Academic Council Meeting No. and Date :8 / September 04, 2023
Agenda Number: 2 Resolution Number: 34, 35 / 2.4, 2.25

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)

[F. Y. B. Sc. Physics]

Level 4.5

CHOICE BASED GRADING SYSTEM

Revised under NEP

From academic year 2023-2024

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 First Year semester I & II)

Mode of Conduct: Offline lectures/ Online lectures

Discipline/Subject: Physics

Specific Programme: B.Sc. PHYSICS

Level: 4.5

Qualification Title: UG 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 analyze 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: F.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

F. Y. B. Sc.

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

Structure of Programme

SEMESTER – I

Course Code	Course Title	No. of lectures	Credits
23BUPH1T01	Classical Physics	**30**	**2**
23BUPH1T02	Modern Physics	**30**	**2**
23BU1SEC04	Physics- Measuring skill	**15+30**	**2**
23BUPH1P01	Practical Based on 23BUPH1T01 & 23BUPH1T02	**60**	**2**
	Total	**165**	**08**
	Minor		
23BUPH1T03	Classical Physics	**30**	**2**
23BUPH1T04	Modern Physics	**30**	**2**
23BUPH1P02	Practical Based on 23BUPH1T03 & 23BUPH1T04	**60**	**2**
	Total	**120**	**06**
	Generic		
23BUPH1T05	Basics Of Quantum Mechanics and Electricity	**30**	**2**
	Total	**30**	**2**
Total		**315**	**16**

SEMESTER – II

Course Code	Course Title	No. of lectures	Credits
23BUPH2T01	Mathematical Physics	**30**	**2**
23BUPH2T02	Electricity And Electronics	**30**	**2**
23BUPH2P01	Practical Based on 23BUPH2T01 & 23BUPH2T02	**15+30**	**2**
23BU2SEC04	OPAMP, Logic gates and Applications	**60**	**2**
	Total	**165**	**08**
	Minor		
23BUPH2T03	Mathematical Physics	**30**	**2**
23BUPH2T04	Electricity And Electronics	**30**	**2**
23BUPH2P02	Practical Based on 23BUPH2T03 & 23BUPH2T03	**60**	**2**
	Total	**120**	**06**
	Generic		
23BUPH2T05	Basics of Thermodynamics and Mathematical Physics	**30**	**2**
	Total	**30**	**2**
Total		**315**	**16**

Semester -I

MAJOR COURSE CODE: 23BUPH1T01	**(02 Credits)**	**No of lecture in Hrs. 30**
MINOR COURSE CODE: 23BUPH1T03	**(02 Credits)**	**No of lecture in Hrs. 30**

Classical Physics

Course Outcomes:

Students will be wanted to learn OR on completion of this course, students will be able to learn

CO1	Apply Newton's laws to calculate the motion of simple systems.	L3
CO2	Make use of concepts of elasticity and fluid Dynamics to calculate elastic constants and viscosity of fluid.	L3
CO3	Construct a Thick lens using concepts of optics.	L3
CO4	Illustrate the concepts of aberration and interference with their applications.	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	1	0	0	0	0	0
CO3	1	0	0	0	0	0
CO4	2	0	0	0	0	0

Unit I:	**Newton's Laws:** Newton's first, second and third laws of motion, (Review) interpretation and applications, pseudo forces, Inertial and non-inertial frames of reference. Worked out examples (with friction present) **Elasticity:** Review of Elastic constants Y, K, η and σ; Equivalence of shear strain to compression and extension strains. Relations between elastic constants, Couple for twist in cylinder. **Fluid Dynamics:** Equation of continuity, Bernoulli's equation, applications of Bernoulli's equation, streamline and turbulent flow, lines of flow in airfoil, Poiseuille'sequation.	**15**
Unit II:	**Lens's formulae:** Lens Maker's Formula (Review), Newton's lens equation, magnification-lateral, longitudinal, and angular. Equivalent focal length of two thin lenses, thick lens, cardinal points of thick lens, Ramsden, and Huygens eyepiece. **Aberration**: Spherical Aberration, Reduction of Spherical Aberration, Chromatic aberration, and condition for achromatic aberration. **Interference**: Interference in thin films, Fringes in Wedge shaped films, Newton's Rings (Reflective). ***Note: A good number of numerical examples are expected to be covered during the prescribed lectures.***	**15**

REFERENCES	
23BUPH1T01/T03	
1.	Fundamentals of Physics (extended) Haliday, Resnick and Walker John Wiley and Sons 6th 2005
2.	Concepts of Physics (Part I) H. C. Verma Bharati Bhavan 1st 2015
3.	A Textbook of Optics Brijlal Subramanyam and Avadhanulu S. Chand 25th 2012
4.	Fundamentals of Optics Jenkins and White McGraw Hill International 4th 1981
5.	Classical Dynamics Thornton and Marion Thomson 5th 2004
6.	Optics C L Arora S. Chand 1st 2001

MAJOR COURSE CODE: 23BUPH1T02	(02 Credits)	No of lecture in Hrs. 30
MINOR COURSE CODE: 23BUPH1T04	(02 Credits)	No of lecture in Hrs. 30

Modern Physics

Course Outcomes:

CO1	Solve for Mass defect, Binding Energy, and Binding Energy per nucleon using properties of Nuclei.	L3
CO2	Utilize the theory of radioactivity to calculate the age of the radioactive material.	L3
CO3	Outline the interaction between particles with matter and the types of nuclear reactions.	L2
CO4	Solve for different nuclear reactions.	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	2	0	0	0	0	0

Unit I:	**Structure of Nuclei**: Basic properties of nuclei, Composition, Charge, Size, Rutherford'sexpt. for estimation of nuclear size, density of nucleus, Mass defect and Binding energy, packing fraction, BE/A vs A plot, stability of nuclei (N Vs Z plot) and problems. **Radioactivity**: Radioactive disintegration concept of natural and artificial radioactivity, Properties of α, β, γ-rays, laws of radioactive decay, half-life, mean life (derivation not required), units of radioactivity, successive disintegration and equilibriums, radioisotopes. Numerical problems. Carbon dating and other applications of radioactive isotopes (Agricultural, Medical, Industrial, Archaeological - information from net).	**15**
Unit II:	**Interaction between particles and matter**: Ionization chamber, Proportional counter and GM counter problems **Nuclear Reactions**: Types of Reactions and Conservation Laws. Concept of Compound and Direct Reaction, Q value equation and solution of the Q equation problems. Fusionand fission definitions and qualitative discussion with examples.	**15**

REFERENCES	
23BUPH1T02/T04	
1.	Nuclear Physics Irving Kaplan Narosa Publishing House 2nd 1987
2.	Nuclear Physics Dr. S. B. Patel New Age International 2nd 2011
3.	Atomic and Nuclear Physics N. Subrahmanyam, Brijlal and SeshanS. Chand 2nd 2012
4.	Perspectives of Modern Physics Arther Beiser Tata McGraw Hill 2nd 1st1988
5.	Atomic Physics S. N. Ghoshal S. Chand1st 2003
6.	Nuclear Physics S. N. Ghoshal S. Chand 2nd2014

MAJOR COURSE CODE: 23BUPH1P01	(02 Credits)	No of lecture in Hrs. 60

Practical based on 23BUPH1T01& 23BUPH1T02

MINOR COURSE CODE: 23BUPH1P02	(02 Credits)	No of lecture in Hrs. 60

Practical based on 23BUPH1T03 & 23BUPH1T04

Course Outcomes:

CO1	Make Use of Basic instruments to measure Physical Quantities.	L3
CO2	Analyse the different electrical circuits.	L4
CO3	Determine the Physical constants of the matter.	L5
CO4	Perceive the light interaction with matter.	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	3	0	0	0	2	0
CO2	1	1	0	0	2	0
CO3	1	1	0	0	2	0
CO4	2	1	0	0	2	0

Practical 1	Use of Vernier Calipers, Micrometer Screw Gauge
Practical 2	Use of Travelling Microscope
Practical 3	**Graph Plotting:** Experimental, Straight Line with intercept, Resonance Curve etc.
Practical 4	**Spectrometer:** Schuster's Method
Practical 5	**Error Calculation:** Absolute and relative errors calculation.
Practical 6	**Use of DMM:** AC DC Voltage, current and continuity.
Practical 7	**Component Testing:** Resistance, Capacitor, Diode, and Transistor.
Practical 8	**Connecting Simple circuit:** Voltage divider.
Practical 9	**J by Electrical Method:** To determine mechanical equivalent of heat.
Practical 10	**Bifilar Pendulum:** To determine the moment of Inertia of a Rectangular Wooden bar.
Practical 11	**Bifilar Pendulum:** To determine the moment of Inertia of a Spherical Wooden bar.
Practical 12	**Spectrometer:** To determine of angle of Prism.
Practical 13	**Spectrometer:** To determine refractive index of Prism.
Practical 14	**Flat spiral Spring:** To determine Y Young's Modulus of a wire material by method of vibrations.
Practical 15	**Surface Tension:** To determine the surface tension of water by capillary rise method.
Practical 16	**Combination of Lenses:** To determine equivalent focal length of a lens system by magnification method.
Practical 17	**Thermistor characteristic:** To study Electrical characteristic of Thermistor.
Practical 18	**Thermistor characteristic:** To study thermal characteristic of Thermistor.

Practical 19	**Newton's Rings:** To determine radius of curvature of a given convex lens using Newton's rings.
Practical 20	**Torsional Oscillation:** To determine modulus of rigidity η of a material of wire by torsional oscillations

REFERENCES	
23BUPH1P01 and 23BUPH1P02	
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

MAJOR COURSE CODE: 23BU1SEC04	(02 Credits)	No of lecture in Hrs. 15

Physics Measuring skill

Course Outcomes:

CO1	Summarize the basic instruments used for measuring the physical quantities.	L2
CO2	Illustrate the basic components of Electrical circuits	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	2	0
CO2	2	0	0	0	2	0

UNIT- I	**Introduction Measuring units**. Conversion to SI and CGS Familiarization with meter scale,Vernier caliper and it's least count Screw gauge and their utility, Microscope and it's utility. Spectrometer. Measure the dimensions of a solid block, Volume of cylindrical beaker or glass, Diameter of a thin wire, Thickness of metal sheet extra. **Electrical and electronic skill.** Use of voltmeter, Use of current metre, Use of multimeter, Testing of resistors capacitors diodes and transistor using multimeter, Introduction to IC s IC 741.IC 555 and their application, Soldering of electrical circuits having discrete components (R,C, L & Diode) and ICs on PCB and Operation of CRO and its use**.**	**15**

Course Code 23BU1SEC04	Course Title Physics measuring skill Practical's	Credits 1	No.of lectures 30

Course Outcomes:

CO3	Make Use of basic instruments to measure the Physical Quantities.	L3
CO4	Analyze the functioning of Electrical circuits	L4

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

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

1	Use of Vernier Callipers
2	Use of Micrometer screw gauge
3	Use of Travelling Microscope
4	Resistance of Voltmeter
5	Use of Spectrometer.
6	Use of multimeter
7	Frequency and amplitude measurement using CRO
8	Forward and reverse characteristics of diode
9	I/P Characteristics of NPN transistor
10	O/P Characteristics of NPN transistor
11	Transistor as a switch

REFERENCES

23BU1SEC04

1.	A test book in electrical technology B.L. Theraja, S Chand and company.
2.	Measurements in Physics: Fundamental and Derived Quantities by Daniel Okoh , Harrison Onah , Ambrose Eze , Joseph Ugwuanyi , Ernest Obetta **ISBN-10 :** 1533697493 **ISBN-13 :** 978-1533697493

	Generic-I	Credit 02
Course Code 23BUPH1T05	**Course Title Basics Of Quantum Mechanics and Electricity**	**No. of lectures in Hrs 30**

Course Outcomes:

CO1	Apply Quantum Theory to real-life problems.	L3
CO2	Summarize the properties, characteristics and applications of X-rays.	L3
CO3	Develop the theory of electrostatics to find the electric field and potential due to point charge.	L3
CO4	Apply magnetic field theory to find the magnetic field due to current in straight wire and loop.	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	1	0	0	0	0	0
CO2	1	0	0	0	0	0
CO3	2	0	0	0	0	0
CO4	2	0	0	0	0	0

Unit I :	**Life History of Dr. Homi Bhaba** **Origin of Quantum theory**: Black body (definition), Black Body spectrum, Wien's displacement law (Review), Matter waves, wave particle duality, Heisenberg's uncertainty Principle. Davisson - Germer experiment, G. P. Thompson experiment. **X-Rays:** X-Rays production and properties. Continuous and characteristic X-Ray spectra, X-Ray Diffraction, Bragg's Law, Applications of X-Rays. Compton Effect, Pair production, Photons and Gravity, Gravitational RedShift. ***Note: A good number of numerical examples are expected to be covered during the prescribed lectures***	**15**
Unit II :	Electric field and potential, Electric charge, Kinds of charges.Unit of charge, Coulomb's law, Electric field, Electric field due to a point charge, Lines of electric force, Electric potential energy, Electric potential, Electric potential due to a point charge. .Introduction, Definition of magnetic field, Relation between electric and magnetic field, Motion of a charge particle in a uniform magnetic field, Magnetic force on a current carrying wire, Biot-Savart law, Magnetic field due to a current in a straight wire, Force between parallel currents, Magnetic field due to a circular current.	**15**

REFERENCES

23BUPH1T05

1.	Electricity and Magnetism D.Chattopadhyay, PC Rakshit New Central Book agency 8th 2009
2.	A Textbook of Electrical Technology Vol. I B.L. Theraja and A.K. Theraja S. Chand 22nd 2004
3.	Electronic devices and Circuit Theory Boylestad and Nashelsky Prentice Hall of India 10th 2009
4.	Electronics Principals V K Mehta and R Mehta S Chand 11th 2012
5.	Introduction to Electrodynamics David J. Griffiths, Prentice Hall India (EEE) 3rd 2002
6.	Digital Principles and Applications A P Malvino Tata McGraw Hill 4th 1992
7.	Fundamental of Physics (extended) Halliday, Resnick and Walker John Wiley and Sons 6th 2005
	Concepts of Physics (Part I) H. C. Verma Bharati Bhavan1st2015

Semester-II

MAJOR COURSE CODE: 23BUPH2T01	CREDIT -02	NO OF LECTURES IN HRS. 30
MINOR COURSE CODE: 23BUPH2T03	CREDIT -02	NO OF LECTURES IN HRS. 30

Mathematical Physics

Course Outcomes:

CO1	Solve the differential equation.	L3
CO2	Illustrate the examples of differential equations.	L2
CO3	Apply the superposition principle to find the resultant of two harmonic oscillations.	L3
CO4	Summarize the wave motion.	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	3	0	0	0	0	0
CO2	2	0	0	0	0	0
CO3	1	0	0	0	0	0
CO4	2	0	0	0	0	0

Unit I:	**Differential equations:** Introduction, Ordinary differential equations, First order homogeneous and non- homogeneous equations with variable coefficients, Exact differentials, General first order Linear Differential Equation, Second-order homogeneous equations with constant coefficients. Simple Harmonic motion (spring mass system). **Transient response of circuits**: Series LR, CR, LCR circuits. Growth and decay of currents/charge.	**15**
Unit II:	**Superposition of Collinear Harmonic oscillations**: Linearity and Superposition Principle. Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats). **Superposition of two perpendicular Harmonic Oscillations**: Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses **Wave Motion**: Transverse waves on string, Travelling and standing waves on a string. Normal modes of a string, Group velocity, Phase velocity, Plane waves, Spherical waves, Wave intensity. ***Note: A good number of numerical examples are expected to be covered during the prescribed lectures.***	**15**

REFERENCES	
23BUPH2T01/23BUPH2T03	
1.	Mechanics and Electrodynamics, Brijlal, N. Subramanyam, Jivan Seshan S. Chand 3rd 2005
2.	Mathematical Physics A. K. Ghatak, Chua Macmillan India Ltd 1st 1995
3.	Mathematical Methods for Physics and Engineering Ken Riley, Michael Hobson and Stephan Bence Cambridge (Indian edition) 2nd 1983
4.	Mathematical Physics H. K. Dass S. Chand & Co. 7th 1999
5.	Mathematical Methods of Physics Jon Mathews & R. L. Walker W. A. Benjamin Inc 2nd 1969

MAJOR COURSE CODE: 23BUPH2T02	CREDIT -02	NO OF LECTURES IN HRS. 30
MINOR COURSE CODE: 23BUPH2T04	CREDIT -02	NO OF LECTURES IN HRS. 30

Electricity and Electronics

Course Outcomes:

CO1	Make use of Complex numbers in AC circuits .	L3
CO2	Construct the AC bridges.	L3
CO3	Make use of circuit theorems in linear circuits.	L3
CO4	Illustrate the application of Zener diode and Logic gates	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	2	0	0	0	0	0
CO3	1	0	0	0	0	0
CO4	3	0	0	0	0	0

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Unit I:	**Alternating current theory**: [(Concept of L, R, and C:AC circuit containing pure R, pure L and pure C (Review)], representation of sinusoids by complex numbers, Series L-R, C-R and LCR circuits. Resonance in LCR circuit (both series and parallel), Power in ac circuit. Q-factor. **AC bridges**: AC-bridges: General AC bridge, Maxwell, de-Sauty	**15**
Unit II:	**Circuit theorems**: (Review: ohm's law, Kirchhoff's laws, Thevenin's Theorem, Norton's Theorem), Superposition Theorem, Ideal Current Sources, Reciprocity Theorem, Maximum Power Transfer Theorem. Numerical related to circuit analysis using the above theorems. **Zener Diodes**: (Review: Zener forward and reverse characteristics), Zener diode as voltage stabilizer, Avalanche breakdown, Zener breakdown, Temperature coefficient of Zener. **Digital electronics**: Logic gates (Review), NAND and NOR as universal building blocks. EXOR gate: logic expression, logic symbol, truth table, Implementation using basic gates and its applications, Boolean algebra, Boolean theorems. De-Morgan theorems, Half adder and Full adder.	**15**

REFERENCES	
23BUPH2T02/23BUPH2T04	
1.	Electricity and Magnetism D. Chattopadhya y, P. C. Rakshit New Central Book agency 8th 2009
2.	A Textbook of Electrical Technology Vol. I B. L. Theraja and A. K. Theraja S. Chand 22nd 2004
3.	Electronics devices and Circuit Theory Boylestad and Nashelsky Prentice Hall of India (EEE) 10th2009
4.	Electronics Principles V. K. Mehta and R. Mehta S. Chand 11th 2012
5.	Introduction to Electrodynamics David J. Griffiths Prentice Hall of India (EEE) 3rd2002
6.	Digital Principles and Applications A.P. Malvino Tata McGraw Hill 4th1992

MAJOR COURSE CODE: 23BUPH2P01	(02 CREDITS)	No of lecture in Hrs. 60
Practical based on 23BUPH2T01 & 23BUPH2T02		
MINOR COURSE CODE: 23BUPH2P02	**(02 CREDITS)**	**No of lecture in Hrs. 60**
Practical based on 23BUPH2T03 and 23BUPH2T04		

Course Outcomes:

CO1	Analyze basic and Universal gates	L4
CO2	Analyze physical properties using experimental methods.	L4
CO3	Compare LR, CR, LCR and Diode circuits	L4
CO4	Construct equivalent circuits using network theorems.	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	1	1	0	0	2	0
CO2	1	1	0	0	2	0
CO3	1	1	0	0	2	0
CO4	1	1	0	0	2	0

Practical 1	**To study load regulation of a Bridge Rectifier:** To study bridge rectifier without capacitor filter.
Practical 2	**To study load regulation of a Bridge Rectifier:** To study bridge rectifier with capacitor filter.
Practical 3	**Flywheel:** To determine the moment of inertia and to determine frictional torque graphically.
Practical 4	**LR Circuit:** To determine the value of given inductance.
Practical 5	**To study simple AND, OR and NOT gates**
Practical 6	**To study NAND gate as Universal Building Block:** Design and testing of AND, OR and NOT gate using NAND gate.
Practical 7	**To study NOR gate as Universal Building Block:** Design and testing of AND, OR and NOT gate using NOR gate.
Practical 8	**To verify De Morgan's Theorems**: Design and testing of De Morgan's 1st Theorem.
Practical 9	**To verify De Morgan's Theorems**: Design and testing of De Morgan's 2nd Theorem.
Practical 10	**Thevenin's Theorem:** To verify Thevenin's theorem for DC circuits experimentally and graphically.
Practical 11	**Norton's Theorem:** To verify Norton's theorem for DC circuits experimentally and graphically.
Practical 12	**LDR Characteristics:** To study the dependence of LDR resistance on intensity of light.
Practical 13	**CR Circuit:** To determine value of given capacitor.
Practical 14	**To study EX-OR Gate:** Design half adder verify the truth table.
Practical 15	**To study EX-OR Gate:** Design full adder and verify the truth table.

Practical 16	**LCR series Resonance**: To determine resonance frequency of LCR series circuit.
Practical 17	**LCR parallel Resonance**: To determine resonance frequency of LCR parallel circuit.
Practical 18	**Frequency of AC Mains:** To determine frequency of AC mains
Practical 19	**Laser beam divergence:** To study the divergence of Laser beam
Practical 20	**p-n junction diode:** To study the characteristics of simple p-n junction diode
Practical 21	**Zener diode:** To study the characteristics of simple zener diode

REFERENCES

23BUPH2P01 and 23BUPH2P02

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

MAJOR COURSE CODE: 23BU2SEC04	(02 Credits)	No of lecture in Hrs. 15+30= 45

OPAMP, Logic gates and Applications

Course Outcomes:

CO1	Utilize IC 741 for mathematical operations	L3
CO2	Develop universal logic gates using basic gates.	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	Integrated circuit Op-Amp IC 741,Pin Diagram, Working of IC 741 Op-Amp, Specifications of IC 741 Op-Amp, Op-Amp Characteristics and 741 Op-Amp mathematical Applications, IC 741 is used in Amplifier. Basic Logic gates, Universal logic gates .

SEC- PRACTICAL

Course Outcomes:

CO3	Construct circuits for Amplifiers, filters, and mathematical operations using IC 741	L3
CO4	Compare Universal logic gates	L4

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

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

1	Inverting DC amplifier
2	Inverting AC Amplifier
3	Non-- Inverting DC amplifier
4	Non- AC Inverting amplifier
5	Op-Amp as Voltage Follower

6	Op-Amp as Adder
7	Op-Amp as Subtractor
8	Op-Amp as Comparator
9	Op-Amp as first order LPF
10	Op-Amp as first order HPF
11	To verify the truth table of basic gate (NOT, AND, OR)
12	To verify the truth table of universal gates (NAND and NOR).
13	To verify the truth table of basic gate (NOT, AND, OR) using RTL (using Resistor Transistor Logic)/ DTL (Diode Transistor Logic) circuits.
14	To verify the truth table of universal gates (NAND and NOR). using RTL (using Resistor Transistor Logic)/ DTL (Diode Transistor Logic) circuits.

References:

1) **Op-Amps** and Linear Integrated Circuits by Ramakant A. Gayakwad

2) Logic gates for beginners by Vimal Mehta

	Generic	Credits2
Course code: 23BUPH2T05	**Basics of Thermodynamics and Mathematical Physics**	**No of lectures in hrs 30**

COURSE OUTCOME

Course Outcomes:

CO1	Summarize the thermodynamic laws.	L2
CO2	Solve for the efficiency of Heat engines.	L3
CO3	Solve for the problems based on gradient, divergence and curl	L3
CO4	Make use of Fundamental theorem of Calculus	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-1	**Life History of Dr. S.N. Bose** Thermal equilibrium, Zeroth law of thermodynamics, The concept of temperature. Heat, work and internal energy. The first law of thermodynamics. The second law of thermodynamics: reversible and irreversible processes. Carnot engine and its efficiency. Working of Refrigerator, Air Conditioner.	**15**
Unit-2	**Review**: Vectors, Scalars, Vector algebra, Laws of Vector algebra, Unit vector, Rectangular unit vectors, Components of a vector, Scalar fields, Vector fields, Problems based on Vector algebra. Dot or Scalar product, Cross or Vector product, Commutative and Distributive Laws, Scalar Triple product, Vector Triple product **Gradient, divergence and curl**: The ∇ operator, Definitions and physical significance of Gradient, Divergence and Curl; Distributive Laws for Gradient, Divergence and Curl (Omit proofs); Problems based on Gradient, Divergence and Curl. Line, Surface and Volume Integrals, The Fundamental Theorem of Calculus, The Fundamental Theorem of Gradient, The Fundamental Theorem of Divergence, The Fundamental Theorem of Curl (Statement and Geometrical interpretation is included, Proof of these theorems are omitted). Problems based on these theorems are required to be done.	**15**

Books and References:	
1.	Thermal Physics A.B.Gupta Reprint 2008
2.	Mathematical Physics A K Ghatak, Chua Macmillan India Ltd 1st **Edition** 1995
3.	Mathematical Methods for Physics and Engineering Ken Riley**, Michael** Hobson **and Stephen** Bence Cambridge (Indian edition) Reprinted 1983
4.	Mathematical Physics H. K. Dass S. Chand &Co 7th **Edition** 1999
5.	Mathematical Methods of Physics Jon Mathews & R. L. Walker W A Benjamin Inc 2nd **Edition** 1969

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

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

	SEMESTER – I	**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**
23BUPH1T01	Classical Physics	--	--	√	--	--	--	--
23BUPH1T02	Modern Physics	--	--	√	--	--	--	--
23BUPH1P01	Practical based on 23BUPH1T01 and 23BUPH1T02	√	√	√	√	--	--	--
23BU1SEC04	Physics- Measuring skill	√	√	√	√	--	--	√
	Minor Course Title							
23BUPH1T03	Classical Physics	--	--	√	--	--	--	--
23BUPH1T04	Modern Physics	--	--	√	--	--	--	--
23BUPH1P02	Practical based on23BUPH1T03 and 23BUPH1T04	√	√	√	√	--	--	--
Course Code	**Generic - Course Title**							
23BUPH1T05	Basics Of Quantum Mechanics and Electricity	--	--	√	√	--	--	√
	Total	**03**	**03**	**08**	**04**	**00**	**00**	**02**

	SEMESTER – II	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**
23BUPH2T01	Mathematical Physics	--	--	√	--	--	--	--
23BUPH2T02	Electricity And Electronics	--	--	√	--	--	--	--
23BUPH2P01	Practical based on23BUPH2T01 and 23BUPH2T02	√	√	√	√	--	--	--
23BU2SEC04	OPAMP, Logic gates and Applications	√	√	√	√	--	--	√
	Minor Course Title							
23BUPH2T03	Mathematical Physics	--	--	√	--	--	--	√
23BUPH2T04	Electricity And Electronics	--	--	√	--	--	--	--
23BUPH2P02	Practical based on23BUPH2T03 and 23BUPH2T04	√	√	√	--	--	--	--
Course Code	**Generic - Course Title**							
23BUPH2T05	Basics of Thermodynamics and Mathematical Physics	--	--	√	√	--	--	√
	Total	**03**	**03**	**08**	**03**	**00**	**01**	**03**