DEBRA THANA S.K.S. MAHAVIDYALAYA

(Autonomous)

Debra, Paschim Medinipur, West Bengal

Department Of Physics

Proposed Curriculum & Syllabus (draft)

(w.e.f. Academic Year 2024-2025)

Based on

Curriculum & Credit Framework for Undergraduate Programmes (CCFUP), 2024 & NEP, 2020

Selection of Disciplines/Subjects during Admission:

1. 4-YEAR BACHELOR OF SCIENCE (HONOURS) WITH PHYSICS:

i) MAJOR IN PHYSICS:

a) Major- Physics
b) Minor - Any other 2 subjects

ii) MAJOR IN OTHER SUBJECT WITH MINOR IN PHYSICS:

a) Major- Other subject
b) Minor – Physics and another subject

PHYSICS: Minor 1 / Minor 2

2. 3-YEAR BACHELOR OF PHYSICAL SCIENCE WITH PHYSICS (MULTIDISCIPLINARY STUDIES) :

a) Major- 2 subjects (A & B)
b) Minor -1 subject (C)

PHYSICS: A/B/C

ANNEXURE-1

Curriculum & Credit Structure of 4-Year Bachelor Degree Programme B.A./B.Sc./B.Com. (Hons./ Hons. with Research) in Single Major

SEMESTER	Major - MJ (Core Discipline)	Minor Disciplines- MI (Discipline- I & II)	Ability Enhancement Courses -AEC	Skill Enhancement- SEC	Summer Internship	Multidisciplinary Courses	Value Added Courses - VAC	Dissertation/ Project/ Entrepreneurship	Total Credit / No. of courses
	Major - 20 (4 Credits)	Minor- 8 (4 Credits)	AEC -4 (2 Credits)	SEC- 3 (3 Credits)	Int./Proj./ Comm. Ser. -2 (4 Credits)	MDC-3 (3 Credits)	VAC -2 (4 Credits)	Dissertation/ Project/ Entp. 2	
I	Major-1	Minor -1 (Discipline-1)	English Communication-1	SEC-1		MDC-1	VAC-1 (ENVS)		20 /6
II	Major -2	Minor-2 (Discipline-II)	MIL (Bengali/Hindi) -1	SEC-2	Community Service (Add.)	MDC-2	VAC-2		20/ 6
YEAR-1	(2x4) 8	(2x4) 8	(2x2) 4	(3x2) 6	(+4)	(3x2) 6	(2x4) 8	-	40 (+4) 44
Exit option with Undergraduate Certificate (in the Major Discipline) securing 44credits with Community Service (Additional 4 credits)									
III	Major -3 Major -4	Minor-3 (Discipline-1)	English Communication-2	SEC-3		MDC-3			20/ 6
IV	Major 5 Major 6 Major 7	Minor4 (Discipline-1I)	MIL (Bengali/Hindi) -2		Internship / Apprenticeship (Major Disc.)				22/ 6
YEAR-2	(7x4) 28	(4x4) 16	(4x2) 8	(3x3) 9	4 (+4) 8	(3x3) 9	(2x4) 8	-	86
Students on Exit shall be awarded Undergraduate Diploma (in the Major Discipline) securing 86 credits									
V	Major 8, 9, 10 Major (Elect.) -1	Minor- 5 (Discipline-1)							20/ 5
VI	Major -11, 12, 13 Major (Elect.) -2	Minor-6 (Discipline-1I)							20/ 5
YEAR-3	(15x4) 60	(6x4) 24	(4x2) 8	(3x3) 9	4 (+4) 8	(3x3) 9	(2x4) 8	-	126
Students on Exit shall be awarded 3-Year Bachelor Degree (in the Major Discipline) after securing 126 Credits									
VII	Major -14, 15, Major (Elect.) -3*	Minor-7 (Discipline-I)						Project-1 (4 Credit)	20/ 5
VIII	Major -16 Major (Elect.) -4*	Minor-8 (Discipline-1I)						Project-2 (8 Credit)	20/ 4 (5*)
YEAR-4	(20x4) 80	(8x4) 32	(4x2) 8	(3x3) 9	4 (+4)=8	(3x3) 9	(2x4) 8	(4+8) 12	166 /43
Students shall be awarded Bachelor Degree (Hons. with Research) in the Major Discipline securing 166 credits									
**Students not opting Research shall complete Three (03) additional papers (Major Electives-5 in Sem.-VII and Major Electives-6, 7 in Sem.-VIII*									
One (01) Major Discipline & Two (02) Minor Disciplines-(1 & 2) Disciplines to be selected from given Subject bunch/group									

ANNEXURE-2

Curriculum and Credit Structure of 3-Year Bachelor Degree Programme B.A./B.Sc./B.Com. in Multidisciplinary Studies

SEMESTER	Major - MJ (Disciplines- A & B)	Minor Disciplines- MI (Discipline- C)	Ability Enhancement Courses -AEC	Skill Enhancement- SEC	Summer Internship	Multidisciplinary Courses	Value Added Courses - VAC	Dissertation/ Project/ Entrepreneurship	Total Credit / No. of courses
	Major - 15 (4 Credits)	Minor Disc.- 6 (4 Credits)	AEC -4 (2 Credits)	SEC- 3 (3 Credits)	Int./Proj./ Comm. Ser. -2 (4 Credits)	MDC-3 (3 Credits)	VAC -2 (4 Credits)	Dissertation/ Project/ Entp. 2	
I	Major -A1	Minor -C1	English Communication-1	SEC-1		MDC-1	VAC-1 (ENVS)		20 /6
II	Major -B1	Minor-C2	MIL (Bengali/Hindi) -1	SEC-2	Community Service (Add.)	MDC-2	VAC-2		20/ 6
YEAR-1	(2x4) 8	(2x4) 8	(2x2) 4	(3x2) 6	(+4)	(3x2) 6	(2x4) 8	-	40 (+4) 44
Exit option with Undergraduate Certificate (Multidisciplinary field of study) securing 44credits with Community Service (Additional 4 credits)									
III	Major -A2 Major -A3	Minor-C3	English Communication-2	SEC-3		MDC-3			20/ 6
IV	Major -B2 Major -B3 Major (Elect.) -1	Minor-C4	MIL (Bengali/Hindi) -2		Internship / Apprenticeship (any Discipline)				22/ 6
YEAR-2	(7x4) 28	(4x4) 16	(4x2) 8	(3x3) 9	4 (+4) 8	(3x3) 9	(2x4) 8	-	86
Students on Exit shall be awarded Undergraduate Diploma (in Multidisciplinary field of study) securing 86 credits									
V	Major-A4, A5, A6 Major (Elect.) -2	Minor- C5							20/ 5
VI	Major-B4, B5, B6 Major (Elect.) -3	Minor-C6							20/ 5
YEAR-3	(15x4) 60	(6x4) 24	(4x2) 8	(3x3) 9	4 (+4) 8	(3x3) 9	(2x4) 8	-	126
Students shall be awarded Bachelor Degree in Multidisciplinary field of studies securing 126 credits									

A, B & C – Three (03) Disciplines/ Subjects to be selected from Subject bunch/group of respective Multidisciplinary studies

DEBRA THANA S.K.S. MAHAVIDYALAYA

Proposed Syllabus (Draft) of

BACHELOR OF SCIENCE (HONOURS)
MAJOR IN PHYSICS

4-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2024-2025)

Based on Curriculum & Credit Framework for Undergraduate Programmes (CCFUP), 2024 & NEP, 2020

DEBRA THANA S.K.S. MAHAVIDYALAYA
BACHELOR OF SCIENCE (HONOURS) MAJOR IN PHYSICS
(under CCFUP, 2024)

Level	YR.	SEM	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
								CA	ESE	TOTAL
B.Sc. (Hons.)	1st	I	**SEMESTER-I**							
			Major-1	**PHSHMJ101**	**T: Foundation of Physics; P: Practical**	**4**	**3-0-1**	**15**	**60**	**75**
			SEC	**PHSSEC01**	**P: Basic Computer and Graph Plotting**	**3**	**0-0-3**	**10**	**40**	**50**
			AEC	**AEC01**	Communicative English -1 (***common for all programmes***)	**2**	**2-0-0**	**10**	**40**	**50**
			MDC	**MDC01**	Multidisciplinary Course -1 (***to be chosen from the list***)	**3**	**3-0-0**	**10**	**40**	**50**
			VAC	**VAC01**	ENVS (***common for all programmes***)	**4**	**2-0-2**	**50**	**50**	**100**
			Minor (Disc.-I)	**PHSMI01**	**T: Mathematical Methods and Mechanics; P: Practical** ***(To be taken by students of other Disciplines)***	**4**	**3-0-1**	**15**	**60**	**75**
					Semester-I Total	**20**				**400**
		II	**SEMESTER-II**							
			Major-2	**PHSHMJ102**	**T: Waves and Optics; P: Practical**	**4**	**3-0-1**	**15**	**60**	**75**
			SEC	**PHSSEC02**	**P: Introduction to Python Programming and Graph plotting**	**3**	**0-0-3**	**10**	**40**	**50**
			AEC	**AEC02**	MIL-1 (***common for all programmes***)	**2**	**2-0-0**	**10**	**40**	**50**
			MDC	**MDC02**	Multi Disciplinary Course-02 (***to be chosen from the list***)	**3**	**3-0-0**	**10**	**40**	**50**
			VAC	**VAC02**	Value Added Course-02 (***to be chosen from the list***)	**4**	**4-0-0**	**10**	**40**	**50**
			Minor (Disc.-II)	**PHSMI01**	**T: Mathematical Methods and Mechanics; P: Practical** ***(To be taken by students of other Disciplines)***	**4**	**3-0-1**	**15**	**60**	**75**
			Summer Intern.	**CS**	Community Service	**4**	**0-0-4**	**-**	**-**	**50**
					Semester-II Total	**24**				**400**
					TOTAL of YEAR-1	**44**				**800**

MJ = Major, MI = Minor Course, SEC = Skill Enhancement Course, AEC = Ability Enhancement Course, MDC = Multidisciplinary Course, VAC = Value Added Course; CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical, MIL = Modern Indian Language, ENVS = Environmental Studies

SEMESTER II

BACHELOR OF SCIENCE (HONOURS)

MAJOR IN PHYSICS

PHYSICS

MAJOR 2

MJ-2: Waves and Optics

MJ-2T: Waves and Optics

Oscillations: SHM: Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor **. [5L]**

Superposition of Collinear Harmonic oscillations Linearity and Superposition Principle: Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats). Superposition of N collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences. [4L]

Superposition of two perpendicular Harmonic Oscillations: Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses. [2L]

Wave Motion: Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities. Differential Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave. Water Waves: Ripple and Gravity Waves. [5L]

Velocity of Waves: Velocity of Transverse Vibrations of Stretched Strings. Velocity of Longitudinal Waves in a Fluid in a Pipe. Newton's Formula for Velocity of Sound. Laplace's Correction. [3L]

Superposition of Two Harmonic Waves: Standing (Stationary) Waves in a String: Fixed and Free Ends. Analytical Treatment. Phase and Group Velocities. Changes with respect to Position and Time. Energy of Vibrating String. Transfer of Energy. Normal Modes of Stretched Strings. Plucked and Struck Strings. Melde's Experiment. Longitudinal Standing Waves and Normal Modes. Open and Closed Pipes. Superposition of N Harmonic Waves. [6L]

Wave Optics: Electromagnetic nature of light. Definition and properties of wave front. Huygens Principle. Temporal and Spatial Coherence. [2L]

Interference: Division of amplitude and wavefront. Young's double slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes

of equal thickness (Fizeau Fringes). Newton's Rings: Measurement of wavelength and refractive index. [4L]

Interferometer: Michelson Interferometer-(1) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index, and (5) Visibility of Fringes. Fabry-Perot interferometer. [4L]

Diffraction and Holography: Kirchhoff's Integral Theorem, Fresnel-Kirchhoff's Integral formula. (Qualitative discussion only) Fraunhofer diffraction: Single slit. Circular aperture, Resolving Power of a telescope. Double slit. Multiple slits. Diffraction grating. Resolving power of grating. Fresnel Diffraction: Fresnel's Assumptions. Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propagation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel's Integral, Fresnel diffraction pattern of a straight edge, a slit and a wire. Holography: Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves. Point source holograms. [10L]

Reference Books:

• Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill.

• Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill

• Principles of Optics, Max Born and Emil Wolf, 7th Edn., 1999, Pergamon Press.

• Optics, Ajoy Ghatak, 2008, Tata McGraw Hill

• The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.

• The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.

• Fundamental of Optics, A. Kumar, H.R. Gulati and D.R. Khanna, 2011, R. Chand Publications.

• The Physics of waves, Howard Georgi, Pearson.

• Optics, Eugene Hecht, Pearson.

List of Practical:

1. To determine the frequency of an electric tuning fork by Melde's experiment and verify $\lambda 2$ law.

2. To study Lissajous Figures by using Oscilloscope.

3. Familiarization with: Schuster`s focusing; determination of angle of prism.

4. To determine refractive index of the Material of a prism using sodium source.

5. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.

6. To determine wavelength of sodium light using Fresnel Biprism.

7. To determine wavelength of sodium light using Newton's Rings.

8. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.

9. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating.

10. To determine dispersive power and resolving power of a plane diffraction grating.

11. Study of diffraction with piece of cloth and LASER by using image analysis.

Suggested Readings:

1. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
2. Laboratory Manual of Physics, Madhusudan Jana, Books & Allied (P) Ltd., 2022, Kolkata.
3. B.Sc. Practical Physics, C.L. Arora, S Chand and Company Limited
4. Physics in Laboratory, Mandal, Chowdhury, Das, Das, Santra Publication
5. Advanced Practical Physics Vol 1, B. Ghosh, K. G. Majumder, Sreedhar Publisher
6. Practical Physics, P.R. Sasi Kumar, PHI Learning Private Limited10. B.Sc. Practical Physics, Harnem Singh, P.S. Hemne, S Chand and Company Limited.

BACHELOR OF SCIENCE (HONOURS)

MAJOR IN PHYSICS

PHYSICS

SKILL ENHANCEMENT COURSE (SEC)

SEC 2

SEC 2: Introduction to Python programming and Graph Plotting

SEC2P: Introduction to Python programming and Graph Plotting

Course Outline:

1. Introduction to programming in python(Version-3):

(a) Introduction

1. Python interpreter as a calculator

2. Variable and data types (int, float, complex, list, tuple, set, string),the type()function)

3. Basic mathematical operations

4. Compound statements in python

Logical Conditions (if, elif, else)

Loops (for, while)

User defined functions def: (return statement, default values for arguments, key word arguments), lambda function.

5. Importing modules with math, c math, random as examples

6. Using help and dir command to use the inbuilt manual

7. Basic idea of name spaces-local and global

8. Python scripts, I/O operations (including opening and writing to files)

(b) The python data types

1. List: defining lists, reading and changing elements from lists, slicing, concatenation, list comprehension. 2D list as matrix

2. built in functions involving lists: range(), len(), sum(), min(), max() – list methods:

append(),extend(),count(), index(), sort(), insert(), pop(),remove(), reverse()

3. Tuples: Contrast and compare with lists, packing/unpacking using tuples (including a,b=b,a to swap variables)

4. Sets: set methods: update(), pop(), remove(), Set Theoretic operations: union, intersection, difference and symmetric difference of two sets.

5. Strings: Defining strings, the use of single, double or triple quotes as string delimiters, len(), indexing, slicing, string concatenation, some string methods: strip(), split(), join(), find(), count(), replace(), string for matting in python (using the % operator)

6. Dictionary: Make a dictionary, Built-in functions on dict and dictionary methods

2. Problems and Applications

1. Find odd, even numbers

2. Finding factors of an integer

3. Generate list of various random numbers. Find mean, var., std. dev.

4. Roots of a quadratic equation

5. Area of triangle by Heron's formula

6. Check strong number, Armstrong number

7. Determining whether an integer is prime or not. Define a python function and use this to find out

all prime numbers within a given range. Finding out prime number greater than or lesser than a given value.

8. Sorting of lists (algorithm and code) using Bubble, insertion or Selection sort

9. Sum of series correct upto given decimal places (Sine, Cosine, Exponential etc.)

10. Motion of a particle under a given force F(x, t, v) with given initial condition and plotting (x,t), (x, v),(t, v). (Matplotlib to be used to plot graphs), using Euler's method only. [Examples: Nuclear Decay equation, projectile motion, damped harmonic motion etc.]

11. Matrix Addition, Multiplication and Transpose directly and using List Comprehension.

12. Curve fitting, Least square fit, Goodness of fit, standard deviation.

13. Plot a polynomial (or any transcendental) function. Indentify the real roots by plotting. Write a

Python code to fine tune a possible root.

3. Introduction of graph plotting:

Matplotlib as a plotting Module: Basics of XY-plotting of function (i) power laws and exponential functions, (ii) trigonometric functions, (iii) Hyperbolic functions. (iv) Define a Python function and

plot in a domain. Bar chart plots, histograms, polar plots, pie plots, Plot from data file, saving the figures, subplots, multiple plots.

4.Introduction to Adruino:

Understand the fundamentals of Arduino hardware and software. Basic programming using Adruino.

Suggested Readings:

1. Scientific Computing in Python. Abhijit Kar Gupta, Techno World

2. Computational Physics, Mark Newman, Amazon Digital.

3. Introduction to Numerical Analysis, S.S. Sastry, 5thEdn. , 2012, PHI Learning Pvt. Ltd

4. Numerical Methods, Arun Kr Jalan, Utpal Sarkar, University Press

5. Numerical Mathematical Analysis, J. B. Scarborough, OXFORD and IBH Co. Pvt. Ltd.

6. Elementary Numerical Analysis, K.E. Atkinson, 3rdEdn., 2007, Wiley India Edition

7. Python Programming, Satyanarayana, Radhika Mani, Jagdesh, University Press

8. Python 2.1 Bible Dave Brueck, Stephen Tanner, Hungry Minds Inc, New York

9. Learning with Python-how to think like a computer scientist, J.Elkner, C.Meyer, and A Downey, 2015, Dreamtech Press.

10. Introduction to computation and programming using Python, J.Guttag, 2013, Prentice Hall India.

11. Effective Computation in Physics-Field guide to research with Python, A. Scopatz and K.D.Huff,2015, O'Rielly

12. An Introduction to Computational Physics, T. Pang, 2nd Edn., 2006, Cambridge Univ. Press

Computational Physics, DarrenWalker,1stEdn.,2015, Scientific International Pvt.Ltd.

BACHELOR OF SCIENCE (HONOURS)

MINOR IN PHYSICS

Physics

MINOR 2

Mathematical Methods and Mechanics:

MI-2T: Mathematical Methods and Mechanics:

Course contents:

1.Differential equations: Exact and inexact differential, First order linear differential equations with integrating factor, Second order Linear differential equations with constant coefficients. Particular Integral. [5L]

2.Vector Calculus: Properties of vectors under rotations. Scalar product and its invariance under rotations. Scalar triple product and their interpretation in terms of area and volume, respectively. Scalar and Vector fields. Vector differentiation: Gradient of a scalar field and its geometrical interpretation. Divergence and Curl of a vector field. Gauss' divergence theorem, Green's theorem and Stokes theorem. [8L]

3.Fundamentals of Dynamics: Reference frames. Inertial frames and Non inertial frames. Review of Newton's laws of motion. Dynamics of a system of particles. Centre of mass. Calculation of center of masses of 2d and 3d bodies. [8L]

4.Rotational Dynamics: Perpendicular and parallel axes theorems, radius of gyration, calculationof moment of inertia for rectangular, cylindrical, and spherical bodies, pure rolling of a body on an inclined plane. [7L]

5.Introduction to classical Dynamics:

UNIT I-

Generalised co-ordinates and Velocities, Generalised Force, Principle of virtual work Derivation of Lagranges equation of motion from DAlemberts Principles, Lagrangian and its Application to Simple, Compound and Double Pendulums, Single Particle in Space, Atwoods Machine, Dumb-bell, Linear harmonic oscillator. [7L]

UNIT II-

Hamiltons Principle, Calculus of Variation and derivation of Euler-Lagranges equation, Langranges Equations derived from Hamiltons Principles, Hamiltonian and its applications to Shortest Distance between two points in a plane, Hamiltions equations of motion. [5L]

Suggested Readings:

1. Mathematical Methods in the Physical Sciences, M. L. Boas, 2005, Wiley

2. Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris, 2013, 7th Edn., Elsevier

3. Mathematical Methods for Physics and Engineering: A Comprehensive Guide by K. F. Riley, M. P.Hobson, S. J. Bence, Cambridge Univ. Press, 3rd Eds., 2006

4. Vector Analysis and an introduction to Tensor Analysis, S. Lipschutz, D. Spellman, M. R. Spiegel, Schaum's Outline Series, Tata McGraw Hill Education Private Limited, edition 2009

5. Mathematical Physics, A. K. Ghatak, I. C. Goyal, S. J. Chua, Macmillan India Ltd., 2016

6. Fundamentals of Mathematical Physics, A. B. Gupta, Books and Allied (P) Ltd. 2022

Classical Mechanics:

1. Classical Mechanics, N. C. Rana and P. S. Joag, McGraw-Hill Education

2. Classical Mechanics, A. K. Raychaudhuri, Oxford University Press, 1984

3. Feynman Lectures, Vol. I, R. P. Feynman, R. B. Leighton, M. Sands, 2008, Pearson Education

4. Classical Mechanics and General Properties of Matter. S. N. Maiti and D. P. Raychaudhuri, New Age International.

5. Introduction to Classical Mechanics, R. G. Takwale and P.S.Puranik, Tata McGraw-Hill

Publishing Company Ltd.

6. Theory and Problems of Theoretical Mechanics, M. R. Spiegel, Mc Grow Hill Education

7. Introduction to Classical Mechanics with problems and solutions, D. Morin, Cambridge University Press

8. Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al. 2007, Tata McGraw-Hill, Physics

9. Mechanics, Resnick, Halliday and Walker 8/e. 2008, Wiley

10. Mechanics, D. S. Mathur, S. Chand and Company Limited, 2000

11. University Physics. F.W. Sears, M.W.Zemansky, H.D Young 13/e, 1986, Addison Wesley

12. Classical Mechanics, J. C.Upadhyay, Himalaya Publishing house.

MI-2P: Practical :

Course Outline:

1. Measurements of length (or diameter) using vernier callipers, screw gauge and travelling microscope.

2. To determine g and velocity for a freely falling body using Digital Timing Technique.

3. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g.

4. To determine g by Bar Pendulum.

5. To determine the Moment of Inertia of a Flywheel.

6. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.

7. To determine the Elastic Constants of a Wire by Searle's method.

Suggested Readings:

1. Advanced Practical Physics for students, B. L. Flint and H. T. Worsnop, 1971, Asia Publishing House.

2. Engineering Practical Physics, S. Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.

3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New

Delhi.

4. Laboratory Manual of Physics, Madhusudan Jana, Books & Allied (P) Ltd., 2022, Kolkata.

5. Practical Physics, G.L. Squires, 2015, 4th Edition, Cambridge University Press

6. B.Sc. Practical Physics, C.L. Arora, S Chand and Company Limited

7. Physics in Laboratory, Mandal, Chowdhury, Das, Das, Santra Publication

8. Advanced Practical Physics Vol 1, B. Ghosh, K. G. Majumder, Sreedhar Publisher

9. Practical Physics, P.R. Sasi Kumar, PHI Learning Private Limited

10. B.Sc. Practical Physics, Harnem Singh, P.S. Hemne, S Chand and Company Limited.