Academic Council Meeting No. and Date: 9/ July 02, 2024
Agenda Number: 3 Resolution Number: 41,42 /3.4,3.24

Vidya Prasarak Mandal's
B. N. Bandodkar College of Science
(Autonomous), Thane

Syllabus for

Programme Code: BUPH

Programme: Bachelor of Science Specific Programme: Physics

(Major/Minor/Generic)

[S. Y. B. Sc. Physics]

Level 5.0

CHOICE BASED GRADING SYSTEM

Revised under NEP

From academic year 2024-2025

Preamble

The systematic and planned curricula from these courses shall motivate and encourage learners to understand basic concepts of Physics. It will help the student to

- To develop analytical abilities towards real world problems
- To familiarize with current and recent scientific and technological developments
- To enrich knowledge through problem-solving, hands-on activities, study visits
- To develop good observation ability
- To understand links of Physics to other disciplines.
- To develop scientific temperament.
- To obtain solutions to scientific questions by use of qualitative and quantitative reasoning and by experimental investigation.

The syllabus is aimed to achieve certain objectives. The syllabus spanning three years, covers from fundamental concepts in Physics and give glimpses of the scenario at the frontier. The students will be ready for the higher educational opportunities and jobs available in different fields of Physics and related environment like:

- Master's degree in Physics
- Master's degree in Computer applications MCA.
- PG Course in Radiology
- Software Development (Programming C++)
- Careers that require Scientific or Technical expertise.
- Careers in Civil and administrative Services.

Dr.Sangita S. Meshram
Chairperson, BOS Physics
VPM's B.N.Bandodkar College of Science (Autonomous), Thane

PROGRAMME OUTCOMES (POs) OF BACHELOR OF SCIENCE (B.Sc.)

The Undergraduate Programmes of Science are intended to cater quality education and attain holistic development of learners through the following programme outcomes:

PO1 - Disciplinary Knowledge

Lay a strong foundation of conceptual learning in science. Instill ability to apply science in professional, social and personal life.

PO2 - Inculcation of Research Aptitude

Ignite spirit of inquiry, critical thinking, analytical skills and problem-solving approach which will help learners to grasp concepts related to research methodology and execute budding research ideas.

PO3 - Digital Literacy

Enhance ability to access, select and use a variety of relevant information e-resources for curricular, co-curricular and extracurricular learning processes.

PO4 - Sensitization towards Environment

Build a cohesive bond with nature by respecting natural resources, encouraging eco-friendly practices and creating awareness about sustainable development.

PO5 - Individuality and Teamwork

Encourage learners to work independently or in collaboration for achieving effective results through practical experiments, project work and research activities.

PO6 - Social and Ethical Awareness

Foster ethical principles which will help in developing rational thinking and becoming socially aware citizens. Build an attitude of unbiased, truthful actions and avoid unethical behavior in all aspects of life.

Eligibility: 12th Science Pass

Duration: 3 years (Syllabus for Second Year semester III & IV)

Mode of Conduct: Offline lectures/ Online lectures

Discipline/Subject: Physics

Specific Programme: B.Sc. PHYSICS

Level: 5.0

Qualification Title: UG Diploma Certificate

Discipline/Subject: PHYSICS

Program Specific Outcomes-Physics

1.	**PSO1: Mastery of Fundamental Physics Concepts** Learners will acquire a strong conceptual understanding of fundamental principles in classical mechanics, electromagnetism, optics, quantum physics, and thermodynamics, enabling them to apply scientific knowledge effectively in academic, professional, and real-life situations.	L1
2.	**PSO2: Application of Physics in Problem Solving and Research** Learners will develop analytical thinking, experimental skills, and problem-solving abilities that strengthen scientific inquiry and research aptitude, enabling them to design, perform, and interpret basic physics experiments and pursue innovative research ideas.	L2
3.	**PSO3: Proficiency in Computational Tools and Digital Resources** Learners will gain competency in using simulations, data-analysis software, digital laboratories, and online resources to support learning, model physical systems, and analyse scientific data with accuracy.	L3

4.	**PSO4: Understanding of Environmental Physics and Sustainability** Learners will understand physical principles behind environmental processes—such as energy production, climate systems, and renewable technologies—and will develop an awareness of sustainable practices and eco-friendly applications of physics.	L4
5.	**PSO5: Experimental Competence, Teamwork, and Scientific Collaboration** Learners will effectively carry out laboratory experiments, projects, and field activities both independently and as part of a team, demonstrating precision, systematic planning, and collaborative scientific practice.	L5
6.	**PSO6: Ethical Practice and Social Responsibility in Physics** Learners will recognize the ethical dimensions of scientific work, follow safety and integrity standards in laboratories, avoid data manipulation, and apply physics knowledge responsibly for the benefit of society.	L6
Specific Programme: S. Y. B. Sc. (PHYSICS -Major/ Minor/Generic)		

Assessment: Weightage for assessments (in percentage) For Major and Minor

Type of Course	Formative Assessment / IA	Summative Assessment
Theory	40%	60%

VPM's B.N. Bandodkar College of Science (Autonomous), Thane

S. Y. B. Sc.

Curriculum Structure for the Undergraduate Degree Program S.Y.B.Sc. Physics

Structure of Programme

Semester-wise Titles of the Papers in S.Y.B.Sc. (Major Physics)

Year	Sem.	Course code	Course Title	Theory/ Practical	No. of Lectures	Credits
Second Year	III	24BUPH3T01	Analog and Digital Electronics	Theory	30	02
		24BUPH3T02	Laser, Fiber Optics andCommunication	Theory	30	02
		24BUPH3T03	Solar Energy	Theory	30	02
		24BUPH3P01	Practical Based on 24BUPH3T01 & 24BUPH3T02	Practical	60	02
		24BUPH3P02	Practical Based on 24BUPH3T02 & 24BUPH3T03	Practical	60	02
		24BUPH3P03	Field Project in Physics I	Practical	60	02
		24BU3SEC04	Basics of C++	Theory +Practical	15+30	02
		Total			**315**	**14**
			Minor			
		23BUPH3T04	Fundamental probability and distribution	Theory	30	02
		Total			**30**	**02**
			Generic			
		24BUPH3T05	Designing of Mobile Charger and Frequency Generator	Theory	30	02
		Total			**30**	**02**
		Total			**375**	**18**
	IV	24BUPH4T01	Solid State Devices and Circuits	Theory	30	02
		24BUPH4T02	Optical Physics	Theory	30	02
		24BUPH4T03	Microprocessor and Medical Physics	Theory	30	02

		24BUPH4P01	Practical Based on 24BUPH4T01 & 24BUPH4T02	Practical	60	02
		24BUPH4P02	Practical Based on 24BUPH4T02 & 24BUPH4T03	Practical	60	02
		24BUPH4P03	Field Project in Physics II	Practical	60	02
		24BU4SEC04	Advanced C++	Theory +Practical	15+30	02
		Total			**315**	**14**
			Minor			
		23BUPH4T04	Nanotechnology	Theory	30	02
		Total			**30**	**02**
			Generic			
		24BUPH4T05	Environmental Physics	Theory	30	02
		Total			**30**	**02**
		Total			**375**	**18**

B. N. Bandodkar College of Science, (AUTONOMOUS)-Thane

S.Y.B.Sc.

Level	SEM.	Faculty - DSC							Vocational & Skill Enhancement Course (VSEC)	Ability Enhancement Course (AEC) / Indian Knowledge System (IKS)			Field Project / Apprenticeship / Community Engagement & Services		Credit	Cumulative Credits
		Subject					Subject	Any Faculty Subject								
		Major (6T + 4P)					Minor	GE & OE								
		Course - I	Course - II	Course - III	Practical Course – I	Practical Course – II	Course – I	Course – I		AEC	VEC	IKS	FP	CC		
5.0	III	02 (2T)	02 (2T)	02 (2T)	02 (2P)	02 (2P)	02 (2T)	02 (2T)	02 (1T + 1P)	02 (2P)	-	-	02 (2P)	02 (1T + 1P)	22	44
	IV	02 (2T)	02 (2T)	02 (2T)	02 (2P)	02 (2P)	02 (2T)	02 (2T)	02 (1T + 1P)	02 (2P)	-	-	02 (2P)	02 (1T + 1P)	22	

Semester III

Course Code 24BUPH3T01	Major – 1 Course Title: **Analog and Digital Electronics**	Credit 2	No. of Lecture 30

Course Outcomes:

CO1	Construct circuit diagram for transistor biasing methods	L3
CO2	Develop the transistorized general Amplifier	L3
CO3	Make use of various number systems for arithmetic operations	L3
CO4	Outline the operation of sequential circuits, counters and shift registers.	L2

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	0	0	0	0	0
CO2	1	0	0	0	0	0
CO3	3	0	0	0	0	0
CO4	3	0	0	0	0	0

UNIT I	**Transistor Biasing:** Inherent Variations of Transistor Parameters, Stabilization, Essentials of a Transistor Biasing Circuit, Stability Factor, Methods of Transistor Biasing, Base Resistor Method, Emitter Bias Circuit, Circuit analysis of Emitter Bias, Biasing with Collector Feedback Resistor, Voltage Divider Bias Method, Stability factor for Potential Divider Bias *VM : 9.1 – 9.13* **General amplifier characteristics:** Concept of amplification, amplifier notations, current gain, Voltage gain, power gain, input resistance, output resistance. Practical circuit of transistor amplifier, phase reversal, frequency response, Decibel gain and Band width.	**15**
UNIT II	**Number System :** Binary number system , Arithmetic building blocks, Digital IC signal levels, Binary to Decimal ,Decimal to binary , Hexadecimal number, Hexadecimal to decimal Conversion, Decimal to hexadecimal conversion, Hexadecimal to binary conversion, Binary to hexadecimal conversion, Binary addition, Unsigned binary numbers, Sign magnitude numbers, 1's complement, 2's complement, Converting to and from 2's complement representation, 2's complement arithmetic, The adder-subtractor (ignore IC specific diagrams) *NGP : 1.2, 1.3, 1.4, 1.6, 2.1-2.7* **Sequential Circuits:** SR, D, JK and T Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. M/S JK Flip-Flop. *NGP : 8.1 – 8.8* **Counters (4 bits):** Ring Counter, Asynchronous counters, Decade Counter, MOD N Counter, Synchronous Counter, *NGP : 9.1 – 9.3, 9.5, 9.7, 9.8* **Shift registers (4 bits):** Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers. *NGP : 10.1-10.5*	**15**

Reference Books:

1. **VM:** Principles of Electronics by V. K. Mehta and Rohit Mehta, S. Chand & Company (Multicolor edition)
2. **NGP:** Digital Electronics and logic Design by N. G. Palan, Technova publication
3. **RJ:** Modern Digital Electronics by R. P. Jain, McGraw Hill education, 4th edition
4. **LMS:** Digital Principles and Application by Malvino, Leach & Saha, McGraw Hill Education

Course Code 24BUPH3T02	Major – 2 Course Title: **Laser, Fiber Optics and Communication**	Credit 2	No. of Lecture 30

Course Outcomes:

CO1	Summarize the working of laser, its properties and applications.	L2
CO2	Apply the theory of fiber optics to communication systems.	L3
CO3	Outline the basics of communication	L2
CO4	Apply Amplitude modulation and Frequency modulation for communication systems.	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	0	0
CO2	2	0	0	0	0	0
CO3	2	0	0	0	0	0
CO4	2	0	0	0	0	0

UNIT I	**Laser:** Introduction, transition between atomic energy states, Principle of Laser, Properties of Laser: Coherence Properties of LASER, Spatial Coherence Length, Directionality, Intensity, Helium–Neon Laser, Application of Laser, Holography SP: 9.1, 9.2, 9.3, 9.4, 9.4.1, 9.4.2, 9.4.3, 9.4.4, 9.6& 9.10 SB: Ch. 22 **Fiber Optics:** Light propagation through Fibers, Fiber Geometry, Internal reflection, Numerical Aperture, Step-Index and Graded-Index Fibers, Applications of Optical Fibers. SP: 13.3, 13.3.1, 13.3.2, 13.3.3, 13.5 & 13.9	**15**
UNIT II	**Basics of Communication:** Block diagram of communication system, types of communication system: simplex, duplex, analog and digital communication, Electromagnetic spectrum, base band and broad band communication. K : 1.2, 1.3, 2.1, 2.2, 2.4, 2.5, **Amplitude Modulation:** Need of modulation, concept of modulation, AM waveform, mathematical expression of AM, concept of sideband, demodulation principles. AM Receiver: TRF and super heterodyne receiver. K : 3.1, 6.1 **Frequency Modulation:** Definition, mathematical representation, frequency spectrum, bandwidth, and modulation index. Concept of ASK, PSK, FSK, PAM, PWM, PPM, PCM. K : 5.1.1 – 5.1.3, 13.2, 13.3	**15**

Reference Books:

1. **SP:** Modern Physics Concept and Applications by Sanjeev Puri, Narosa Publication
2. **RK:** Atomic and Molecular Spectra, LASER by Raj Kumar, KedarNath Ram Nath Publishers
3. **BL:** Lasers and Nonlinear Optics by B B Laud, New Age International (P) Ltd., New Delhi
4. **K:** Electronics Communication Systems by Kenndy, Tata McGraw Hill edition
5. **SB:** A Textbook of Optics by N. Subrahmanyam & Brij Lal, S. Chand publication

Course Code 24BUPH3T01	Major – 3 Course Title: **Solar Energy**	Credit 2	No. of Lecture 30

Course Outcomes:

CO1	Explain the structure of the Sun and Solar radiation	L2
CO2	Apply knowledge of measurement tools for solar radiation.	L3
CO3	Apply the knowledge of the characteristics of Solar Photovoltaic cell.	L3
CO4	Outline the operation of a solar power plant.	L2

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	0	0
CO2	2	0	0	0	0	0
CO3	1	0	0	0	0	0
CO4	3	0	0	0	0	0

UNIT I	**Solar Radiation:** Structure of the sun, Solar constant, Sun's radiation, Composition of Sun's radiation, basic sun- earth angle, tilt factor, Solar Radiation Geometry **Energy Source of the Sun:** The p – p Chain, Carbon Chain **Solar Radiation Measurement:** Pyrheliometers, Angstrom, Abbot silver disc and Eppley, Pyranometers- Eppley Pyranometers, Yellot Solarimeter [Photovoltaic solar cell] Average value of Horizontal Solar radiation, Solar radiation on the tilted surface. GR: 2.1, 2.2, 2.3, 2.3.4, 2.4.1- 2.4.7, 2.6.1, 2.6.2, 2.9, 2.10. CJ : 3.3 BS: 2.1 – 2.7	**15**
UNIT II	**Solar Energy:** Solar photovoltaic (PV) energy conversion / Photovoltaic effect, Performance analysis of solar photovoltaic (PV) Cell, Current in a short circuit, voltage in an open circuit, Power delivered to the load, Maximum current, Maximum power, Efficiency of solar cell, Fill factor, Limitation of Solar Cell, Solar cell material, Solar power plant, Autonomous solar power plant / off grid power plant, Grid connected Solar power plant, Solar photovoltaic (PV) energy conversion limitations SR : 3.1, 3.2, 3.2.1, 3.2.2. 3.2.3, 3.2.4, 3.2.5, 3.2.6, 3.2.7, 3.2.8, 3.3, 3.4, 3.5, 3.5.1, 3.5.2, 3.6.	**15**

Reference Books:

1. **GR:** Non- Conventional Energy Sources - A textbook of Engineering students by G. D. Rai,6th edition, Khanna publishers, 2017
2. **BS:** Non- Conventional Energy Sources by B. L. Singhal, Tech-Max publication
3. **CJ:** Physics of Solar Energy by C. Julian Chen, John Wiley & Sons INC., 2011
4. **SR:** Solar Energy - Fundamentals, Economic and Energy Analysis by Saurabh Kumar Rajput, Nitra Publication, 1st edition, 2017

PRACTICALS

Course Code 24BUPH3P01	Practical Based on 24BUPH3T01 & 24BUPH3T02	Credit 2	No. of Lecture 60

Course Outcomes:

CO1	Construct a circuit for a transistorized amplifier	L3
CO2	Choose the integrated circuits for digital experiments	L5
CO3	Develop counters and shift registers	L3
CO4	Construct the circuits for code conversion and bit comparator	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	2	0
CO2	2	1	0	0	2	0
CO3	2	1	0	0	2	0
CO4	2	1	0	0	2	0

1	BJT as CE characteristics
2	BJT as CB characteristics
3	BJT as CC characteristics
4	CE amplifier: variation of gain with load
5	CE amplifier: determination of bandwidth
6	Half and Full Subtractor
7	Study of Flipflops
8	Shift register: SISO and SIPO
9	Shift register: PISO and PIPO
10	Study of UP counter using IC 74190 / IC 74193
11	Study of DOWN counter using IC 74190 / IC 74193
12	Study of preset UP/DOWN counter using IC 74190 / IC 74193 (MOD N)
13	Study of RING Counter
14	Binary to Gray Code and Gray code to Binary Conversion Using IC 7400
15	BCD to Excess 3 code and Excess 3 to BCD code conversion using IC 7400 & IC7404
16	4-bit comparator using IC 7485
17	8-bit comparator using IC 7485

**The above list can be modified as per the need and requirement.*

References

Online Virtual Lab Experiment List/Link

1. Virtual Labs at Amrita Vishwa Vidyapeetham, https://vlab.amrita.edu
2. Virtual Labs an initiative of MHRD Govt. of India, http://vlabs.iitkgp.ac.in
3. An MoE Govt. of India initiative, https://de-iitr.vlabs.ac.in

Course Code 24BUPH3P02	Practical Based on 24BUPH3T02 & 24BUPH3T03	Credit 2	No. of Lecture 60

Course Outcomes:

CO1	Analyze the applications of laser and Fiber optics	L4
CO2	Compare the characteristics of Solar cell	L4
CO3	Examine the applications of Solar cell	L4
CO4	Build the circuits for electronic communication	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	2	0
CO2	2	1	0	0	2	0
CO3	2	1	0	0	2	0
CO4	2	1	0	0	2	0

1	To find the wavelength of laser using grating
2	To find the wavelength of laser using ruler scale
3	To find Refractive index using total internal reflection by Laser
4	Fiber optics - 1
5	Fiber optics -2
6	I-V characteristics Of Solar Cell.
7	Study of PV cell in series
8	Study of PV cell in parallel
9	Effect of distance on cell current of solar cell
10	Effect of different color filter on solar cell
11	Effect of Shading on Cell Current with 1 cell covered and all cell covered
12	Interfacing of DC motor, LED, Relay using solar Cell
13	Frequency modulation
14	Amplitude modulation
15	Simulation on Multisim

**The above list can be modified as per the need and requirement.*

References

Online Virtual Lab Experiment List/Link

1. Virtual Labs at Amrita Vishwa Vidyapeetham, https://vlab.amrita.edu
2. Virtual Labs an initiative of MHRD Govt. of India, http://vlabs.iitkgp.ac.in
3. An MoE Govt. of India initiative, https://de-iitr.vlabs.ac.in

Course Code 24BUPH3P03	Course Title: Field Project in Physics I	Credit 2	No. of Lecture 60

Course Outcomes:

CO1	Analyze the research problem.	L4
CO2	Choose a Scientific methodology.	L5
CO3	Develop a research technique.	L6
CO4	Demonstrate an innovative and evidence-based solution.	L2

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	0	0	2	0
CO2	2	1	0	0	2	0
CO3	2	1	0	0	2	0
CO4	2	1	0	0	2	0

Course Code 24BU3SEC04	Skill Enhancement Course Course Title: **Basic of C++**	Credit 1	No. of Lecture 15

Course Outcomes:

CO1	Recall the Basics of C++	L1
CO2	Develop C++ programs using tokens and expressions.	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	0	0	0	2	0
CO2	2	0	0	0	2	0

UNIT 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. EB: 1.5, 1.6, 1.7 & 1.8 EB: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7 & 2.8 **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, Control Structure EB: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18, 3.19, 3.20, 3.21, 3.22, 3.23& 3.24 TG: Ch. 1, 2, 3, 4, 5	**15**

Reference Books:

1. **EB:** Object Oriented Programming with C++ by E Balagurusamy, Third /Fourth Edition, Tata McGraw-Hill Publishing Company Limited.
2. **TG:** Starting out with C++ by Tony Gaddis, Third Edition, Addison Wesley Publishing Company

Course Code	Skill Enhancement Course	Credit	No. of Lecture
24BU3SEC04	Course Title: **Basic of C++ Practical's**	1	30

Course Outcomes:

CO3	Choose tokens and expressions in C++ programs	L3
CO4	Compile C++ programs using tokens and expressions	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO3	2	0	0	0	2	0
CO4	2	0	0	0	2	0

1.	Positive and Negative Number
2.	Even and Odd Number
3.	Create a Calculator
4.	Swap 2 numbers
5.	Armstrong Number
6.	Program using Switch Case
7.	Fibonacci Series
8.	Sum of series
9.	palindrome number
10.	Swap of palindrome number
11.	Create a C program that uses both a keyword and an identifier in a variable declaration and demonstrates their usage.
12.	Write a program that calculates the area of a rectangle given its length and width, using appropriate variable declarations and data types.
13.	Declare variables of different data types and print their sizes using the `size of` operator.
14.	Create a C program that prompts the user to enter two numbers, assigns them to variables, and then swaps the values of these variables.

**The above list can be modified as per the need and requirement.*

Reference Books :

1. **EB:** Object Oriented Programming with C++ by E Balagurusamy, Third /Fourth Edition, Tata McGraw-Hill Publishing Company Limited.
2. **TG:** Starting out with C++ by Tony Gaddis, Third Edition, Addison Wesley Publishing Company

Course Code 23BUPH3T04	Minor-I Course Title: Fundamental probability and distribution	Credit 2	No. of Lecture 30

Course Outcomes:

CO1	Apply formulae to calculate central tendencies	L3
CO2	Choose the formula for measuring different dispersions in data	L3
CO3	Illustrate the basic concepts of Probability.	L2
CO4	Apply the statistical distributions for solving the probability problems.	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	0	0
CO2	2	0	0	0	0	0
CO3	2	0	0	0	0	0
CO4	2	0	0	0	0	0

UNIT I	Measure of central tendency: Mean, weighted mean, median, mode, geometric and harmonic means, properties, merits and limitations, relation between these measures. Partition values. Measures of dispersion: Range, Quartile deviation, mean deviation, standard deviation and their relative measures. Moments, Skewness and Kurtosis.	**15**
UNIT II	Review of basic concepts, introduction, sample space, events, independent events, (derivation of formulae not expected), random variables, p.m.f, p.d.f, c.d.f continuous distributions (omit joint distributions), binomial distribution, the normal distribution, the Poisson Distribution. Ref: MB – 15.1-15.9 Expected to cover solved problems from each section	**15**

Reference Books:

1. MB: Mathematical Methods in the Physical sciences: Mary L. Boas Wiley India, 3rd ed.
2. Basic Statistics Agarwal B.L. New Age International Ltd.
3. Theory and Problems of Statistics, Spiegel M.R. Tata McGraw Hill.
4. Fundamentals of Statistics, Volume II Goon A.M., Gupta M.K., Das Gupta B. The World Press Private Limited, Calcutta.
5. Complete Business statistics Aczel Sounder Pandian Tata McGraw Hill

Course Code 24BUPH3T05	Generic-I Course Title: Designing of Mobile Charger and Frequency Generator	Credit 2	No. of Lecture 30

Course Outcomes:

CO1	Understand the knowledge of electronic components to design the circuits.	L2
CO2	Build the circuit diagram of DC power supply for different applications.	L3
CO3	Understand the working of Transistorised Multivibrators	L2
CO4	Build the circuit diagram of the Frequency generator.	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	0	0
CO2	1	0	0	0	0	0
CO3	2	0	0	0	0	0
CO4	1	0	0	0	0	0

UNIT I	**1.** Working of Resistance, Capacitors, Inductors, Diode, **2.** Working of Transistor, Optocoupler and Transformer etc. **3.** Bridge rectifier without Capacitor and with Capacitor for A.C to D.C conversion. **4.** Study the working of DC power supply/ mobile Charger. **5.** Fault findings in a Faulty DC power supply. **6.** Designing a DC power supply/mobile Charger of 5V/10V output.	**15**
UNIT II	**1.** Study of Transistorised Astable Multivibrator. **2.** Study of Transistorised Mono-stable Multivibrator. **3.** Study of Transistorised Bistable Multivibrator. **4.** Study the working of Frequency Generator. **5.** Fault findings in a Faulty Frequency Generator. **6.** Designing a frequency generator of 1k to 10k Hz output frequency by using quartz crystal.	**15**

Reference Books :

1. "Power Supply Design Handbook" by Khurram Kazi:
2. "Switch-Mode Power Supply Design" by Abraham I. Pressman:
3. "Practical Electronics for Inventors" by Paul Scherz and Simon Monk:
4. Digital Principles & Applications (Sie) Book by Albert Paul Malvino and Donald P. Leach

Semester IV

Course Code 24BUPH4T01	Major – 1 Course Title: **Solid State Devices and Circuits**	Credit 2	No. of Lecture 30

Course Outcomes:

CO1	Develop the circuit diagram of FET and MOSFET.	L3
CO2	Develop the circuit diagram of SCR and UJT.	L3
CO3	Make use of a transistor and IC 555 to design a timing circuit.	L3
CO4	Summarize the Special Diodes	L2

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	0	0	0	0	0
CO2	1	0	0	0	0	0
CO3	1	0	0	0	0	0
CO4	3	0	0	0	0	0

UNIT I	**Field effect transistors:** JFET: Basic ideas, drain curve, The transconductance curve, Biasing in the ohmic region and the active region, Transconductance, JFET common source amplifier, JFET analog switch, multiplexer, voltage-controlled resistor, Current sourcing. **MOSFET:** Depletion and enhancement mode, MOSFET operation and characteristics, digital switching. **SCR:** construction, static characteristics, Analysis of the operation of SCR, Gate Triggering Characteristics, Variable half wave rectifier and Variable full wave rectifier, Current ratings of SCR. **UJT:** Construction, Operation, characteristics and application as a relaxation oscillator MB: 13.1 to 13.9 MB: 14.1, 14.2, 14.4, 14.6. AM: 28.1, 28.5	**15**
UNIT II	**Transistor Multivibrators:** Astable, Monostable and Bistable Multivibrators, Schmitt trigger. **555 Timer**: Review Block diagram, Monostable and Astable operation Voltage Controlled Oscillator, Pulse Width modulator, Pulse Position Modulator, Triggered linear ramp generator. **Special Diodes:** Zener Diode, Tunnel diode, Varactor diode, Point contact diode, V-I characteristic of these diodes, Optoelectronic devices: Light emitting diode. Photodiode, Phototransistor. AM: 18.11 2. KVR: 14.5.2.1, 14.5.2.5, 14.5.2.6, 14.5.4.1 3. MB: 23.8, 23.9 4. MB:24.1, 24.3, 24.4	**15**

Reference Books:

1. MB: Electronic Principles, Malvino & Bates,7th Ed, TMH Publication.
2. AM: Electronic Devices and Circuits, Allen Mottershead, PHI Publication
3. BT : Solid state and Electronics by B L Theraja,

Course Code 24BUPH4T02	Major – 2 Course Title: **Optical Physics**	Credit 2	No. of Lecture 30

Course Outcomes:

CO1	Explain the polarization in light.	L2
CO2	Summarize Polarizer, analyzer and retarders	L2
CO3	Apply Fresnel diffraction for narrow slit and narrow wire	L3
CO4	Apply Fraunhoffer Diffraction for double slit and grating	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	0	0	0	0	0
CO2	3	0	0	0	0	0
CO3	1	0	0	0	0	0
CO4	1	0	0	0	0	0

UNIT I	**Polarization:** Types of polarization, Plane polarized light, Circularly polarized light, Elliptically polarized light, Partially polarized light, Production of Plane polarized light, Polarization by reflection from dielectric surface, Polarization by refraction –pile of plates, Polarization by scattering, Polarization by selective Absorption, Polarization by double refraction, Polarizer and Analyzer, Malus' Law, Anisotropic crystal, Calcite crystal, Optic Axis, Double refraction in calcite crystal, Huygens' explanation of double refraction, Ordinary and Extra ordinary rays, Positive and Negative crystals, Superposition of waves linearly polarized at right angles, Superposition of e-Ray and o-Ray, Retarders, Quarter wave plate, Half wave plate, Production of linearly polarized light, Production of elliptically polarized light, Production of circularly polarized light, Analysis of polarized light, Applications of polarized light. **SB:** 20.1 – 20.22, **AG:** 22.1 – 22.7	**15**
UNIT II	**Fresnel's Diffraction:** Fresnel's assumptions, rectilinear propagation (Half period zones) of light, Diffraction pattern due to straight edge, Positions of maxima and minima in intensity, Intensity at a point inside the geometrical shadow (straight edge), Diffraction due to a narrow slit, Diffraction due to a narrow wire **SB :** 17.1 – 17.12, **AG :** 20.1 – 20.3, 20.6 **Fraunhoffer Diffraction:** Introduction, Fraunhoffer diffraction at a single slit, Intensity distribution in diffraction pattern due to a single slit, Fraunhoffer diffraction at a double slit, Distinction between single slit and double slit diffraction pattern and missing orders, Plane diffraction Grating, Theory of plane transmission grating, Width of principal maxima **SB:** 18.1 – 18.5, **AG:** 18.1, 18.2, 18.6	**15**

Reference Books:

1. **SA:** A Textbook of Optics by N. Subrahmanyam & Brij Lal, S. Chand publication
2. **AG:** Optics by Ajoy Ghatak, McGraw hill educations
3. **DM:** A text of optics by D.S. Mathur

Course Code 24BUPH4T03	Major – 3 Course Title: **Microprocessor and Medical Physics**	Credit 2	No. of Lecture 30

Course Outcomes:

CO1	Demonstrate the operation of various components of a microprocessor 8085.	L2
CO2	Utilize the instruction set of 8085 to execute specific tasks.	L3
CO3	Summarize the biomedical electrodes, sensors and transducers.	L2
CO4	Outline the Bioelectric potential and medical instruments	L2

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	0	0
CO2	2	0	0	0	0	0
CO3	2	0	0	0	0	0
CO4	2	0	0	0	0	0

UNIT I	**Building Concept of Microprocessor:** Introduction, Study of Memory, Input Device, Output Device, Input/output Device, Central Processing Unit. **8085 Microprocessor:** Introduction, Features of Inter 8085, Pin Diagram of 8085 , 8085 CPU Architecture , Arithmetic and Logical Group (ALU , Accumulator, Temporary Register, Flag Register (PSW)), Register Group (Temporary Registers (W and Z) , General purpose registers, Special Purpose registers), Interrupt Control , Serial I/O Control Group, Instruction Register, Decoder and Control Group (Instruction Register , Instruction Decode, Timing and Control) **8085 Instruction Set:** Introduction, Flowchart, Classification of Instruction Set (Data Transfer Group, Arithmetic Group, Logical Group, Branching Group , Stack and Machine Control Group) , Notations used in Instructions and Opcode , Data Transfer Group , Program Examples for Data Transfer Group , Arithmetic Operation Group , Branch Group , Logical Group , Addressing Modes , 8085 Programmers Model. RG : Ch 3,4 & 6	**15**

UNIT II	**Medical Physics:** **Biomedical Electrodes, Sensors and Transducers:** Sources of Bioelectric Potential - Resting and Action potential, Propagation of action potential, Electrode Theory, Goldman and Nernst Equations, Ag-AgCl Reference Electrode; Surface electrodes, Needle electrodes, microelectrodes; Classifications and Characteristics of Sensors and Transducers, Pressure, Flow, Temperature and Optical transducers. **The bioelectric potentials**: ECG, EEG, EMG, ERG, EOG, EGG; Digital Biosignals, Types of Noise. SA: Ch 6, 7, 12 **Modern Medical Imaging and Instrumentation Systems:** Ultrasound and Ultrasonic imaging system – Ultrasound Doppler and flow detector, Echocardiogram; Physics of X-rays and X-ray machines, X-ray images and data, Computer Tomography (CT) – Principles and scans; Magnetic resonance imaging (MRI) Positron Emission Tomography (PET). SA: Ch 14,15	**15**

Reference Books:

1. **RG :** Microprocessor Architecture Programming and applications with 8085, R.S. Gaonkar,2002, Prentice Hall.
2. **SA:** Biomedical Instrumentation by S. Chatterjee and Aubert Miller Cengage Learning
3. Biomedical Instrumentation and Measurements by Lesli Cromwell, F J Weibell, Erich PfeifferPHI
4. Handbook of Biomedical Instrumentation by R S Khandpur, TMH
5. Biomedical Digital Signal Processing by Willis J Tompkins, PHI

PRACTICALS

Course Code 24BUPH4P01	Practical Based on 24BUPH4T01 & 24BUPH4T02	Credit 2	No. of Lecture 60

Course Outcomes:

CO1	Experiment with optical instruments	L3
CO2	Determine the material constants using optical phenomenon	L5
CO3	Experiment with electronic circuits	L3
CO4	Construct the electronic circuits using basic components	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	2	0
CO2	2	1	0	0	2	0
CO3	2	1	0	0	2	0
CO4	2	1	0	0	2	0

1	Fresnel's bi-prism: determination of λ
2	Determination of Cauchy's constants.
3	R.P. of telescope.
4	R.P. of grating
5	R. P. of prism
6	Brewster's law: determination of μ
7	Double refraction
8	Transistorized Astable/ Monostable/ Bistable multivibrator
9	Characteristics of Photodiode/ Phototransistor
10	IC 555 timer as Astable/ Monostable multivibrator
11	IC 555 timer as a Ramp generator
12	Energy band gap
13	SCR characteristics
14	FET as VVR and VCA
15	UJT characteristics
16	UJT as relaxation oscillator
17	Thermistor characteristics.
18	Thermocouple- Seebeck effect

**The above list can be modified as per the need and requirement.*

References

Online Virtual Lab Experiment List/Link

1. Virtual Labs at Amrita Vishwa Vidyapeetham, https://vlab.amrita.edu
2. Virtual Labs an initiative of MHRD Govt. of India, http://vlabs.iitkgp.ac.in
3. An MoE Govt. of India initiative, https://de-iitr.vlabs.ac.in

Course Code 24BUPH4P02	Practical Based on 24BUPH4T02 & 24BUPH4T03	Credits 2	No. of Lecture 60

Course Outcomes:

CO1	Analyse 8-bit arithmetic operations using 8085	L4
CO2	Evaluate 16-bit arithmetic operations using 8085	L5
CO3	Analyse the data analysis operations using 8085	L4
CO4	Evaluate optimised routines for data movement and sorting in memory using 8085	L5

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	2	0
CO2	2	1	0	0	2	0
CO3	2	1	0	0	2	0
CO4	2	1	0	0	2	0

1	8 -bit addition/ subtraction.
2	8-bit addition with carry and subtraction with borrow
3	Addition of series of numbers.
4	Multiplication of two hexadecimal numbers.
5	Division of two hexadecimal numbers.
6	Find largest number in given block.
7	Find smallest number in given block.
8	Find number of even elements in given block.
9	Find number of odd elements in given block.
10	Find number of negative elements in given block.
11	Find number of positive elements in given block.
12	Arrange given number in descending order.
13	Arrange given number in ascending order.
14	Memory block transfer from one location to another.
15	Sixteen-bit subtraction.
16	Sixteen-bit addition.

**The above list can be modified as per the need and requirement.*

References

Online Virtual Lab Experiment List/Link

1. Virtual Labs at Amrita Vishwa Vidyapeetham, https://vlab.amrita.edu
2. Virtual Labs an initiative of MHRD Govt. of India, http://vlabs.iitkgp.ac.in
3. An MoE Govt. of India initiative, https://de-iitr.vlabs.ac.in

Course Code 24BUPH4P03	Course Title: Field Project in Physics II	Credits 2	No. of Lecture 60

Course Outcomes:

CO1	Analyze the research problem.	L4
CO2	Choose a Scientific methodology.	L5
CO3	Develop a research technique.	L6
CO4	Demonstrate an innovative and evidence-based solution.	L2

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	0	0	2	0
CO2	2	1	0	0	2	0
CO3	2	1	0	0	2	0
CO4	2	1	0	0	2	0

Course Code	Skill Enhancement Course Course Title: **Advanced C++**	Credit	No. of Lecture
24BU4SEC04		1	15

Course Outcomes:

CO1	Make use of Functions in C++ programs	L3
CO2	Develop C++ programs using arrays, pointers, and strings	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	2	0
CO2	2	0	0	0	2	0

UNIT I	**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. **Arrays, Pointers, C - Strings** EB:4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9 & 4.11 TG: 7.1 – 7.9, 9.1 – 9.5, 10.1 – 10.4	**15**

Reference Books:

1. **EB:** Object Oriented Programming with C++ by E Balagurusamy, Third/Fourth Edition, Tata McGraw-Hill Publishing Company Limited.
2. **TG:** Starting out with C++ by Tony Gaddis, Third Edition, Addison Wesley Publishing Company

Course Code	Course Title:	Credit	No. of Lecture
24BU4SEC04	Advanced C++ Practical's	1	30

Course Outcomes:

CO3	Choose functions, arrays, pointers, and strings in C++ programs	L3
CO4	Compile C++ programs using functions, arrays, pointers, and strings	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO3	2	0	0	0	2	0
CO4	2	0	0	0	2	0

1.	Write a function prototype for a function that takes an array of integers and its size, and returns the average of the array elements.
2.	Implement a function that swaps the values of two integers using call by reference and test it in a program.
3.	Create a function that returns a reference to the largest integer in an array. Test it in a program.
4.	Implement an inline function that calculates the square of a number and use it in a program to calculate the squares of numbers from 1 to 10.
5.	Write a function that takes two integers with a default value for the second parameter. Use the function to calculate the sum of the two integers.
6.	Create a function that takes an array and its size as parameters, both marked as const. The function should calculate the sum of the array elements and print the result.
7.	Implement overloaded functions for addition: one for integers, one for floating-point numbers, and one for arrays of integers.
8.	Trapezoidal rule
9.	Simpson's 1/3 rd Rule
10.	Simpson's $3/8^{th}$ Rule
11.	Create a program that takes an array of integers and reverses the order of its elements. Print the original and reversed arrays.
12.	Implement a function that calculates the sum of elements in each row of a 2D array and prints the results.
13.	Write a program that takes two C-strings (arrays of characters) as input and concatenates them. Print the result.
14.	Implement a function that compares two C-strings and returns whether they are equal. Use this function in a program to compare user-provided strings.

15.	Create a function that finds a substring within a C-string and returns the starting index of the substring if found. Use the function in a program and test it with various inputs.

**The above list can be modified as per the need and requirement.*

Reference Books:

1. **EB:** Object Oriented Programming with C++ by E Balagurusamy, Third /Fourth Edition, Tata McGraw-Hill Publishing Company Limited.
2. **TG:** Starting out with C++ by Tony Gaddis, Third Edition, Addison Wesley Publishing Company

Course Code 23BUPH4T04	Minor-II Course Title: Nanotechnology	Credit 2	No. of Lecture30

Course Outcomes:

CO1	Explain the History and production methods of Nanomaterials	L2
CO2	Extend the applications of Nanotechnology	L2
CO3	Summarize the basic concept of Nanometrology and Its Impact.	L2
CO4	Summarize the natural nanoparticles.	L2

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	0	0
CO2	3	0	0	0	0	0
CO3	2	0	0	0	0	0
CO4	3	0	0	0	0	0

UNIT I	**1.1 MACRO, MICRO, NANO** 1.1.1 Production Methods in Development of Technology and the Importance of Material 1.1.2 Importance of Size in Material Characterization 1.1.3 Macro Structures 1.1.4 Micro Structures 1.1.5 Nano Structures **1.2 The HISTORY of NANOTECHNOLOGY** 1.2.1 Historical Development of Nanotechnology **1.3 DEVELOPMENT of NANOTECHNOLOGY** 1.3.1 Nanotechnology in Material and Production 1.3.2 Nanotechnology in Electronics and Information Technologies 1.3.3 Nanotechnology in Medical Applications 1.3.4 Energy, Environment and Nanotechnology 1.3.5 Textile and Nanotechnology 1.3.6 Food Industry and Nanotechnology	**15**

UNIT II	**1.4 NANOMETROLOGY** 1.4.1 The Nanometre (nm) 1.4.2 The Nano gram (ng) 1.4.3 Current Nano scale Measurement Studies **1.5 IMPACT of NANOTECHNOLOGY** 1.5.1 The impact of nanotechnology 1.5.2 How can nanotechnologies change our lives in the future? 1.5.3 The economic and social impact of nanotechnology 1.5.4 Nanotechnology Future today 1.5.6 Nano impact today **NANOMATERIALS** 3.1 NATURAL NANOPARTICLES 3.1.1 Natural Nanoparticles 3.1.2 Natural Nanoparticles in the Atmosphere 3.1.3 Natural Nanoparticles in the Hydrosphere 3.1.4 Mechanisms for the formation of natural nanoparticles (NNPs)	**15**

Reference Books:

1. Nanotechnology 1 by Prof. Dr. Mustafa ersöz, Dr. Arzum işitan meltem balaban ISBN 978-975-6992-77-71st edition October 2018

Course Code 24BUPH4T05	Generic-II Course Title: **Environment Physics**	Credit 2	No. of Lecture 30

Course Outcomes:

CO1	Relate Physics and Earth's Environment	L2
CO2	Summarize the structure and composition of the atmosphere.	L2
CO3	Interpret the concept of the Physics of wind and Energy resources.	L2
CO4	Understand the facts of Renewable resources and Pollution.	L2

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	0	0
CO2	2	0	0	0	0	0
CO3	2	0	0	0	0	0
CO4	2	0	0	0	0	0

UNIT I	**The human environment, Energy transfers-** Conduction. - Fourier's law of thermal conduction. Convection. Newton's law of cooling, Radiation, Stefan-Boltzmann law, Kirchhoff's law, Planck's law and Wien's displacement law. Evaporation **Structure and composition of the atmosphere-** Troposphere, Stratosphere, Mesosphere, Ionosphere, Thermosphere, Exosphere, Magnetosphere **Photochemical pollution**, Atmospheric aerosol, Atmospheric pressure, Ozone: Advantage of ozone: Disadvantage of ozone, Ozone hole, Greenhouse Effect and Global Warming.	**15**
UNIT II	**Wind**- Physics of wind Creation, - **Principal forces acting on air masses-**Gravitational force, Pressure gradient, Coriolis force, The frictional force **Energy and the** environment-Energy resources: 1- Fossil fuels, 2- Nuclear power: **Renewable resources**: - 1- Hydro-electric power 2- Tidal power, 3- Wind power 4- Wave power 5- Biomass (as fuel) 6- Solar power- **Noise pollution**- Hearing loss: Noise control: **Thermal Pollution**-Ecological effects - warm water, Ecological effects - cold water, Industrial wastewater, and Urban runoff.	**15**

Reference Books :

1. "BASIC ENVIRONMENTAL PHYSICS" by Pankaj singh, tanveer ahmad wani Pragati Prakashan, ISBN: 978-93-85904-19-6.
2. Forinash, K. "Foundation of Environmental Physics", Island Press,2010.

VPM's B.N. Bandodkar College of Science (Autonomous), Thane

Curriculum Structure for the Undergraduate Degree Programme S. Y. B. Sc. Physics

	SEMESTER – III	**Course imparts Employability (EM), Entrepreneurship (EN), Skill Development (SD)**			**Course integrates with Professional Ethics (PE), Gender Equity (GE), Human Value (HV), Environmental Sustainability (ES)**			
Course Code	**Major Course Title**	**EM**	**EN**	**SD**	**PE**	**GE**	**HV**	**ES**
24BUPH3T01	Analog and Digital Electronics	--	--	√	--	--	--	--
24BUPH3T02	Laser, Fiber Optics and Communication	--	--	√	--	--	--	--
24BUPH3T03	Solar Energy	√	√	√	√	--	--	√
24BUPH3P01	Practical Based on 24BUPH3T01 & 24BUPH3T02	√	√	√	--	--	--	√
24BUPH3P02	Practical Based on 24BUPH3T02 & 24BUPH3T03	√	√	√	--	--	--	√
24BUPH3P03	Field Project in Physics I	√	√	√	√	√	√	√
24BU3SEC04	Basics of C++	√	√	√	--	--	--	--
	Minor Course Title							
23BUPH3T04	Fundamental probability and distribution	--	--	√	--	--	--	--
Course Code	**Generic - Course Title**							
24BUPH3T05	Designing of Mobile Charger and Frequency Generator	√	√	√	--	--	--	--
	Total	**06**	**06**	**09**	**02**	**01**	**01**	**04**

	SEMESTER – IV	**Course imparts Employability (EM), Entrepreneurship (EN), Skill Development (SD)**			**Course integrates with Professional Ethics (PE), Gender Equity (GE), Human Value (HV), Environmental Sustainability (ES)**			
Course Code	**Major Course Title**	**EM**	**EN**	**SD**	**PE**	**GE**	**HV**	**ES**
24BUPH4T01	Solid State Devices and Circuits	--	--	√	--	--	--	√
24BUPH4T02	Optical Physics	--	--	√	--	--	--	--

24BUPH4T03	Microprocessor and Medical Physics	--	--	√	--	--	--	--
24BUPH4P01	Practical Based on 24BUPH4T01 & 24BUPH4T02	√	√	√	--	--	--	--
24BUPH4P02	Practical Based on 24BUPH4T02 & 24BUPH4T03	√	√	√	--	--	--	--
24BUPH4P03	Field Project in Physics II	√	√	√	√	√	√	√
24BU4SEC04	Advanced C++	√	√	√	--	--	--	--
	Minor Course Title							
23BUPH4T04	Nanotechnology	√	--	√	--	--	--	√
Course Code	**Generic - Course Title**							
24BUPH4T05	Environmental Physics	--	--	√	√	--	--	√
	Total	**05**	**04**	**09**	**02**	**01**	**01**	**04**