The Kelkar Education Trust's

Vinayak Ganesh Vaze College of Arts, Science & Commerce

(Autonomous)

Mithaghar Road, Mulund East, Mumbai-400081, India

College with Potential for Excellence

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Syllabus for S.Y.B.Sc. Programme

Physics

Syllabus as per Choice Based Credit System (NEP-2020)

(June 2025 Onwards)

Submitted by

Department of Physics

Vinayak Ganesh Vaze College of Arts, Science and Commerce (Autonomous)

Mithagar Road, Mulund (East) Mumbai-400081. Maharashtra, India.

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Vinayak Ganesh Vaze College of Arts, Science & Commerce (Autonomous)

Syllabus as per Choice Based Credit System (NEP 2020)

Syllabus for Approval

Subject: Physics

Sr. No.	Heading	Particulars
1	Title of Programme	**Second Year B.Sc, Physics: Semester III and IV**
2	Eligibility for Admission	As per university guidelines
3	Passing marks	Minimum D Grade or equivalent minimum marks for passing at the Graduation level.
4	Ordinances/Regulations (if any)	---
5	No. of Years/Semesters	One year/ Two semester
6	Level	U.G. Part-II : Level- 5.0
7	Pattern	Semester
8	Status	Revised
9	To be implemented from Academic year	2025-2026

Date: …….. **Signature:**

BOS Chairperson: ……..

The Framework of the Choice-Based Credit System [NEP – 2020]

- **Major Subject**:
  A single subject course of study pursued by a student as a mandatory requirement of the programme of study. Indian Knowledge System (IKS) to be included in the core courses.
- **Elective Course**:
  An elective course could be a project designed to acquire skills to supplement the major study.
- **Minor Subject**:
  A second subject of study pursued by a student as an additional requirement of the programme of study.
- **OE: Open Elective**
  An elective course chosen generally from an unrelated discipline/subject, to see multidisciplinary exposure.
- **AEC: Ability Enhancement Course**
  Mandatory Courses on content related to Language, and Literature
  (i) Compulsory – English communication
  (ii) Elective – any Indian language other than English.
- **IKS: Indian Knowledge System (Generic)**
  Mandatory course - an overview of the contribution of India towards multidisciplinary research and development.
- **VSC: Vocational Skill Course**
  Courses aimed at imparting practical skills, hands-on training, and soft skills to increase the employability of students. Specific or supporting the major subject is to be chosen from a basket/pool offered by the college.
- **SEC: Skill Enhancement Course**
  Courses aimed at imparting practical skills, hands-on training, and soft skills to increase students' employability. It could be chosen from a basket/pool offered by the college or a MOOC on Swayam or NPTEL platforms.
- **On-Job Training (OJT)/Internship/Field Project (FP)/Community Engagement Programme (CEP)/Research Project (RP)**
  Application of knowledge/concepts in solving or analysing a real-life problem. All these are related to the major subject.
- **CC: Co-curricular Course**
  For the holistic development of students through Cultural activities such as performing art, visual art, NCC, NSS, Yoga, etc.
- **VEC: Value Education Course**
  Compulsory courses on
  (i) The Constitution of India
  (ii) Environmental Education

B. Sc. Program in Physics: Cumulative Credit Structure

F.Y.B.Sc.																
Level	Sem	Mandatory				Minor		Any Faculty	VSC/SEC	Ability Enhancement Course / Indian Knowledge System/Value Education Course			OJT/FP/CEP/CC/RP	Credit	Cumulative Credit
		Major		Elective				OE							
		C-1	Practical	C-1	Practical	C-1	Practical	C-1		AEC	VEC	IKS			
4.5	I	2 [2L]	2 [2P]	-	-	2 [2L]	2 [2P]	4 [3L+1P]	VSC = 4 [2L + 2P]	2	2	2	-	22	44
	II	2 [2L]	2 [2P]	-	-	2 [2L]	2 [2P]	4 [3L+ 1P]	SEC = 4 [2L + 2P]	2	2	-	CC = 2	22	

S.Y.B.Sc																
Level	Sem	Mandatory						Minor		Any Faculty	VSC/SEC	Ability Enhancement Course / Indian Knowledge System/Value Education Course			OJT/FP/CEP/CC/RP	Credit	Cumulative Credit
		Major				Elective				OE							
		C-1	C-2	C-3	Practical	C-1	Practical	C-1	Practical	C-1		AEC	VEC	IKS			
5.0	III	2 [2L]	2 [2L]	2 [2L]	2 [2P]	-	-	2 [2L]	2 [2P]	2 [2L]	VSC = 2 [2P]	2	-	-	FP = 2, CC = 2	22	44
	IV	2 [2L]	2 [2L]	2 [2L]	2 [2P]	-	-	2 [2L]	-	2 [2L]	SEC = 2 [2P]	2	-	-	CEP = 4, CC = 2	22	

T.Y.B.Sc.																	
Level	Sem	Mandatory							Minor		Any Faculty	VSC/SEC	Ability Enhancement Course / Indian Knowledge System/Value Education Course			OJT/FP/CEP/CC/RP	Credit	Cumulative Credit
		Major					Elective				OE							
		C-1	C-2	C-3	C-4	Practical	C-1	Practical	C-1	Practical	C-1		AEC	VEC	IKS			
5.5	V	2 [2L]	2 [2L]	2 [2L]	2 [2L]	2 [2P]	2 [2L]	2 [2P]	2 [2T]	2 [2P]	-	VSC = 2 [2P]	-	-	-	FP = 2	22	44
	VI	2 [2L]	2 [2L]	2 [2L]	2 [2L]	2 [2P]	2 [2L]	2 [2P]	2 [2T]	-	-	VSC = 2 [2P]	-	-	-	OJT = 4	22	

**L = Lecture , P = Practical

S.Y.B.Sc. Physics Program Structure and Course Scheme

Semester	Major		Minor	OE	VSC / SEC	AEC/VEC/IKS	OJT/FP/CEP/CC/RP	Total Credit
	Mandatory	Elective						
III	8 Credit [6L + 2P] (Three Paper)	NA	4 Credit [2L + 2P] (One Paper)	2 Credit [2L] (One Paper)	**VSC** 2 Credit [2P] (One Paper)	**AEC** – 2 Credit (One Paper)	**FP** – 2 Cr, **CC** – 2 Cr.	**22**
II	8 Credit [6L + 2P] (Three Paper)	NA	2 Credit [2L] (One Paper)	2 Credit [2L] (One Paper)	**SEC** 2 Credit [2P] (One Paper)	**AEC** – 2 Credit (One Paper)	**CFP** – 4Cr, **CC** – 2 Cr.	**22**
Total	**16**	**-**	**6**	**4**	**4**	**4**	**10**	**44**

Programme Educational Objectives

PEO1	Graduates will have a strong foundation in Physics, allowing them to pursue higher education or careers in academia, industry, and research.
PEO2	Graduates will demonstrate proficiency in problem-solving, analytical thinking, and application of Physics concepts in real-world settings.
PEO3	Graduates will be ethical, socially responsible, and contribute to societal well-being through their professional endeavours.
PEO4	Graduates will demonstrate leadership, communication, and teamwork skills, working effectively in multidisciplinary environments.
PEO5	Graduates will engage in lifelong learning to keep up with advancements in Physics and related fields.
PEO6	Graduates will apply their knowledge of Physics in industries, research institutions, and government agencies, contributing to technological innovation.

Programme Outcomes

Upon successful completion of the B.Sc. (Physics) course from Vaze College affiliated to Mumbai University, graduates can expect the following outcomes:

PO1	**Scientific Knowledge** - Graduates will demonstrate a strong understanding of core principles of Physics and related disciplines, and will apply theoretical knowledge to solve complex problems in scientific contexts.
PO2	**Problem Analysis** - Graduates will be able to identify and analyse complex scientific problems, collect relevant data, and apply appropriate methods to find meaningful solutions.
PO3	**Experimental and Practical Application Skills** - Graduates will be able to apply theoretical knowledge to design and conduct practical experiments, analyse data, and derive conclusions. They will also connect experimental outcomes with theoretical concepts, even in papers that include practical components.
PO4	**Modern Tool Usage**- Graduates will be proficient in using modern computational and experimental tools and software to model, analyse, and solve problems in Physics.
PO5	**Communication** - Graduates will be able to communicate scientific concepts and experimental results effectively, both orally and in writing, to diverse audiences.
PO6	**Lifelong Learning and Societal Contribution** - Graduates will recognize the importance of lifelong learning and contribute to societal and environmental challenges through responsible application of scientific knowledge.

Programme Specific Outcomes

PSO1	Analyze thermodynamic systems and optical phenomena using theoretical models.
PSO2	Perform complex experiments in thermodynamics, wave optics, and electronics, enhancing observation and data interpretation skills.
PSO3	Understand and design basic digital and analog circuits, and relate them to real-world systems.
PSO4	Grasp the foundational ideas of quantum physics and develop basic programming skills in C++ for physics problem-solving.
PSO5	Apply physics knowledge to understand biological, chemical, and environmental systems (e.g., health physics, Arduino, etc.).
PSO6	Employ mathematical methods and wave mechanics to analyze physical systems at a deeper level.

The Detailed Semester and Course Wise Syllabus as follows:

SEMESTER III						
	Code	**Course of Study**	**Cr.**	**L**	**T**	**P**
Major	VSPH200	Thermodynamics	2	2	-	-
	VSPH201	Mechanics and Wave Optics	2	2	-	-
	VSPH202	Digital Electronics	2	2	-	-
	VSPH203	Practical Based on major papers 1 to 3	2	-	-	4
VSC	VSPH205	Advance Skills in Physics	2	-	-	4
Minor	VSPH206	Digital Electronics	2	2	-	-
	VSPH207	Minor Practical	2	-	-	4
OE	VSHP208	History of Physical Sciences in India [For Arts Students]	2	2	-	-
AEC		From the Basket	2	2	-	-
CC		From the Basket	2	2	-	-
FP	VSPH209	Field Project	2	-	-	4
Total			**22**	**14**	**00**	**20**

SEMESTER IV						
	Code	**Course of Study**	**Cr.**	**L**	**T**	**P**
Major	VSPH250	Quantum Physics	2	2	-	-
	VSPH251	Analog Electronics	2	2	-	-
	VSPH252	Mathematical Physics	2	2	-	-
	VSPH253	Practical based on major papers 1 to 3	2	-	-	4
VSC	VSPH255	Programming in C++	2	-	-	4
Minor	VSPH256	Mathematical Physics	2	2	-	-
OE	VSPH258	Scientific Advances of Modern India [For Arts Students]	2	2	-	-
AEC		From the Basket	2	2	-	-
CC		From the Basket	2	2	-	-
CFP	VSPH259	Community Engagement Program	4	4	-	-
Total			**22**	**18**	**00**	**8**

L = Lecture hours per week
T = Tutorial hours per week
P = Practical hours per week

- **1 Credit = 15 Hours Lecture**
- **1 Credit = 30 Hours Practical**

Semester – III

Paper I – Major

Course Code: VSPH200

Credits: 2

Thermodynamics

Course Learning Objective

Upon Completion of the course the student will be able to

LO 1	To introduce students to the basic concepts and terminology of thermodynamics, including systems, properties, processes, and cycles
LO 2	To explain and analyse the three laws of thermodynamics and their implications in real-world heat and work exchanges.
LO 3	To explore the concept of entropy and its relation to the second and third laws of thermodynamics.
LO 4	To familiarize students with the principles of heat engines, phase change, psychrometry, and low-temperature physics.

Course Code VSPH200	**Major - I** Thermodynamics	**Credits** 2	**Lectures** 30
Course Outcomes : Upon Completion of the course the student will be able to			
CO 1	Define and explain basic thermodynamic terms such as system, process, equilibrium, and thermodynamic cycles.		
CO 2	Apply the first, second, and third laws of thermodynamics to analyze physical systems involving heat and work.		
CO 3	Calculate and interpret entropy changes in various thermodynamic processes.		
CO 4	Analyze the working principles of heat engines, refrigeration cycles, and psychrometric systems, and relate them to real-world applications.		
Unit	**Content**		**No. of Lectures**
Unit 1	**I. Basics of Thermodynamics** **1. Basics of Thermodynamics** 1.1 System, Surrounding, Boundary 1.2 Thermodynamic Property, State, Path, Process, and Cycles 1.3 Concept of Equilibrium **2. Laws of Thermodynamics – I** 2.1 Zeroth Law of Thermodynamics and its Applications 2.2 First Law of Thermodynamics and its Applications **3. Energy, Work and Heat** 3.1 Conversion of Heat into Work 3.2 Heat Engine		**10**

	3.3 Introduction to Thermodynamic Cycle: Carnot Cycle and its Efficiency, Carnot's Engine and Refrigerator	
Unit 2	**II. Advanced Thermodynamic Principles** **4. Laws of Thermodynamics – II** 4.1 Second Law of Thermodynamics 4.2 Equivalence of Kelvin and Planck Statements 4.3 Reversible and Irreversible Processes 4.4 Absolute Scale of Temperature **5. Entropy** 5.1 Statements about Entropy 5.2 Similarities between Energy and Entropy 5.3 Entropy Transfer Mechanism 5.4 Change in Entropy for Various Processes 5.5 Absolute Entropy **6. Laws of Thermodynamics – III** 6.1 Third Law of Thermodynamics 6.2 Consequences of the Third Law	**10**
Unit 3	**III. Applications and Modern Topics** **7. Properties of Pure Substances** 7.1 Phases and Phase Change Processes for Water at Constant or Variable Pressure **8. Heat Engines** 8.1 Steam Engine, Rankine Cycle 8.2 Otto Engine 8.3 Diesel Engine **9. Basics of Psychrometry and Climate Change** 9.1 Psychrometric Parameters 9.2 Dry Bulb Temperature, Wet Bulb Temperature and Climate Change 9.3 Psychrometric Charts **10. Low Temperature Physics** 10.1 Methods of Liquefaction of Gases 10.2 Joule-Thomson Effect	**10**

Reference Books :

1. Heat, Thermodynamics and Statistical Physics – Brijlal, N. Subramanyam, P. S. Hemne, S. Chand, edition 2007 [4.1, 4.2, 4.3, 4.4, 5.17, 5.18, Chapter 10]
2. Thermal Physics – A.B. Gupta and H. Roy, Book and Allied (P) Ltd, Reprint 2008, 2009 [Chapter 7]
3. Thermodynamics – Basic and Applied – V. Ganesan, McGraw Hill India, 2018 [1.18, 3.5, 3.9, Chapter 6, 8.1, 8.2, 8.3, 8.4, 8.5, Chapter 9]
4. Thermal Physics – S.C. Garg, R.M. Bansal and C.K. Ghosh, McGraw Hill, 2018 [10.9, 6.9.1, 6.9.2]

Additional References :

1. Basic Thermodynamics – Evelyn Guha (Narosa Publications)
2. A Treatise on Heat – Meghnad Saha and B.N. Srivastava, 1969, India Press

Paper II – Major
Course Code: VSPH201
Credits: 2

Mechanics and Wave Optics

Course Learning Objective

Upon Completion of the course the student will be able to

LO 1	Describe and derive expressions related to compound pendulum motion and apply conservation laws to systems of particles including angular and linear momentum
LO 2	Analyze and interpret the behavior of harmonic oscillations in one and two dimensions, and understand the characteristics of wave motion including phase and group velocity.
LO 3	Explain the types and mechanisms of polarization and discuss the optical behavior of anisotropic materials using concepts of birefringence and Malus' Law.
LO 4	Develop the ability to connect theoretical concepts of mechanics, oscillations, and optics to practical applications and experimental observations.

Course Code VSPH201	Major - II Mechanics and Wave Optics	Credits 2	Lectures 30
Course Outcomes : Upon Completion of the course the student will be able to			
CO 1	Apply the principles of dynamics to understand compound pendulum motion and analyze system of particles.		
CO 2	Interpret and analyze the phenomena of superposition of harmonic oscillations and wave propagation in different media.		
CO 3	Understand and explain the fundamental concepts of polarization and the methods of producing and analyzing polarized light.		
CO 4	Solve conceptual and numerical problems related to oscillatory motion, wave mechanics, and polarization using physical principles.		
Unit	**Content**		**No. of Lectures**
Unit 1	**I. Mechanics of Rigid Bodies and Systems of Particles** **Chapter 1: Compound Pendulum** 1.1 Expression for Period, Maximum and Minimum Time Period 1.2 Centers of Suspension and Oscillations, Reversible Compound Pendulum		**10**

	1.3 Kater's Reversible Pendulum, Compound Pendulum and Simple Pendulum – A Comparative Study **Chapter 2: System of Particles** 2.1 Canter of Mass 2.2 Motion of the Canter of Mass, Linear Momentum of a Particle 2.3 Linear Momentum of a System of Particles 2.4 Linear Momentum with respect to CM Coordinate (i.e., Shift of Origin from Lab to CM) 2.5 Conservation of Linear Momentum 2.6 Applications of the Momentum Principle, System of Variable Mass 2.7 Torque Acting on a Particle 2.8 Angular Momentum of a Particle, Angular Momentum of a System of Particles 2.9 Total Angular Momentum with respect to CM Coordinate, Conservation of Angular Momentum	
Unit 2	**II. Oscillations and Wave Motion** **Chapter 3: Superposition of Collinear Harmonic Oscillations** 3.1 Linearity and Superposition Principle; Superposition of Two Collinear Oscillations with (1) Equal Frequencies and (2) Different Frequencies (Beats) 3.2 Superposition of Two Perpendicular Harmonic Oscillations – Graphical and Analytical Methods 3.3 Lissajous Figures with Equal and Unequal Frequencies and their Applications **Chapter 4: Wave Motion** 4.1 Transverse Waves on a String 4.2 Travelling and Standing Waves on a String; Normal Modes of a String 4.3 Group Velocity and Phase Velocity 4.4 Worked Examples	**10**
Unit 3	**Chapter 5: Polarization – I** 5.1 Introduction to Polarization; Natural Light as Unpolarized and Polarized Light 5.2 Brewster's Law 5.3 Polaroid Sheets, Prism and Grating Spectra 5.4 Types of Polarization: Plane, Circular, Elliptical, and Partial 5.5 Production of Plane Polarized Light: By Refraction, Pile of Plates, Scattering, Selective Absorption, and Double Refraction	**10**

	Chapter 6: Polarization – II 6.1 Polarizer and Analyzer 6.2 Malus' Law 6.3 Anisotropic Crystal, Calcite Crystal, Optic Axis, Double Refraction in Calcite Crystal 6.4 Huygens' Explanation of Double Refraction, Ordinary and Extraordinary Rays, Positive and Negative Crystals 6.5 Superposition of Waves Linearly Polarized at Right Angles 6.6 Production of Linearly Polarized Light 6.7 Production of Elliptically and Circularly Polarized Light 6.8 Analysis of Polarized Light 6.9 Applications of Polarized Light	

Reference Books :

1. Unit 1: Mechanics by H. S. Hans and S. P. Puri, Tata McGraw Hill (2nd Ed.), [Chapter 1, Chapter 7: 7.2, 7.3; Chapter 9: 9.1, 9.1.4, 9.3];
2. Unit 2: Waves (Berkeley Physics Course, Vol. 3) by Francis Crawford, Tata McGraw-Hill
3. Unit 3: A Text Book of Optics by Subrahmanyam, Brijlal, Avadhanulu, S. Chand (25th Revised Ed., 2012, Reprint 2013), [20: 20.3, 20.4,20.5, 20.6, 20.6.1, 20.6.3, 20.7,20.8, 20.9, 20.10, 20.14, 20.14, 20.15, 20.17, 20.18, 20.19, 20.20];

Additional References :

1. Resnick and Halliday: Physics – I
2. The Physics of Vibrations and Waves by H. J. Pain
3. The Physics of Waves and Oscillations by N. K. Bajaj
4. Optics (5th Edition) by Ajoy Ghatak

Paper III – Major / Minor
Course Code: VSPH202 / VSPH206
Credits: 2

Digital Electronics

Course Learning Objective

Upon Completion of the course the student will be able to

LO 1	To understand different number systems, conversions between them, and perform binary arithmetic operations.
LO 2	To explain the operation of multiplexers, demultiplexers, encoders, decoders, and understand the necessity of clock signals.

LO 3	To study the working principles and logic design of basic Flip-Flops and their triggering mechanisms.
LO 4	To understand and analyse the construction and operation of shift registers and counters.

Course Code VSPH202/VSPH206	Major - III / Minor Digital Electronics	Credits 2	Lectures 30

Course Outcomes : Upon Completion of the course the student will be able to

CO 1	Convert numbers between decimal, binary, octal, and hexadecimal systems and perform binary arithmetic including 1's and 2's complement.
CO 2	Describe and analyse the functioning of multiplexers, demultiplexers, encoders, decoders, and clock signals.
CO 3	Construct and explain various Flip-Flops and determine their behavior under different triggering conditions.
CO 4	Design and interpret the operation of shift registers and synchronous/asynchronous counters.

Unit	Content	No. of Lectures
Unit 1	**Chapter 1: Number System** 1.1 Analog vs Digital Comparison 1.2 Types of Number Systems: Decimal, Binary, Octal, Hexadecimal 1.3 Relation between Number Systems 1.4 Conversion of Number Systems: • Decimal to Binary, Octal, Hexadecimal • Binary to Decimal, Octal, Hexadecimal • Octal to Decimal, Binary, Hexadecimal • Hexadecimal to Decimal, Binary, Octal **Chapter 2: Binary Arithmetic** 2.1 Binary Addition 2.2 Binary Subtraction 2.3 Sign Magnitude Representation 2.4 One's Complement Representation 2.5 Two's Complement Representation 2.6 Binary Subtraction using One's Complement 2.7 Binary Subtraction using Two's Complement	**10**
Unit 2	**Chapter 3: Multiplexer and De-Multiplexer** 3.1 4-to-1 Multiplexer 3.2 1-to-4 De-Multiplexer 3.3 Encoder and Decoder	**10**

	Chapter 4: Flip-Flops 4.1 Concept of Clock Signal 4.2 Definition and Necessity of Clock 4.3 Calculation of Duty Cycle 4.4 Triggering Methods: Pulse, Edge, Level 4.5 Introduction to Flip-Flops 4.6 RS Flip-Flop using NAND and NOR gates 4.7 Clocked RS, JK, D, and T Flip-Flops	
Unit 3	**Chapter 5: Shift Register** 5.1 Introduction to Registers 5.2 Methods of Data Transfer 5.3 Introduction and Types of Shift Registers 5.4 4-bit Serial In – Serial Out Shift Register **Chapter 6: Counters** 6.1 Introduction to Counters 6.2 Types of Counters: Synchronous and Asynchronous 6.3 2-bit and 4-bit Synchronous Up/Down Counters 6.4 2-bit Asynchronous Up/Down Counters	**10**

Reference Books :

1. Digital Principles and Applications by Leach, Malvino, Saha 6thedition.
2. Modern Digital Electronics by R. P. Jain, Mc Graw Hill 4th edition
3. Digital Electronics and Logic Design by N. G. Palan. Technova Publiation

Additional References :

1. Digital Fundamentals by Thomas L Floyd 10th ed. (Additional Reading)

Practical

Course Code: VSPH203 / VSPH207

Credits: 2

Major/ Minor Physics Practical

Course Code VSPH203/VSPH207	Practical Based on Major Papers 1 to 3 & Minor Practical	Credits 2	Lectures 60

	Lists of Experiment of GROUP A
1.	Y by bending.
2.	Bifilar Pendulum – Cylindrical / Rectangular
3.	Modulus of Rigidity by Torsortional oscillations
4.	Verification of Stefan's law (Electrical method)
5.	Helmholtz resonator – determination of unknown frequency.
6.	Optical lever : determination of μ
7.	R. P. of telescope.
8.	Determination of R. I. of liquid by laser
9.	Frequency response of CE amplifier
10.	CE Amplifier : Variation of gain with load
	Lists of Experiment of GROUP B
1.	To study the RS Filp Flop Using universal gates
2.	To study the J-K, D & T Filp Flop
3.	To study the Mod -2,5,10 counter
4.	To study the 4: 1 Multiplexer
5.	To study the 1:4 De- Multiplexer
6.	To study the 8:3 encoder
7.	To study the 3:8 decoder
8.	To study the 4-bit One's complement using EX-OR gates.
9.	To study shift registers : SISO and SIPO
10.	To study shift registers : PISO and PIPO

Note: Minimum **6 from each group** and **total 12 experiments** along with skills experiment should be completed in the semester III. All experiments are to be reported in a journal. Certified journal is must to be eligible to appear for the semester end practical.

Reference Books :

1. Advanced course in Practical Physics D. Chattopadhya, PC. Rakshit & B. Saha. (6th Edition) Book & Allied Pvt. Ltd.
2. BSc Practical Physics – Harnam Singh S. Chand & Co. Ltd. – 2001
3. A Text book of advanced Practical Physics – Samir Kumar Ghosh, New Central Book Agency –

(3rd edition) 4. B Sc. Practical Physics – CL Arora (1stEdition) – 2001 S. Chand & Co. Ltd.

4. Practical Physics – CL Squires – (3rd Edition) Cambridge University Press.
5. University Practical Physics – D C Tayal. Himalaya Publication.
6. Advanced Practical Physics – Worsnop& Flint.

Practical
Vocational Skill Course
Course Code: VSPH205
Credits: 2

Advance Skill in Physics

Course Learning Objective

Upon Completion of the course the student will be able to

LO 1	To introduce basic experimental skills for measuring electrical, optical, and mechanical quantities using standard laboratory instruments.
LO 2	To train students in the use of CROs, LDRs, filters, TTL logic circuits, and soldering techniques.
LO 3	To enable learners to use software tools like Origin or GeoGebra for plotting and analysing experimental data.
LO 4	To promote skills in error estimation, PCB designing, and circuit simulation for real-world applications.

Course Code VSPH205	**VSC – Advance Skills in Physics**	**Credits** 2	**Lectures** 60
Course Outcomes : Upon Completion of the course the student will be able to			
CO 1	Perform and interpret electrical measurements using tools like CRO, resistor ladders, and verify Ohm's Law through experiments.		
CO 2	Construct and test basic analog and digital circuits, including TTL gates, filters, and passive network responses.		
CO 3	Apply graphing tools (log, semi-log, Origin/GeoGebra) and estimate experimental errors using real data.		
CO 4	Demonstrate hands-on skills in soldering, PCB designing, optical alignment (Schuster's method), and understanding of basic photonics (laser divergence, LDR characteristics)		
1.	Voltage divider method (Using resistance ladder)		
2.	Use of oscilloscope as component tester, Phase measurements		
3.	Radius of ball bearings (single pan balance)		
4.	Soldering technique and assembly of any electronic circuit (analog or digital)		

5.	Plotting of graphs on semi logarithmic / logarithmic scale.
6.	Spectrometer: optical levelling and Schuster's method
7.	Laser beam profile (Divergence of LASER beam)
8.	Estimation of errors from actual experimental data.
9.	Find the refractive index of given liquid using hallow prism
10.	Design TTL as AND, OR, NAND and NOR gate
11.	Ohms law verification.
12.	Graph Plotting using Origin / Geogebra Software
13.	PCB Designing
14.	LDR Characteristics
15.	Passive Low Pass Filter
16.	Passive High Pass Filter
17.	Passive Band Pass Filter
18.	Passive Band Reject Filter

Note: Minimum **12 experiments** should be completed in the semester III. All experiments are to be reported in a journal. Certified journal is must to be eligible to appear for the semester end practical.

Reference Books :

1. BSc Practical Physics by Harnam Singh, S. Chand & Company
2. Advanced course in Practical Physics D. Chattopadhya, PC. Rakshit & B. Saha. (6th Edition) Book & Allied Pvt. Ltd.
3. A Text book of advanced Practical Physics – Samir Kumar Ghosh, New Central Book Agency – (3rd edition) 4. B Sc. Practical Physics – CL Arora (1stEdition) – 2001 S. Chand & Co. Ltd.
4. Practical Physics – CL Squires – (3rd Edition) Cambridge University Press.
5. University Practical Physics – D C Tayal. Himalaya Publication.
6. Advanced Practical Physics – Worsnop & Flint.

Field Project
Course Code: VSPH209
Credits: 2

Guidelines for Field Project (FP)

General Instructions

1. Each student is expected to dedicate 60 hours to complete the Field Project.
2. The actual fieldwork must be conducted outside regular college hours — during holidays, weekends, or vacations.
3. Successful completion and submission of the Field Project is mandatory for the award of the degree.
4. The Field Project carries 2 credits, and evaluation will be done for 50 marks.
5. Students must pass this course to be eligible for the B.Sc. degree.

Project Implementation Instructions

1. Students should engage in hands-on field learning/projects under the supervision of a faculty guide.
2. A minimum of 30 hours per credit is required for semester.
3. Students may work individually or in groups (2–3 students per group).
4. Each group will be assigned a faculty guide for mentorship.
5. Prepare a questionnaire of 20–30 questions (or more) in English or Marathi, depending on the topic.
6. For non-survey-based projects (e.g., sample/data collection), the questionnaire may be replaced by another appropriate method.
7. Faculty guides or coordinators must review and finalize the questionnaire.
8. Avoid questions that may create unnecessary complications.
9. Ensure the questionnaire includes both qualitative and quantitative questions.
10. Conduct field visits and collect at least 50 responses or samples.
11. Record all field data and observations clearly and systematically.
12. Analyze the collected data using appropriate tools, tables, graphs, or software.
13. Prepare a project report with the structure: Index, Chapters (1, 2, 3...), Conclusion, References.
14. The report must be typed in Times New Roman, font size 12, 1.5 spacing, and have a minimum of 25 pages, excluding title and prelims.

15. Submit two hard copies of the project report signed by the faculty guide to the departmental FP coordinator.
16. All students must give an oral presentation of their project in front of an internal departmental panel.
17. Two examiners will be appointed by the HoD for evaluation.
18. The evaluation will be done as per the guidelines provided by the Examination Cell.
19. The certified project report and oral presentation are mandatory for appearing in the practical examination.
20. Projects will be assessed on topic selection, study design, fieldwork, analysis, reporting, and presentation.

Typical Time and marks allocation for the different stages of the field project is:

Step of Project	Individual students work in hours	Marks
Topic Selection	5	3
Study Design and Survey preparation	15	10
Fieldwork	20	12
Analysis	10	5
Report writing	10	10
Oral Presentation	-	10
Total	**60**	**50**

Semester – IV

Paper I – Major

Course Code: VSPH250

Credits: 2

Quantum Mechanics

Course Learning Objective

Upon Completion of the course the student will be able to

LO 1	Understand the experimental basis of quantum theory through black-body radiation and the photoelectric effect.
LO 2	Apply Schrödinger's time-dependent and time-independent equations to physical systems in one and three dimensions.
LO 3	Analyze quantum mechanical systems including the step potential, finite barriers, and harmonic oscillators.
LO 4	Solve numerical problems involving quantum mechanical systems such as particles in potential wells, barrier penetration, and expectation values using appropriate equations.

Course Code VSPH250	**Major - I** Quantum Mechanics	**Credits** 2	**Lectures** 30
Course Outcomes : Upon Completion of the course the student will be able to			
CO 1	Describe the limitations of classical physics and explain the foundational concepts that led to quantum mechanics, including wave-particle duality and Heisenberg's uncertainty principle.		
CO 2	Apply the Schrödinger equation to determine energy levels and wave functions for systems like free particles and potential wells.		
CO 3	Evaluate and compare quantum phenomena such as tunneling, degeneracy, and alpha decay using the appropriate potential models.		
CO 4	Develop the ability to solve quantitative problems in quantum mechanics by applying core principles and mathematical formulations to real and theoretical scenarios.		
Unit	**Content**		**No. of Lectures**
Unit 1	**1. Review of the Origin of Quantum Mechanics** 1.1 Black-body radiation 1.2 Photoelectric effect 1.3 Failure of classical theory **2. Wave Nature of Particles** 2.1 de Broglie hypothesis, phase velocity, group velocity 2.2 Heisenberg's uncertainty principle and its applications **3. Wave Function** 3.1 Max Born's interpretation of wave function 3.2 Properties of wave function, acceptable/well-behaved wave		**10**

	functions 3.3 Normalization, probability, probability current density, linearity, superposition 3.4 Operators, Expectation value, Eigenvalue equation	
Unit 2	**4. Wave Equation** 4.1 Comparison of classical and quantum formulations 4.2 Characteristics of the quantum wave equation 4.3 Postulates of quantum mechanics **5. Schrödinger Equation** 5.1 Time-dependent Schrödinger equation (1D and 3D) 5.2 Time-independent Schrödinger equation (steady-state form) 5.3 Operator method for steady-state equation in 1D **6. Applications of Schrödinger Equation – I** 6.1 Free particle 6.2 Particle in an infinitely deep 1D potential well 6.3 Particle in a finitely deep 1D potential well	**10**
Unit 3	**7. Applications of Schrödinger Equation – II** 7.1 Step potential 7.2 Particle in a 3D rigid box, degeneracy 7.3 Finite potential barrier: quantum tunneling, transmission probability (approximate) **8. Applications of Schrödinger Equation – III** 8.1 Theory of alpha particle decay from radioactive nuclei 8.2 1D harmonic oscillator, Correspondence principle	**10**

Reference Books :

1. **Concepts of Modern Physics – A. Beiser (6th Ed.), Tata McGraw Hill**,
   - for Unit I - Chapter 1; sections 2.2,2.3, 3.1, 3.3, 3.4
   - for Unit II Chapter 2.1; sections 3.7, 3.8, 3.9
   - for Unit II Chapter 2.2; sections 5.1, 5.4, 5.5, 5.6
   - for Unit III Chapters 3.2, 3.3, 3.4; section 5.2
   - for Unit I Chapters 1.1, 1.2;
   - Chapter 5 for Unit III Chapters 6, 7, 8.
2. **Quantum Mechanics: Fundamentals and Applications to Technology – Jaspreet Singh (1997 Ed.)**, Chapter 1 for Unit I Chapter 1.3.

Additional References:

1. Quantum Mechanics – S. P. Singh, M. K. Bagade, Kamal Singh, S. Chand, 2004 Ed.
2. Quantum Mechanics of Atoms, Molecules, Solids, Nuclei and Particles – R. Eisberg and R. Resnik, Wiley.
3. Introduction to Quantum Mechanics – D. Griffiths, Prentice Hall.
4. Quantum Mechanics – Ghatak and Lokanathan, McMillan.

5. Quantum Mechanics – L. I. Schiff.
6. Quantum Mechanics – Powell and Crasemann, Addison-Wesley.

Paper II – Major
Course Code: VSPH251
Credits: 2

Analog Electronics

Course Learning Objective

Upon Completion of the course the student will be able to

LO 1	Understand the need for transistor biasing and analyze different biasing methods and their stability.
LO 2	Explain amplifier parameters and understand the role of negative feedback in improving amplifier performance.
LO 3	Describe the configuration and applications of Op-Amps like inverting, non-inverting, integrator, differentiator, and comparator.
LO 4	Identify and understand the working of sinusoidal oscillators such as Colpitt's, Phase Shift, and Wien Bridge oscillators.

Course Code	**Major - II**	**Credits**	**Lectures**
VSPH251	**Analog Electronics**	**2**	**30**
Course Outcomes : Upon Completion of the course the student will be able to			
CO 1	Analyze and compare different transistor biasing circuits and determine the stability factor to ensure faithful amplification.		
CO 2	Evaluate the performance of amplifiers with and without negative feedback and solve related numerical problems.		
CO 3	Apply operational amplifier concepts to build and analyze various analog signal processing circuits.		
CO 4	Construct and explain the working of different sinusoidal oscillators and evaluate their frequency of oscillation.		
Unit	**Content**		**No. of Lectures**
Unit 1	**Chapter 1: Transistor Biasing** 1.1 Faithful amplification 1.2 Transistor Biasing 1.3 Inherent Variations of Transistor Parameters 1.4 Stabilization 1.5 Essentials of Transistor Biasing Circuit 1.6 Stability Factor **Chapter 2: Methods of Transistor Biasing** 2.1 Base Resistor Method 2.2 Emitter Bias Circuit and Circuit Analysis of Emitter Bias		**10**

	2.3 Biasing with Collector Feedback Resistor 2.4 Voltage Divider Bias Method 2.5 Stability Factor for Potential Divider Bias 2.6 Numerical problems based on biasing circuits	
Unit 2	**Chapter 3: General Amplifier Characteristics** 3.1 Concept of amplification 3.2 Amplifier notations 3.3 Current gain, Voltage gain, Power gain 3.4 Input resistance, Output resistance 3.5 Numerical problems based on amplifier parameters **Chapter 4: Amplifier with Negative Feedback** 4.1 Feedback concept in amplifiers 4.2 Principles of Negative Voltage Feedback 4.3 Gain of negative voltage feedback amplifier 4.4 Advantages of negative feedback 4.5 Numerical problems based on feedback	**10**
Unit 3	**Chapter 5: Operational Amplifier** 5.1 Introduction to Operational Amplifier 5.2 Schematic symbol of Op-Amp 5.3 Features of Op-Amp 5.4 Output voltage of Op-Amp 5.5 Op-Amp as Inverting Amplifier 5.6 Op-Amp as Non-Inverting Amplifier 5.7 Applications of Op-Amp 5.8 Op-Amp as Summing Amplifier 5.9 Op-Amp as Difference Amplifier 5.10 Op-Amp as Integrator 5.11 Op-Amp as Differentiator 5.12 Op-Amp as Comparator **Chapter 6: Sinusoidal Oscillators** 6.1 Sinusoidal Oscillators and their types 6.2 Oscillatory circuit 6.3 Effect of positive feedback 6.4 Essentials of Transistor Oscillators 6.5 Types of Oscillators 6.5.1 Colpitt's Oscillator 6.5.2 Phase Shift Oscillator 6.5.3 Wien Bridge Oscillator	**10**

Reference Books :

1. Principles of Electronics – V. K. Mehta and Rohit Mehta – Published by S. Chand Publishing
2. Electronic Principles – Albert Paul Malvino – Published by McGraw Hill
3. Electronic Devices and Circuits: An Introduction by Allen Mottershead – Published by Prentice Hall

4. Op-Amps and Linear Integrated Circuits – Ramakanth A. Gayakwad – Published by Prentice Hall / Pearson Education

Paper III – Major / Minor
Course Code: VSPH252 / VSPH256
Credits: 2

Mathematical Physics

Course Learning Objective

Upon Completion of the course the student will be able to

LO 1	Introduce the formulation and solution of ordinary differential equations relevant to physical systems.
LO 2	Develop an understanding of vector algebra operations and their applications in physics.
LO 3	Apply differential vector operators such as gradient, divergence, and curl in scalar and vector fields.
LO 4	Interpret and solve vector integrals using fundamental theorems of vector calculus and understand coordinate transformations.

Course Code	Major - III / Minor	Credits	Lectures
VSPH252/VSPH256	Mathematical Physics	2	30

Course Outcomes : Upon Completion of the course the student will be able to

CO 1	Solve first and second-order ordinary differential equations and apply them to electrical circuits and harmonic motion.
CO 2	Perform vector algebra operations and apply dot, cross, and triple products in solving physical and geometrical problems.
CO 3	Compute and interpret gradient, divergence, and curl for various scalar and vector fields.
CO 4	Evaluate line, surface, and volume integrals using vector calculus theorems, and transform problems into cylindrical and spherical coordinates.

Unit	Content	No. of Lectures
Unit 1	**Chapter 1: Differential Equations** 1.1. Introduction to ordinary differential equations 1.2. First order homogeneous and non-homogeneous equations 1.3. Differential equations with variable coefficients 1.4. Variable separable method 1.5. Exact differentials, General first-order linear differential equation 1.6. Second-order homogeneous equations with constant coefficients **Chapter 2: Applications of Differential Equations** 2.1. Problems depicting physical situations like LC and LR circuits	**10**

	2.2. Simple Harmonic Motion (spring-mass system)	
Unit 2	**Chapter 3: Vector Algebra** 3.1. Vectors, Scalars 3.2. Laws of Vector algebra, Unit vector, rectangular unit vectors 3.3. Components of a vector, Scalar fields, Vector fields 3.4. Dot or Scalar product, Cross or Vector product 3.5. Commutative and distributive laws, Scalar triple product 3.6. Vector triple product (Omit proofs) 3.7. Problems and applications based on dot, cross, and triple products **Chapter 4: Gradient, Divergence, and Curl** 4.1. Gradient, divergence, and curl 4.2. The operator, definitions, and physical significance of gradient, divergence, and curl 4.3. Distributive laws for gradient, divergence, and curl (Omit proofs) 4.4. Problems based on gradient, divergence, and curl	**10**
Unit 3	**Chapter 5: Vector Calculus** 5.1. Line, Surface, and Volume integrals 5.2. The Fundamental Theorem of Calculus, the Fundamental Theorem of Gradient, the Fundamental Theorem of Divergence 5.3. The Fundamental Theorem of Curl (Statement and geometrical interpretation included) 5.4. Problems based on these theorems **Chapter 6: Curvilinear Coordinates** 6.1. Cylindrical coordinates 6.2. Spherical coordinates	**10**

Reference Books :

Unit 1:

1. **Mathematical Physics – H.K. Dass,** Unit-II, Chapter 12 (Sections 2.1, 12.2, 12.3, 12.7, 12.8, 12.10, 12.12, 17.2, 17.3, 17.10)

Unit 2:

1. **Mathematical Physics – H.K. Dass**, Chapters 1 & 2 (Sections 1.1 to 1.6, 1.8 to 1.11, 1.16, 1.17, Chapter 2, 2.1, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11)

Unit 3:

1. **Mathematical Physics – H.K. Dass**, Chapter 3 (Sections 3.2, 3.3, 3.6, 3.8)

Additional References:

1. Schaum's Outline of Theory and Problems of Vector Analysis – Murray R. Spiegel, Asian Student Edition

2. Introduction to Mathematical Physics – Charlie Harper, 2009 (EEE), PHI Learning Pvt. Ltd

Practical
Course Code: VSPH253
Credits: 2

Major Physics Practical

Course Code VSPH253	Practical Based on Major Papers 1 to 3	Credits 2	Lectures 60
Lists of Experiment of GROUP A			
1.	Determination of Y using Flat spiral spring.		
2.	Determination of Cauchy's constants.		
3.	Resonance Pendulum.		
4.	Determination of h/e by photocell		
5.	To determine the value of specific charge (e/m) of an electron by Thomson method.		
6.	R.P of Grating		
7.	Figure of merit of a mirror galvanometer.		
8.	Surface Tension of Soap Solution		
9.	Temperature coefficient of resistance of conducting material.		
10.	J by Electrical Method		
Lists of Experiment of GROUP B			
1.	To study the op-amp as inverting amplifier		
2.	To study the op-amp as non-inverting amplifier and voltage follower.		
3.	To study the op-amp as difference amplifier.		
4.	To study Colpitt's oscillator.		
5.	To study maximum power transfer theorem.		
6.	To study the first order Active low pass filter.		
7.	To study the First order Active high pass filter.		
8.	To Study OPAMP as an Integrator		
9.	To study OPAMP as Differentiator		
10.	To study Phase Shift Oscillator using OPAMP/Transistor		

Note: Minimum **6 from each group** and **total 12 experiments** along with skills experiment should be completed in the semester I. All experiments are to be reported in a journal. Certified journal is must to be eligible to appear for the semester end practical.

Reference Books :

1. Advanced course in Practical Physics D. Chattopadhya, PC. Rakshit & B. Saha. (6th Edition) Book & Allied Pvt. Ltd.

2. BSc Practical Physics – Harnam Singh S. Chand & Co. Ltd. – 2001
3. A Text book of advanced Practical Physics – Samir Kumar Ghosh, New Central Book Agency – (3rd edition) 4. B Sc. Practical Physics – CL Arora (1stEdition) – 2001 S. Chand & Co. Ltd.
4. Practical Physics – CL Squires – (3rd Edition) Cambridge University Press.
5. University Practical Physics – D C Tayal. Himalaya Publication.
6. Advanced Practical Physics – Worsnop & Flin

Practical
Skill Enhancement Course
Course Code: VSPH255
Credits: 2

Programming in C++

Course Learning Objective

Upon Completion of the course the student will be able to

LO 1	Recall the basic concepts, benefits, and applications of Object-Oriented Programming (OOP) and C++ language.
LO 2	Explain the structure and elements of a C++ program, including tokens, expressions, variables, and operators.
LO 3	Write simple C++ programs demonstrating the use of control structures, functions, and operator overloading.
LO 4	Analyse program logic and write optimized C++ programs using memory management techniques and advanced function concepts.

Course Code	SEC -	Credits	Lectures
VSPH254	Programing in C++	2	60
Course Outcomes : Upon Completion of the course the student will be able to			
CO 1	Describe the principles of Object-Oriented Programming and structure of a C++ program, and write basic programs to illustrate these concepts.		
CO 2	Interpret tokens, data types, operators and write C++ programs utilizing correct syntax and expressions.		
CO 3	Develop and write C++ programs using control structures, different types of functions, and operator overloading.		
CO 4	Analyse different programming scenarios and write efficient C++ programs incorporating memory management and advanced control structures.		

Unit	Content	No. of Lectures
I	**Basics of Object-Oriented Programming & Beginning with C++** Basic concepts of Object-Oriented Programming, Benefits of OOP, Object-Oriented Languages, Applications of OOP, What is C++?, Applications of C++, A simple C++ program, More C++ Statements, Example with Class, Structure of C++ Program, Creating the Source File, Compiling and Linking, Introduction to Namespace, Introduction to Input/Output with Streams (cin, cout)	**10**
II	**Tokens and Expressions in C++** Introduction, Tokens, Keywords, Identifiers and Constants, Basic Data Types, User-Defined Data Types, Derived Data Types, Symbolic Constants, Type Compatibility, Declaration of Variables, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators, Manipulators, Type Cast Operator, Expressions and Their Types, Special Assignment Expressions, Implicit Conversions, Operator Overloading, Operator Precedence	**10**
III	**Control Structures and Functions** Control Structures, Functions: The Main Function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, Default Arguments, Constant Arguments, Function Overloading, Math Library Functions	**10**

Course Code VSPH255	Programming in C++ Practical	Credits	Lectures 30
1.	Program to perform basic arithmetic operations (+, −, ×, ÷) on two numbers		
2.	Program to calculate the area and perimeter of a rectangle		
3.	Program to swap two numbers using a temporary variable		
4.	Program to convert temperature from Celsius to Fahrenheit		
5.	Program to check whether a number is even or odd using if-else		
6.	Program to check whether a number is positive, negative, or zero using nested if		
7.	Program to find the largest among three numbers using if-else		
8.	Program to check whether a year is a leap year or not		
9.	Program to print different star pattern		
10.	Program to calculate the sum of first n natural numbers using while loop		
11.	Program to print multiplication table of a given number using do-while loop		

12.	Program to calculate the digit sum of three-digit number.
13.	Program to display the reverse of a given number using a loop
14.	Program to create a simple calculator using switch
15.	Program to display day name based on number (1 to 7) using switch
16.	Program to create a function that returns the square of a number
17.	Program to demonstrate function with default arguments
18.	Program to calculate factorial of a number using a function
19.	Program to demonstrate function overloading (e.g., area of square and rectangle)
20.	Program using a function to find GCD of two numbers
21.	Program using a function to check if a number is prime
22.	Program to check if a number is an Armstrong number
23.	Program to check if a number is a Palindrome
24.	Program to print Prime numbers in given range
25.	Program to print Fibonacci series using a function

Note: Minimum **16 experiments** should be completed in the semester IV. All experiments are to be reported in a journal. Certified journal is must to be eligible to appear for the semester end practical.

Reference Books :

1. E. Balagurusamy, Object Oriented Programming with C++, 8th Edition, McGraw Hill Education (India), 2020.
2. Tony Gaddis, Starting Out with C++: From Control Structures through Objects, 9th Edition, Pearson Education, 2017.
3. Ashok N. Kamthane, Object-Oriented Programming with ANSI and Turbo C++, 2nd Edition, Pearson Education India, 2003.
4. Ravichandran D., Programming with C++, 2nd Edition, McGraw Hill Education (India), 2019.

Community Engagement Programme
Course Code: VSPH259
Credits: 4

Guidelines for Community Engagement Programme (CFP)

1. Each student must complete 120 hours of community engagement activities across semester.
2. The program carries 4 credits.
3. Students must work outside regular class hours, such as on weekends, holidays, or vacations.
4. Activities must be conducted individually or in small groups (2–3 students).
5. A faculty mentor will be assigned to each student/group for supervision and guidance.
6. Students should maintain a logbook or field diary with dates, hours, and activity details, signed regularly by the mentor.
7. Students must select a community-based theme or issue related to science, environment, or social well-being.
8. Suggested activities include:
    - Awareness drives (e.g., cleanliness, energy, health)
    - Science demonstrations/workshops in schools or communities
    - Data collection and surveys on local issues
    - Creating educational posters, videos, or models
    - Volunteering with NGOs, schools, or local bodies
9. Students must conduct at least one field visit per activity and ensure meaningful community interaction.
10. All communication and behaviour during fieldwork must be respectful, ethical, and culturally sensitive.
11. Students must prepare a project report summarizing their work, learnings, and outcomes.
12. The report should be typed (Times New Roman, size 12, 1.5 spacing), and be 20–25 pages long (excluding prelims).
13. Two hard copies of the report must be submitted to the department, duly signed by the faculty mentor.
14. An oral presentation of the work is mandatory before an internal evaluation panel.
15. Evaluation will be based on planning, participation, creativity, report writing, and presentation.
16. Students must pass this course to be eligible for the B.Sc. degree.
17. Community Engagement must align with the vision of NEP 2020 — promoting real-world learning, social responsibility, and civic engagement.

Typical Time and marks allocation for the different stages of the community engagement Programme is:

Step of Project	Individual students work in hours	Marks
Topic Selection	5	5
Study Design and Survey preparation	15	10
Fieldwork Execution [Data Collection / Activity / Events]	50	30
Data Analysis	20	10
Project Report Writing	30	20
Community Impact and Reflection	-	10
Oral Presentation	-	15
Total	**120**	**100**

Theory / Practical Examination Pattern for

(Major / Minor and VSC / SEC)

➢ Internal Assessment – Theory Paper (Total: 40 Marks)

Sr. No.	Component	Nature of Assessment	Marks
1.	**CIA-1** **Class Test** (Short Answers / MCQs / Objective Questions)	Written test conducted in class	**15**
2.	**CIA-2** **Assignment / Project / Presentation / Book Review / Research Review**	Individual or group work submitted as report or presented orally	**15**
3.	**CIA-3** **Participation, Performance & Attendance**	Based on engagement, attentiveness, regularity	**10**
Total			**40**

➢ External Assessment – Semester End Theory Paper (Total: 60 Marks)

Paper Name		
Duration : 2 Hours		**Marks : 60**
Q. 1	Questions Based on Unit 1	15
Q. 2	Questions Based on Unit 2	15
Q. 3	Questions Based on Unit 3	15
Q. 4	Questions Based on Unit 1, 2, 3	15

➢ External Assessment – Semester End Practical Examination (Total: 100 Marks)

- Every student must maintain and complete a practical journal as per the prescribed syllabus.
- The journal must be duly checked and certified by the subject teacher and Head of the Department (HOD).
- Students without a completed and certified journal will not be permitted to appear for the practical examination.

Component	Marks
Experiment - I	40
Experiment - II	40
Viva Voce	10
Journal Evaluation	10
Total Marks	**100**