in scientific research, industry, and society.
7. **Interdisciplinary and Global Perspective**
   Integrate physics knowledge with interdisciplinary sciences and emerging technologies while appreciating global scientific developments and societal needs.
8. **Leadership and Teamwork**
   Demonstrate leadership, interpersonal skills, and the ability to work effectively as an individual and as a member of multidisciplinary teams.
9. **Professional Competence and Employability**
   Acquire the scientific knowledge, technical expertise, computational skills, and professional competencies required for higher education, research, industry, teaching, and entrepreneurship.
10. **Lifelong Learning and Self-Development**
    Cultivate a commitment to continuous learning, independent thinking, adaptability, and professional growth to meet the challenges of rapidly evolving scientific and technological advancements.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Upon completion of the M.Sc. Physics Degree Programme, graduates are expected to	Mapping with Mission
PEO1	Develop a strong foundation in theoretical and experimental physics with the ability for independent learning and scientific inquiry.	M1 & M2
PEO2	Apply advanced knowledge, computational techniques, and experimental skills to solve scientific, technological, and interdisciplinary problems.	M2,M3 & M4
PEO3	Demonstrate ethical values, professional responsibility, leadership, and effective communication in academic, research, industrial, and societal environments.	M4& M5
PEO4	Pursue lifelong learning, higher education, research, innovation, and entrepreneurship to contribute to scientific advancement and societal development.	M3& M4

Programme Outcomes (POs)

POs	Upon completion of the M.Sc Physics Degree Programme, students will be able to:	Mapping with PEOs
PO1	**Physics Knowledge**: Demonstrate comprehensive knowledge of classical, quantum, mathematical, computational, and modern physics to understand and explain physical phenomena.	PEO1
PO2	**Problem Analysis**: Analyze scientific problems using mathematical models, experimental techniques, and critical thinking to develop appropriate solutions.	PEO1, PEO2
PO3	**Research and Innovation**: Apply scientific principles, computational methods, and research methodologies to investigate problems and develop innovative solutions in physics and interdisciplinary fields.	PEO1, PEO2, PEO4
PO4	**Experimental and Technical Skills**: Design, perform, analyze, and interpret experiments using modern scientific instruments, computational tools, and laboratory techniques.	PEO2
PO5	**Ethics and Professional Responsibility**: Demonstrate ethical values, scientific integrity, environmental awareness, and professional responsibility in research and professional practice.	PEO3
PO6	**Digital Literacy and Lifelong Learning**: Utilize modern digital technologies, computational tools, scientific databases, and information resources for continuous learning and professional development.	PEO2, PEO4
PO7	**Leadership and Teamwork**: Function effectively as an individual and as a leader or member of multidisciplinary teams, demonstrating communication, collaboration, and management skills.	PEO3
PO8	**Scientific Communication**: Communicate scientific ideas, experimental findings, and research outcomes effectively through technical writing, presentations, and professional interactions.	PEO3
PO9	**Global Perspective and Sustainability**: Apply physics knowledge to address societal, industrial, environmental, and global challenges while promoting sustainable development.	PEO3, PEO4
PO10	**Higher Education and Employability:** Demonstrate the knowledge, technical competence, and professional skills required for higher studies, research,	PEO4

	teaching, entrepreneurship, and careers in academia, industry, and research organizations.	

Programme Specific Outcomes (PSOs)

PSOs	Upon completion of the M.Sc. Physics Degree Programme, students will be able to:	Mapping with POs
PSO1	Demonstrate comprehensive knowledge of core areas of physics, including classical mechanics, quantum mechanics, electromagnetism, statistical physics, condensed matter physics, and modern physics.	PO1, PO2, PO4, PO5
PSO2	Apply advanced mathematical methods, computational techniques, and scientific principles to analyze and solve complex physical problems.	PO1, PO2, PO3, PO4, PO6
PSO3	Design, perform, analyze, and interpret experiments using modern laboratory instruments, scientific methods, and data analysis techniques.	PO2, PO3,PO4, PO8
PSO4	Develop research competence by formulating scientific problems, conducting investigations, and communicating research findings effectively in academic and professional settings.	PO2, PO3, PO4, PO8, PO10
PSO5	Utilize computational tools, programming languages, simulation software, and modern scientific technologies for modeling, data analysis, and interdisciplinary applications.	PO2, PO3, PO4, PO6
PSO6	Critically evaluate recent developments, emerging technologies, and current research trends in physics for lifelong learning and professional advancement.	PO3, PO6, PO9, PO10
PSO7	Apply physics knowledge and analytical skills to interdisciplinary research, industrial applications, entrepreneurship, and societal challenges while adhering to professional ethics and sustainability.	PO3, PO5, PO7, PO9, PO10

Mapping of Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

POs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
PO1	3	3	1	3	3	3	2
PO2	3	3	3	3	3	3	3
PO3	2	3	2	3	3	2	3
PO4	3	3	3	3	3	3	3
PO5	1	3	3	3	3	3	3
PO6	3	2	2	3	2	3	3
PO7	3	2	3	2	3	3	3
PO8	3	3	3	3	3	3	3
PO9	3	3	3	3	3	3	3
PO10	3	3	3	3	3	3	3

•3 – High Correlation •2 – Moderate Correlation •1 – Low Correlation

COURSES OFFERED

SEMESTER I

Part	Course Code	Title of the Course	Credits	Hours / Week
Core-I	NMPH11	Mathematical Physics	5	6
Core- II	NMPH12	Classical Mechanics and Relativity	5	6
Core-III	NMPH13	Linear and Digital ICs and Applications	4	5
Core Practical – I	NMPHP1	General Physics Experiments – I	2	4
Core Practical – II	NMPHP2	Electronics Experiments – I	2	4
Elective-I	NEPH11	Communication Electronics	3	5
Total			**21**	**30**

SEMESTER I

CORE COURSE I: MATHEMATICAL PHYSICS

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
NMPH11	**Core**	Y	Y	-	Y	5	6	25	75	100

Pre-requisite

Matrices, Vectors, Basics of Differentiation, Integration and Differential equations

Learning Objectives

The course aims to:

1. To equip students with the mathematical techniques needed for understanding theoretical treatment in different courses taught in their program
2. To extend their manipulative skills to apply mathematical techniques in their fields
3. To help students apply Mathematics in solving problems of Physics.

Course Outcomes (COs)

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level

CO1	Understand the concepts of vector spaces, complex analysis, matrices, integral transforms, and differential equations relevant to mathematical physics.	K1,K2
CO2	Apply complex integration, matrix methods, Fourier transforms, and Laplace transforms to solve physical and mathematical problems.	K3
CO3	Analyze eigenvalue problems, orthogonality relations, special functions, and transformation techniques in physical systems.	K4
CO4	Evaluate mathematical models and formulate solutions to advanced physical problems using Green's functions, Sturm–Liouville theory, and differential equation techniques.	K5
CO5	Develop mathematical models and computational approaches to investigate and solve complex physical problems encountered in theoretical and applied physics.	K6

Bloom's Taxonomy Levels

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, K6 – Create

Course Content

Units	Contents	No. of Hours
I	**LINEAR VECTOR SPACE**: Basic concepts – Definitions- examples of vector space – Linear independence -Scalar product- Orthogonality – Gram-Schmidt orthogonalization procedure – linear operators – Dual space- Ket and Bra notation – orthogonal basis – change of basis - projection operator.	**18**
II	**COMPLEX ANALYSIS and GROUP THEORY**: Review of Complex Numbers -de Moivre's Theorem-Functions of a Complex Variable- Differentiability -Analytic functions- Harmonic Functions- Complex Integration- Contour Integration, Cauchy – Riemann conditions – Singular points – Cauchy's Integral Theorem and integral Formula - Laurent's Expansion- Zeros and poles – Residue theorem. Concept of groups-Abelian group-cyclic group- subgroups- classes- conjugate subgroups- Isomorphism and homomorphism – reducible and irreducible representations- character tables and applications.	**18**
III	**MATRICES**: Types of Matrices and their properties, Rank of a Matrix - Conjugate of a matrix - Adjoint of a matrix - Inverse of a matrix - Hermitian and Unitary Matrices - Transformation of matrices - Characteristic equation - Eigen values and Eigen vectors - Cayley–Hamilton theorem –Diagonalization.	**18**
IV	**FOURIER TRANSFORMS & LAPLACE TRANSFORMS**: Definitions -Fourier series and transform and its inverse – Properties of FT - Fourier transform of derivatives - Cosine and sine transforms –Applications.	**18**

	Laplace transform and its inverse - Transforms of derivatives and integrals – Differentiation and integration of transforms – Properties - applications.	
V	**DIFFERENTIAL EQUATIONS** :Power series solutions around ordinary points - Special Functions: generating functions, Rodrigues' formula, Legendre and Hermite polynomials and orthogonality properties; Sturm Liouville Theory: self-adjoint operators, eigenvalue problems, and the expansion of functions in orthogonal eigenfunctions; Green's Functions: introduction to the Dirac delta function, basic construction of Green's functions for linear ODEs, and the Reciprocity theorem.	**18**
	Total	**90**

S. No.	**Text Book**
1	George Arfken and Hans J Weber, 2012, Mathematical Methods for Physicists – A Comprehensive Guide (7th edition), Academic press.
2	P.K. Chattopadhyay, 2013, Mathematical Physics (2nd edition), New Age, New Delhi
3	A W Joshi, 2017, Matrices and Tensors in Physics, 4th Edition (Paperback), New Age International Pvt. Ltd., India
4	B. D. Gupta, 2009, Mathematical Physics (4th edition), Vikas Publishing House, New Delhi.
5	H. K. Dass and Dr. Rama Verma, 2014, Mathematical Physics, Seventh Revised Edition, S. Chand & Company Pvt. Ltd., New Delhi.

S. No.	**Reference Books**
1	E. Kreyszig, 1983, Advanced Engineering Mathematics, Wiley Eastern, New Delhi
2	D. G. Zill and M. R. Cullen, 2006, Advanced Engineering Mathematics, 3rd Ed. Narosa, New Delhi.
3	S. Lipschutz, 1987, Linear Algebra, Schaum's Series, McGraw - Hill, New York
4	E. Butkov, 1968, Mathematical Physics Addison Wesley, Reading, Massachusetts.
5	P. R. Halmos, 1965, Finite Dimensional Vector Spaces, 2nd Edition, Affiliated East West, New Delhi.
6	C. R. Wylie and L. C. Barrett, 1995, Advanced Engineering Mathematics, 6 th Edition, International Edition, McGraw-Hill, New York

S. No.	**Web Resources**
1	www.khanacademy.org
2	https://youtu.be/LZnRlOA1_2I

3	http://hyperphysics.phy-astr.gsu.edu/hbase/hmat.html#hmath
4	https://www.youtube.com/watch?v=_2jymuM7OUU&list=PLhkiT_RYTEU27vS_SlED56gNjVJGO2qaZ
5	https://archive.nptel.ac.in/courses/115/106/115106086/

Mapping with Programme Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	2	1	3	3	3	3
CO2	2	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	2	2	2	3
CO5	3	3	3	3	3	3	1	2	2	3

3 – Strong, 2 – Medium , 1 - Low

Mapping with Programme Specific Outcomes

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3
Weightage	15	15	15	15	15	14	14
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0	2.8	2.8

CORE COURSE II: CLASSICAL MECHANICS AND RELATIVITY

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
NMPH12	**Core**	Y	Y	-	Y	5	6	25	75	100

Pre-requisite

Fundamentals of mechanics, Foundation in mathematical methods**.**

Learning Objectives

The course aims to:

1. To understand fundamentals of classical mechanics, oscillations and relativity concepts.
2. To understand Lagrangian formulation of mechanics and apply it to solve equation of motion.
3. To understand Hamiltonian formulation of mechanics and apply it to solve equation of motion.
4. To discuss the theory of small oscillations of a system.
5. To learn the relativistic formulation of mechanics of a system

Course Outcomes (COs)

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Understand the fundamental principles of classical mechanics, oscillations, and relativity concepts	K1,K2
CO2	Apply Lagrangian and Hamiltonian formulations to solve equations of motion in physical systems.	K3
CO3	Analyze dynamical systems, oscillatory behavior, and phase space representations.	K4
CO4	Evaluate relativistic systems and formulate solutions using advanced mechanics concepts.	K5,K6

Bloom's Taxonomy Levels

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, K6 – Create

Course Content

Units	Contents	No. of Hours

I	**LAGRANGIAN FORMULATION**: Introduction – Space and Time – Mechanics of a Particle and Mechanics of System of Particles- Coordinate System – Configuration space - Constraints – Generalized coordinates – Principle of Virtual Work - D'Alembert's principle – Lagrange's equations from D'Alembert's Principle – Applications - Variational principle – Hamilton's principle – Lagrange's equations from Hamilton's principle.	**18**
II	**HAMILTONIAN DYNAMICS** :Generalized Momentum and Cyclic Coordinates – Hamilton Function H – Conservation laws – Hamilton's equations – Examples in Hamiltonian dynamics: Harmonic Oscillator – Motion of a Particle moving in a Central force field - Canonical transformations – Poisson brackets – Hamilton–Jacobi equation.	**18**
III	**CENTRAL FORCE AND OSCILLATIONS** :Definition and properties of central forces – Reduction of two body problem to equivalent one body problem - Conservation and angular momentum and conservation of energy - Kepler's Problem – Action-angle variables - Small oscillations – Normal mode analysis of system with two and three degree of freedom - Coupled oscillations – Vibrations in a Linear tri atomic molecule.	**18**
IV	**RIGID BODY DYNAMICS**: Rigid body motion and degrees of freedom – Moment of inertia and inertia tensor - Euler angles and their geometric significance – Rotation matrices and direction cosines – Angular momentum and torque – Euler's equations of motion in a rotating frame and their derivation – Symmetric top – Free rigid body motion.	**18**
V	**SPECIAL RELATIVITY** :Postulates of Special Relativity – Lorentz transformations – Relativity of simultaneity – Time dilation – Length contraction – Relativistic addition of velocities – Minkowski space-time and space-time interval – Four-vectors and Lorentz covariance – Position, velocity, momentum, acceleration and force in four-vector notation – Transformation properties of four-vectors – Relativistic momentum – Relativistic energy – Mass–energy equivalence – Relativistic dynamics and equations of motion.	**18**
	Total	**90**

S. No.	**Text Book**
1	H. Goldstein, Classical Mechanics, 3rd Edition, Pearson Edu. 2002.
2	N. C. Rana and P.S. Joag, Classical Mechanics - Tata McGraw Hill, 2001
3	J. V. Narlikar, Introduction to Relativity.
4	R. Resnick, Introduction to Special Theory of Relativity, Wiley Eastern, New Delhi, 1968.

S. No.	**Reference Books**
1	Landau & Lifshitz, Mechanics.

2	Marion & Thornton, Classical Dynamics.
3	Ryder, Quantum Field Theory (Relativity sections).

S. No.	Web Resources
1	http://poincare.matf.bg.ac.rs/~zarkom/Book_Mechanics_Goldstein_Classical_Mechanics_optimized.pdf
2	https://pdfcoffee.com/classical-mechanics-j-c-upadhyay 2014editionpdf-pdf-free.html
3	https://nptel.ac.in/courses/122/106/122106027/
4	https://ocw.mit.edu/courses/physics/8-09-classical-mechanicsiii fall-2014/lecture-notes/
5	https://www.britannica.com/science/relativistic-mechanics

Mapping with Programme Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	2	3	2	3	3	3
CO2	2	3	3	3	3	3	2	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	3	2
CO5	3	3	3	3	3	3	3	2	3	2

3 – Strong, 2 – Medium , 1 - Low

Mapping with Programme Specific Outcomes

CO /PO	PSO 1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	3

CO4	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3
Weightage	15	15	15	15	15	14	14
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0	2.8	2.8

CORE COURSE III: LINEAR AND DIGITAL ICs AND APPLICATIONS

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
NMPH13	**Core**	Y	Y	-	Y	4	5	25	75	100

Pre-requisite

Introduce the fundamental building blocks of linear and digital integrated circuits.

Learning Objectives

The course aims to:

1. To understand fundamentals building blocks of linear and digital integrated circuits.
2. To develop the ability to analyze and apply operational amplifiers, waveform generation circuits, and digital IC systems in practical electronic applications.

Course Outcomes (COs)

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Understand IC fabrication, Op-Amp characteristics, filters, regulators and digital logic concepts	K1,K2
CO2	Apply Op-Amp, timer, PLL, DAC/ADC and digital IC techniques in circuit design.	K3
CO3	Analyze linear and digital circuits including filters, waveform generators, K3 sequential and combinational systems.	K4
CO4	Evaluate and design IC-based systems for practical electronic and communication applications.	K5,K6

Bloom's Taxonomy Levels

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, K6 – Create

Course Content

Units	Contents	No. of Hours
I	**INTEGRATED CIRCUITS AND OPERATIONAL AMPLIFIER**: Introduction, Classification of IC's, Op-Amp 741 and its features, the ideal Operational amplifier, Op-Amp internal circuit diagram, Op-Amp Characteristics – Inverting and Non-Inverting modes of operation – DC and AC performance characteristics.	15
II	**APPLICATIONS OF OP-AMP**: Linear applications of Op-Amp: Solution to simultaneous equations and differential equations, Instrumentation amplifiers, V to I and I to V converters. Non-linear applications of Op-Amp: Sample and Hold circuit, Log and Antilog amplifier, multiplier and divider, Comparators, Schmitt trigger, Multivibrators, Triangular and Square waveform generators.	15
III	**ACTIVE FILTERS & TIMER AND PHASE LOCKED LOOPS** :Active filters: Introduction, Butterworth filters – 1st order, 2nd order low and high pass filters, band pass, band reject and all pass filters – Applications. Timer and Phase Locked Loops: Introduction to IC 555 timer, monostable and astable operations and applications, Schmitt trigger, voltage controlled oscillator (IC 566), PLL – introduction, basic principle, phase detector/comparator, monolithic PLL (IC 565) and applications.	15

IV	**VOLTAGE REGULATOR & DAC AND ADC**: Voltage Regulators: Introduction, Series Op-Amp regulator, IC Voltage Regulators, IC 723 general purpose regulators, Switching regulator. DAC and ADC: Introduction, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A to D converters – parallel comparator type ADC, counter type ADC, successive approximation ADC, dual slope ADC, specifications.	**15**
V	**CMOS LOGIC AND TTL IC CIRCUITS CMOS Logic**: CMOS logic levels, MOS transistors, CMOS inverter, NAND and NOR gates, CMOS AND-OR-INVERT and OR-AND-INVERT gates, implementation of any function using CMOS logic. Combinational circuits using TTL 74xx ICs: Logic gates, 4-bit parallel adder (IC 7483), comparator (IC 7485), decoder (IC 74138, IC 74154), BCD to 7-segment decoder (IC 7446/7447), encoder (IC 74147), multiplexer (IC 74151), demultiplexer (IC74154). Sequential circuits using TTL 74xx ICs: Flip-flops (IC 7474, IC 7473), shift registers, universal shift register (IC 74194), 4-bit asynchronous counter (IC 7493).	**15**
	Total	**75**

S. No.	**Text Book**
1	D. Roy Choudhury, Shail B. Jain (2012), Linear Integrated Circuit, 4th edition, New Age International Pvt. Ltd., New Delhi, India.
2	Ramakant A. Gayakwad (2012), OP-AMP and Linear Integrated Circuits, 4th edition, Prentice Hall / Pearson Education, New Delhi.
3	B.L. Theraja and A.K. Theraja, 2004, A Textbook of Electrical Technology, S. Chand & Co.
4	V.K. Mehta and Rohit Mehta, 2008, Principles of Electronics, S. Chand & Co, 12th Edition.
5	V. Vijayendran, 2008, Introduction to Integrated Electronics (Digital & Analog), S. Viswanathan Printers & Publishers Private Ltd, Reprint.

S. No.	**Reference Books**
1	Sergio Franco (1997), Design with Operational Amplifiers and Analog Integrated Circuits, McGraw Hill, New Delhi.
2	Gray, Meyer (1995), Analysis and Design of Analog Integrated Circuits, Wiley International, New Delhi.
3	Malvino and Leach (2005), Digital Principles and Applications, 5th Edition, Tata McGraw Hill, New Delhi.
4	Floyd, Jain (2009), Digital Fundamentals, 8th Edition, Pearson Education, New Delhi.
5	Integrated Electronics, Millman & Halkias, Tata McGraw Hill, 17th Reprint (2000).

Mapping with Programme Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	2	3	3	3	3	2
CO2	2	3	3	3	3	3	2	3	3	2
CO3	3	3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	2	3	2

3 – Strong, 2 – Medium , 1 - Low

Mapping with Programme Specific Outcomes

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	2	3
CO2	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3
Weightage	15	15	15	15	15	13	14
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0	2.6	2.8

Core Practical I : GENERAL PHYSICS EXPERIMENTS –I

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
NMPHP1	**Core**	-	-	Y	Y	2	4	50	50	100

Pre-Requisites:

Knowledge and hands on experience of basic general experiments of Physics

Learning Objectives

The course aims to:

1. To understand the concept of mechanical behavior of materials and calculation of same using appropriate equations.
2. Application of Diffraction and Interference
3. Determination of some physical constants
4. To calculate the thermodynamic quantities and physical properties of materials.
5. To analyze the optical and electrical properties of materials.

Course Outcomes

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Explain the principles of experimental techniques, scientific instruments, and physical measurements.	**K1,K2**
CO2	Perform physics experiments using appropriate procedures and laboratory instruments.	**K3**
CO3	Analyze experimental data and evaluate physical parameters from observations.	**K4**
CO4	Interpret experimental results and apply physical concepts to scientific problems.	**K5**
CO4	Design, validate, and present experimental investigations by integrating theoretical concepts with laboratory observations and scientific reasoning.	**K6**

Bloom's Taxonomy Levels

K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyse, **K5** – Evaluate, **K6** – Create

Course Content

List of Exercises
1.Determination of Young's modulus and Poisson's ratio by Hyperbolic fringes - Cornu's Method 2. Determination of Thickness of the enamel coating on a wire by diffraction 3. Measurement of Band gap energy of the Thermistor material 4. Determination of Planck Constant – LED Method 5. Determination of Compressibility of a liquid using Ultrasonic Interferometer 6. Determination of Wavelength, Separation of wavelengths using Michelson Interferometer 7. Accurate measurement of wavelength of Diode Laser using Diffraction grating. 8. Determination of Diffraction pattern of light with circular aperture using Diode/He-Ne laser. 9. Measurement of Susceptibility of liquid - Quincke's method 10. Determination of Self Inductance of the given coil using Maxwell's method. 11. Determination of Crystallographic Parameters for the given XRD spectrum a) Unit cell determination b) W-H plot and interpretation 12. Measurement of RC Time constant (through discharging) and its theoretical verification.

S. No.	Text Book

1	Practical Physics, Gupta and Kumar, PragatiPrakasan.

S. No.	Reference Books
1	Advanced Practical Physics, S.P Singh, PragatiPrakasan.
2	An advanced course in Practical Physics, D.Chattopadhayay, C.R Rakshit, New Central Book Agency Pvt. Ltd.

Mapping with Programme Specific Outcomes

Mapping with Programme Outcomes

CO /PO	PSO 1	PSO 2	PSO3	PSO4	PS O5	PS O6	PS O7
CO1	3	2	2	3	3	3	3
CO2	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	2	3
Weightage	15	14	14	15	15	14	14
Weighted percentage of Course Contribution to POs	3.0	2.8	2.8	3.0	3.0	2.8	2.8

3 – Strong, 2 – Low

Core :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	3	3	3
CO2	2	3	3	3	2	2	2
CO3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	2	3	3	3	3	3

– Medium , 1

Practical II

Core Practical II - ELECTRONICS EXPERIMENTS –I

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
NMPHP2	**Core**	-	-	Y	Y	2	4	50	50	100

Pre-Requisites:

Knowledge and hands on experience of basic electronics experiments of Physics

Learning Objectives

The course aims to:

1. To provide practical exposure to analog and digital electronics through circuit design and experimental analysis.
2. To develop skills in electronic instrumentation and signal processing, enhance the ability to analyze electronic circuit behavior and performance characteristics,
3. To design and implement basic electronic systems for scientific and technological applications.

Course Outcomes

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Explain the principles of analog and digital electronic circuits, devices, and measurement techniques.	**K1,K2**
CO2	Perform electronic experiments using appropriate components, instruments, and testing procedures.	**K3**
CO3	Analyze the characteristics and performance of analog and digital electronic circuits.	**K4**
CO4	Design and implement electronic circuits for waveform generation, signal processing, and digital applications.	**K5,K6**
CO5	Construct, test, troubleshoot, and optimize analog and digital electronic circuits to solve practical engineering and scientific problems.	**K6**

Bloom's Taxonomy Levels

K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyse, **K5** – Evaluate, **K6** – Create

Course Content

List of Exercises

(Choose any SIX experiments)

ELECTRONICS Experiments

1.Construction of series voltage regulator and its characteristics

2. FET CS amplifier- Frequency response, input impedance, output impedance

3. Important electrical characteristics of IC 741 (i/p and o/p impedance, Voltage Gain, CMRR).

4. Construction of a Constant current source using Transistor/FET and 741 and I-R characteristics (Floating and Grounded Load)

5. V- I and optical Characteristics of LEDs of different wavelengths.

6. Study of attenuation characteristics of Wien's bridge network and design of Wien's bridge oscillator using Op-Amp.
7. Study of attenuation characteristics of Phase shift network and design of Phase shift oscillator using Op-Amp.
8. To design and construct a Schmitt trigger using IC741
9. Construction of square wave and Triangular wave generator using IC 741
10. Construction of pulse generator using the IC 741 – application as frequency divider
11. Construction of Op-Amp- 4-bit Digital to Analog converter (Binary Weighted and R/2R ladder type
12. BCD addition using IC7483

S. No.	Text Book
1	Kit Developed for doing experiments in Physics- Instruction manual, R.Srinivasan K.R Priolkar, Indian Academy of Sciences.
2	Electronic Laboratory Primer a design approach , S. Poornachandra, B.Sasikala, Wheeler Publishing, New Delhi.
3	Electronic lab manual Vol I, K ANavas, Rajath Publishing.
4	Electronic lab manual Vol II, K ANavas, PHI eastern Economy Edition

S. No.	Reference Books
1	Op-Amp and linear integrated circuit, Ramakanth A Gaykwad, Eastern Economy Edition.
2	A course on experiment with He-Ne Laser, R.S. Sirohi, John Wiley & Sons (Asia) Pvt. Ltd.
3	Electronic lab manual Vol II, Kuriachan T.D, Syam Mohan, Ayodhya Publishing.

Mapping with Programme Specific Outcomes

CO /PO	PSO 1	PS O2	PSO3	PS O4	PS O5	PS O6	PS O7
CO1	3	2	2	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3
Weightage	15	14	14	15	15	14	15
Weighted percentage of Course Contribution to POs	3.0	2.8	2.8	3.0	3.0	2.8	3.0

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	2	1	3	3
CO2	2	3	3	3	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	2	3	3	3	3	2	1	3	3

3 – Strong, 2 – Medium, 1 - Low

EC1: Elective Course : COMMUNICATION ELECTRONICS

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
NEPH11	**Elective I**	Y	-	-	Y	3	5	25	75	100

Pre-Requisites

Knowledge of Regions of electromagnetic spectrum and its characteristics

Learning Objectives

The course aims to:

1. To comprehend the transmission of electromagnetic waves thorough different types of antenna and also to acquire knowledge about the propagation of waves through earth's atmosphere and along the surface of the earth.
2. To gain knowledge in the generation and propagation of microwaves.
3. To acquire knowledge about radar systems and its applications and also the working principle of colour television.
4. To learn the working principle of fiber optics and its use in telecommunication.
5. To understand the general theory and operation of satellite communication systems.

Course Outcomes

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Discuss and compare the propagation of electromagnetic waves through sky and on earth's surface Evaluate the energy and power radiated by the different types of antenna.	**K1,K5**
CO2	Compare and differentiate the methods of generation of microwaves analyze the propagation of microwaves through wave guides- discuss and compare the different methods of generation of microwaves.	**K4**
CO3	Classify and compare the working of different radar systems- apply the principle of radar in detecting locating, tracking, and recognizing objects of various kinds at considerable distances – discuss the importance of radar in military- elaborate and compare the working of different picture tube.	**K3**
CO4	Classify, discuss and compare the different types of optical fiber and also to justify the need of it-discover the use of optical fiber as wave guide	**K1,K3**
CO5	Explain the importance of satellite communication in our daily life-distinguish between orbital and geostationary satellites elaborate the linking of satellites with ground station on the earth.	**K4**

Bloom's Taxonomy Levels

K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyse, **K5** – Evaluate, **K6** – Create

Course Content

Unit	Contents	No. of Hours
I	**ANTENNAS AND WAVE PROPAGATION**: Radiation field and radiation resistance of short dipole antenna grounded antenna-ungrounded antenna-antenna arrays-broadside and end side arrays-antenna gain-directional high frequency antennas-sky wave ionosphere- Eccles and Larmor theory- Magneto ionic theory- ground wave propagation.	**12**
II	**MICROWAVES**: Microwave generation—multi cavity Klystron-reflex klystron magnetron travelling wave tubes (TWT) and other microwave tubes MASER- Gunndiode-wave guides-rectangular wave guides-standing wave indicator and standing wave ratio(SWR).	**12**
III	**RADAR AND TELEVISION**: Elements of a radar system-radar equation-radar performance Factors radar transmitting systems-radar antennas-duplexers radar receivers and indicators-pulsed systems-other radar systems colour TV transmission and reception-colour mixing principle-colour picture tubes-Delta gun picture tube-PIL colour picture tube-cable TV, CCTV and theatre TV.	**12**
IV	**SATELLITE COMMUNICATION**: Orbital satellites-geostationary satellites-orbital patterns-satellite system link models-satellite system parameters-satellite system link equation link budget-INSAT communication satellites.	**12**
V	**EARTH STATION TECHNOLOGY**: Transmitters, Receivers, Antennas, Tracking systems, Terrestrial Interface, Power Test methods, Lower Orbit Considerations. Satellite Navigation & Global Positioning Systems: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers, GPS C/A code accuracy, Differential GPS.	**12**
	Total	**60**

S. No.	Text Books
1	Handbook of Electronics by Gupta and Kumar, 2008 edition.
2	Electronic communication systems – George Kennedy and Davis, Tata McGraw Hill, 4th edition, 1988.
3	Taub and Schilling, principles of communication systems, second edition, Tata Mc Graw Hill (1991).
4	M. Kulkarani, Microwave and radar engineering, Umesh Publications, 1998.
5	Mono Chrome and colour television, R. R. Ghulathi
6	Satellite Communication Engineering- Wilbur L. Pritchand, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications.

7	Digital Satellite Communications-Tri. T.Ha, 2nd Edition, 1990, Mc. Graw Hill.

S. No.	**REFERENCE BOOKS**
1	Electronic communications – Dennis Roody and Coolen, Prentice Hall of India, IV edition, 1995.
2	Wayne Tomasi, Advanced electronics communication systems, fourth edition, Prentice Hall of India, 1998.
3	Dennis Roddy and Coolen,1995,Electronics communications, Prentice Hall of India IV Edition.
4	Wayne Tomasi,1998 "Advanced Electronics communication System" 4thedition, Prentice Hall of India, 1998.
5	S. Salivahanan, N. Suersh Kumar & A. Vallavaraj, 2009, Electronic Devices and Circuits, Tata McGraw-Hill Publishing Company Limited, New Delhi, Second Edition.

S. No.	**WEB SOURCES**
1	https://www.geeksforgeeks.org/digital-electronics-logic designtutorials/ /
2	https://www.polytechnichub.com/difference-analog instrumentsdigital-instruments
3	http://nptel.iitm.ac.in/
4	http://web.ewu.edu/
5	http://nptel.iitm.ac.in/

Mapping with Programme Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO1	3	3	3	3	3	3	3	1	2	3
CO2	2	3	3	3	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	2	3	3	3	2	3	3	2	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes

CO /PO	PSO 1	PSO 2	PS O3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	2	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	2	3
Weightage	15	15	15	14	15	14	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	2.8	3.0	2.8	3.0