Resolution no ——————

Bharatiya Vidya Bhavan's

M. M. College of Arts, N.M. Institute of Science, H.R.J. College of Commerce. (Bhavan's College) Autonomous

(Affiliated to University of Mumbai)

Syllabus for:.Science (Physics)

Program: B.Sc.
Program Code: BH.BSc.

Course Code: (BH.USPH)

Choice Based Credit System (CBCS)
With effect from academic year 2023-2024

PROGRAM OUTCOMES

PROGRAM OUTCOMES

A student completing Bachelor's Degree Science Program must develop:	
PO -1	Fundamental disciplinary knowledge and/or interdisciplinary approach.
PO - 2	Develop effective communication skills for the dissemination of scientific knowledge through written, oral and multimedia/technology-based formats.
PO- 3	The ability to apply broadly accepted scientific methodologies in their research project
PO- 4	The ability to effectively communicate disciplinary knowledge to the scientific community and broader public.
PO- 5	The ability to communicate scientific results effectively in presentations or posters

PROGRAM SPECIFIC OUTCOMES

Students who complete the physics degree programs must develop	
PSO 1	A thorough quantitative and conceptual understanding of the core areas of physics, including mechanics, thermodynamics, quantum mechanics, electronics at a level compatible with graduate programs in physics at peer institutions.
PSO 2	The ability to analyze and interpret quantitative results, both in the core areas of physics and interdisciplinary areas.
PSO 3	To use modern library searching and retrieval methods, to obtain the information about a topic, fundamental and recent trends in research and industrial requirements.
PSO 4	Competencies to successfully crack the competitive/qualifying exams in Physical sciences

PROGRAM OUTLINE

Year	Sem	Course Code	Course name	Course Title	Credit
FYB Sc	I	BH.USPH101	Mechanics and Properties of Matter	Core Paper-I/ Major	3
FYB Sc	I	BH.USPH102		Minor	3
FYB Sc	I	BH.USPHOE101	General Physics for All-I	Generic Elective / Open elective	3
FYB Sc	I	BH.USPHVAC101	Basic Physics of Communication system-I	VEC	2
FYB Sc	I	BH.USPHVSEC101	Fundamental Physics in medical Applications-I	VSEC	3+1
FYB Sc	I	BH.USPHP1 (Core)		Practical 1	1
FYB Sc	I	BH.USPHP1 (Minor)		Practical 2	1
FYB Sc	I	BH.USPHP1 (OE)		Practical 3	1
FYB Sc	I	BH.USPHP1 (IKS)		IKS	2
FYB Sc	I	BH.USPHP1 (OE)		CC/CEP/OJT	2
				Total Credits in FY BSc(SEM-I)	**22**
FYB Sc	II	BH.USPH201	Electricity and Magnetism	Core Paper-I/ Major	3
FYB Sc	II	BH.USPH202		Minor	3
FYB Sc	II	BH.USPHOE201	General Physics for All-II	Generic Elective / Open elective	3

FYB Sc	II	BH.USPHVEC 201	Basic Physics of Communicatio n system-I	VEC	2
FYB Sc	II	BH.USPHVSE C201	Fundamental Physics in medical Applications-I	VSEC	4
FYB Sc	II	BH.USPHP2 (Core)		Practical 1	1
FYB Sc	II	BH.USPHP2 (Minor)		Practical 2	1
FYB Sc	II	BH.USPHP2 (OE)		Practical 3	1
FYB Sc	II	BH.USPHP2 (CC)		CC	2
FYB Sc	II	BH.USPHPOJT		CC/CEP/OJT	2
				Total Credits in FY BSc(SEM-II)	**22**
Total Credits for FYBSc					**44**

SEM	Major	Major elective	Minor	OE	VSC	VSEC	OJT/RP /FP	Cum. Credit
1	Mechanics and properties		Mechanics and properties	General Physics for All -I	Basic Physics of communication system - I	Fundamenta l physics in medical Application -I		22
2	Electricity and magnetism		Electricity and magnetism	General Physics for All -II	Basic Physics of communication system - II	Fundamenta l physics in medical Application -II		22
3	Wave motion and Optics Thermal Physics		Physics in Biological Applications -I	General Physics for All-III	Basic Physics of Communicatio n system-III			
4	Applied Physics		Physics in Biological Applications	Basic Physics behind Star		Fundamenta l Physics in medical		22

	Electronics		-II	Gazing-I		Applications -III		
5	Thermal Physics --- Elements of Atomic and Molecular Physics --- Electronics	Basics and application of Rasberry pi	Physics for everyone	Basic Physics behind Star Gazing-I			OJT/RP	22
6	Elements of Condensed Matter Physics --- Mathematical Methods of Physics --- Nuclear Physics	Introduction to programming using Blockly	Applied Physics for everyone				OJT/RP	22
7	Laser and Non-Linear technology --- Material Science and Nano materials --- Computational Physics	VHDL					RP 4 Cr.	22
8	Classical Electrodynamics-II --- ParticlePhysics --- Advances in Solid State Electronics	Cluster computing for Physicists					RP 8 Cr.	22
Total								**176**

PREAMBLE

This is a revised part of the undergraduate programme (Eight Semesters) in Physics, to be taught in Semester I& II from the academic year 2023-24 onwards and subsequent academic year.

Developing Curriculum that is progressive and purposeful to create positive improvement in the education system is the logic behind this revisionunder the aegis of NEP.

Out of the three courses in each Semester, two courses are devoted to core Physics, catering to Mechanics, Thermodynamics, Optics, Electrodynamics, Quantum Mechanics, Mathematical Physics and Digital and Analog Electronics. These have been tailored to fit in

with the existing FYBSc syllabus (Sem I and Sem II) in terms of continuity and to ensure delivery of quality content to the learner.

The science of Physics has diversified immensely in recent times and numerous new fields in Physics, such as nanotechnology, Solar cell, Radio-Physics, Physics of metals and materials, and microprocessor etc. have come into existence. The fundamentals and the generality of many principles of Physics are common to all these specialized diverse fields. Most problems in applied areas have been discussed intensely in academic conferences and journals, but have not found their place in curricula or in textbooks.

The third course in each semester offers interdisciplinary application- oriented topics.

The 'practical' component in the applied course will be seen as a combination of laboratory sessions, a visit to a Research Institute/Industry, mini project, an assignment on a relevant topic etc.

PROGRAM OUTLINE

DETAILED SYLLABUS – SEMESTER I & II

Programme specific outcomes (PSOs):UG I Year / Certificate course in Basic Physics

After completing this certificate course, the student should have

1)Acquired the basic knowledge of Mechanics, Electricity and Magnetism.

2)Hands-on experience to apply the theoretical knowledge to solve practical problems of basic

3)physical phenomena. He should be able to carry out experiments to understand the laws and

concepts of Physics.

4)An insight in understanding electrical circuits and in handling electrical instruments.

<table>
<tr><td colspan="4">Programme: B.Sc.</td><td colspan="2">Semester: I</td></tr>
<tr><td colspan="4">Course: Mechanics and Properties of Matter (3+1 credits)
DSC (Major/Minor)</td><td colspan="2">Course Code:
BH.USPH101</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="2">Evaluation Scheme (Theory)</td></tr>
<tr><td>Lecture (Periods per week)</td><td>Practical (Periods per week per batch)</td><td>Tutorial (Periods per week per batch)</td><td>Credits (Theory +Practical)</td><td>Continuous Internal Assessment (CIA)</td><td>End Semester Examination (ESE)</td></tr>
<tr><td>3</td><td>2</td><td>-</td><td>3+1</td><td>40%</td><td>60%</td></tr>
<tr><td colspan="6">Pre-requisites: Subject prerequisites:
1. For Semester I: 12th pass with subjects Physics, Chemistry & Mathematics
2. For Semester II: Passed Semester I with Physics,awarded with Certificate Course in Basic Physics
3. For Semester III: Passed Semester II
4. For Semester IV: Passed Semester III awarded with Diploma in Physics
5. For Semester V: Passed Semester IV
6. For Semester VI: Passed Semester V awarded with Degree in Physics
7.For Semester VII: Passed Semester VI</td></tr>
</table>

8.For Semester VIII: Passed Semester VII ,awarded with Honor Degree in Physics

Course Outcomes:

After successfully completing this course, students will be able to:

1. Understanding of Vector Algebra and Vector Calculus.

2. Understand the physical interpretation of gradient, divergence and curl.

3. Study of gravitational field and potential and understanding of Kepler's laws of Planetary motion.

4. Understanding of different frames of references and conservation laws.

5. Understand the dynamics of rigid body and concept of moment of inertia. Study of moment of inertia of

different bodies and its applications.

6. Study the properties of matter, response of the classical systems to external forces and their elastic

deformation and its applications.

7. Comprehend the dynamics of Fluid and concept of viscosity and surface tension along with its

Applications.

Unit	syllabus	Periods
I	Vectors Algebra: Vector algebra. Scalar and vector products, scalar and vector triple products, Derivative of a vector with respect to a parameter, Del operator, gradient, divergence and curl, Gauss divergence theorem, Stokes curl theorem and Green's theorem, Line, surface and volume integral of a vector function.	**15L**
II	Gravitation field and potential: Introduction to Gravitational field and potential, Gravitational potential energy, Gravitational field Intensity and potential due to a ring, a spherical shell, solid sphere and circular disc, gravitational self-energy, Inverse square law of forces, Kepler's laws of planetary motion.	**15L**

III	**Conservation Laws** Frames of reference, Concept of inertial and Non-inertial frames of references,Work energy theorem, Conservative and non-Conservative forces, Linear restoring force, Gradient of potential, Conservation of energy for the particle; Energy function, Concept of Centre of mass, Angular momentum and torque,Laws of conservation of total energy, total linear momentum and total angular momentum along with their examples.	**15L**
	TOTAL	**45L**
	REFERENCE **Suggested Reading** **1.R. Resnick and D. Halliday : Physics Vol-I** **2.Berkeley Physics Course : Mechanics Vol-I** **3.R.P. Feynman, R.B.Lightan and M.Sand : The Feynman Lectures in Physics** **4.D.S. Mathur : Mechanics** **5.D.S. Mathur : Elements of Properties of Matter** **6. Murray Spiegel, Seymour Lipschutz, Dennis Spellman, "Schaum's Outline Series: Vector Analysis", McGraw Hill, 2017.** **7. J. C. Upadhaya: Mechanics, S. Chand** **8. Fundamentals of Physics by Robert Resnick, David Halliday and Jearl Walker, 11th Edition** **Suggested Online Link:** **1. MIT Open Learning - Massachusetts Institute of Technology, https://openlearning.mit.edu/** **2. National Programme on Technology Enhanced Learning (NPTEL), https://www.youtube.com/user/nptelhrd** **3. Swayam Prabha - DTH Channel, https://www.swayamprabha.gov.in/index.php/program/current_he/8**	

Practicals	
Sr. No.	**Aim of the practical**

	1. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity. 2. To determine the Moment of Inertia of a Flywheel. 3. To determine g and velocity for a freely falling body using Digital Timing Technique. 4. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method). 5. To determine the Young's Modulus of a Wire by Optical Lever Method. 6. To determine the Young's Modulus by bending of beam. 7. To determine the Modulus of Rigidity of a Wire by Maxwell's needle. 8. To determine the elastic Constants of a wire by Searle's method. 9. To determine the value of g using Bar Pendulum. 10. To determine the value of g using Kater's Pendulum. 11. To determine Surface Tension.
	References: Suggested Readings: 1. B.L.Worsnop, H.T. Flint, "Advanced Practical Physics for Students", Methuen & Co., Ltd., London, 1962. 2. S. Panigrahi, B. Mallick, "Engineering Practical Physics", Cengage Learning India Pvt. Ltd., 2015. 3. Indu Prakash: Practical Physics 4. S.L. Gupta, V. Kumar, "Practical Physics", Pragati Prakashan, Meerut, 2014. Suggestive Digital Platforms / Web Links: 1. Virtual Labs at Amrita Vishwa Vidyapeetham, https://vlab.amrita.edu/?sub=1&brch=74 2. Digital Platforms /Web Links of other virtual labs may be suggested / added to this lists by individual Universities Suggested Continuous Evaluation Methods: Continuous internal evaluation shall be based on attendance of student in Lab and presentation of

	practical in the record file. The marks shall be as follows

Programme: B.Sc.				**Semester: I**	
Course: General Physics for all-I				**Course Code: BH.PSPHOE101 (OPEN ELECTIVE)**	
Teaching Scheme				**Evaluation Scheme (Theory)**	
Lecture (Periods per week)	**Practical (Periods per week per batch)**	**Tutorial (Periods per week per batch)**	**Credits (Theory +Practical)**	**Continuous Internal Assessment (CIA)**	**End Semester Examination (ESE)**
02	02		04	40	60
Pre-requisites:					
Course Objectives:					

Unit	**Syllabus**	**Periods**
I	**Mechanics I :** Measurements,position and displacement,velocity and acceleration, free fall acceleration, scalar and vectors,projectile motion, Newton's 1st law, Newton's 2nd and 3rd law	**15L**
II	**Friction:** properties of friction,drag force and terminal speed. Work and kinetic energy:work done by the gravitational force, a spring force and general variable force,work and potential energy:path independence conservative force; conservation of energy,centre of mass,linear momentum,collision and impulse,	**15L**
III	**Mechanics II :** rotation:rotational variables;relating linear and angular variables,torque,centre of gravity,elasticity,newtons law of gravitation, Kepler's law. FLUIDS:density and pressure;pascals principle; archimedes principle;the equation of continuity;	**15L**

	Bernoulli's principle,Simple harmonic motion:the force law of SHM;energy in SHM;pendulum;simple harmonic motion and uniform circular motion; damped simple harmonic motion;forced oscillation and resonance.	
	TOTAL	**45**
	REFERENCE: 1. Fundamental physics by Halliday and Resnick,9th edition. 2. *University Physics* By Sears and Zemansky	

Practicals	
1	Analysis of motion under gravity i.e free fall
2	Analysis of projectile motion, i.e to study the effect of air drag
3	Analysis of Simple harmonic motion using Tracker software
4	Analysis of damped harmonic motion
5	To calculate the work done by a spring force
6	To find the terminal speed of a ball bearing in oil.

Programme: B.Sc.				**Semester: I**	
Course: Basics of Communication Systems-I				**Course Code: BH.PSPHVEC101 (VEC)**	
Teaching Scheme				**Evaluation Scheme (Theory)**	
Lecture (Periods per week)	**Practical (Periods per week per batch)**	**Tutorial (Periods per week per batch)**	**Credits (Theory +Practical)**	**Continuous Internal Assessment (CIA)**	**End Semester Examination (ESE)**
02	–		02	40	60
Pre-requisites:					
Course Objectives: 1. To introduce students to the concepts of electronic communication systems.					

2. To introduce the concept of Amplitude Modulation, Fundamentals of Amplitude and frequency modulation and AM and FM circuits

Unit	Syllabus	Periods
I	**Introduction to electronic communication fundamentals, Amplitude Modulation** 1. The significance of human communication, communication systems, types of electronic communication, modulation and multiplexing, the electromagnetic spectrum, bandwidth, survey of communication applications. 2. Gain, attenuation and decibels, tuned circuits, filters, Fourier theory 3. Amplitude modulation concepts, modulation index and percentage of modulation, sidebands and the frequency domain, amplitude modulated power, single sideband modulation, classification of radio emissions.	**15L**
II	**Amplitude Modulator and demodulator circuits, fundamentals of frequency modulation and FM circuits.** 1. Basic principles of amplitude modulation, amplitude modulators, amplitude demodulators, balanced modulators, single side band circuits. 2. Basic principles of frequency modulation, principles of phase modulation, modulation index and sidebands, noise separation effects of FM, frequency modulation versus amplitude modulation. 3. Frequency modulators, phase modulators, frequency demodulators.	**15L**
	TOTAL	**30**
	REFERENCE: 1. Principles of Electronic Communication systems 4th edition by Louis Frenzel Jr., McGraw Hill Publishers 2. Principles of Electronics (Multicolour revised edition) by V.K. Mehta and Rohit Mehta, S. Chand and Company	

Practicals (if required)	
1	LC low pass filter design and testing
2	RC Active Filter Design and Testing
3	Ceramic Band Pass Filters

4	Switched Capacitor Filters
5	Measuring the percent of modulation
6	Diode Modulator and Mixer
7	Differential Amplifier Modulator
8	Diode Detector
9	Double side band balanced modulator
10	Frequency Modulation
11	Phase Locked Loop

Programme: B.Sc.				**Semester: I**	
Course: Fundamental Physics in Medical Applications-I				**Course Code: BH.PSPHVSEC101 (VSEC)**	
Teaching Scheme				**Evaluation Scheme (Theory)**	
Lecture (Periods per week)	**Practical (Periods per week per batch)**	**Tutorial (Periods per week per batch)**	**Credits (Theory +Practical)**	**Continuous Internal Assessment (CIA)**	**End Semester Examination (ESE)**
02	-		02	40%	60%

Pre-requisites:

Course Objectives:

1. To introduce the concept of atomic structure and electromagnetic radiation.

Unit	**Syllabus**	**Periods**
I	**ATOMIC STRUCTURE** Structure of matter - atom - nucleus -atomic mass and energy units -distribution of orbital electrons - atomic energy levels -nuclear forces -nuclear energy levels- particle radiation	**15L**

II	**ELECTROMAGNETIC RADIATION**- Binding energy General properties of alpha, beta, and gamma rays. Laws of equilibrium - modes of radioactive decay - nuclear isomerism -nuclear reactions - natural and artificial radioactivity - reactor and cyclotron produced isotopes - fission products fusion.	**15L**
III	**GENERATION AND DETECTION OF ULTRASOUND** Propagation of ultrasound in biological materials - Piezoelectric effect - intensity changes by reflection, scattering, refraction, absorption and attenuation - impedance - transducer probes.	**15L**
	TOTAL	**45L**
	REFERENCE: **Unit 1:** **TEXT BOOKS** 1. E.B.Podgorsak, Radiation Physics for Medical Physicists, 3rd Edition, Springer, 2016. 2. F.M.Khan, The Physics of Radiation Therapy, Fifth Edition, Lippincott Wiliams and Wilkins, U.S.A.,2015. 3. W. J. Mer B. Massey, Fundamental Physics of Radiology, John Wright and Sons, U. K., 2000. **REFERENCES:** 1. H. E. Johns, J.. R. Cunningham, The Physics of Radiology, Charles C. Thomas, New York, 2002 2. Frank Herbert Attix, Introduction to Radiological Physics and Radiation Dosimetry, Wiley- VCH Verlag, 2007. 3. Donald T. Graham, Paul J. Cloke, Principles of Radiological Physics, Churchill Livingstone, 2003 **Unit 2:** 1. M. Hussey, Basic Physics and Technology of Medical Diagnostic Ultrasound, 2nd Edition, McMikkan, London 1990. 2. W. M. McDicken, Diagnostic Ultrasonic principles and use of Instrument, 2nd edition, JohnWiley and Sons, New York, 1992. 3. D. H. Evans and J. P. Wood Cock, Doppler ultrasound Physics Instrumentation and Clinical applications, John Wiley, Chichester, 1998. **REFERENCES** 1. C. R. Hill, J. C. Bamber, G. R. terHaar, Physical Principles of Medical Ultrasonics, John Wiley & Sons, 2005. 2. George L. Gooberman, Ultrasonics: Theory and Application, Hart Publishing Company, 1969. 3. Michiel Postema, Fundamentals of Medical Ultrasonics, Taylor & Francis	

	Practicals: Trip to nearby research labs/hospitals/diagnosis centers and report writing.	

Programme: B Sc				**Semester: I**	
Course: IKS- I(common)				**Course Code: BH.USPHPIKS1**	
Teaching Scheme				**Evaluation Scheme (Theory)**	
Lecture (Periods per week)	**Practical (Periods per week per batch)**	**Tutorial (Periods per week per batch)**	**Credits (Theory +Practical)**	**Continuous Internal Assessment (CIA)**	**End Semester Examination (ESE)**
2	---	----	2	40%	60%
Pre-requisites:					
Course Objectives:					

Unit	**syllabus**	**Periods**
I	Survey of IKs Domain: A broad overview of disciplines included in IKS and historical developments Sources of IKs knowledge, classification of IkS texts , a survey of available primary text , translated primary text , and secondary resources materials. Difference between a sutra ,bhashya ,karika and vartika text .Fourteen / eighteen vidyasthanas , tantrayukti. Vocabulary of IKS : Introduc of Panchamahabhutas, concepts of a sutra, introduction to the concept of non-translatables (Ex. Dharma, punya, aatma, karma, yagna, shakti, varna, jaati, moksha , loka, daana, itihaasa, puraana etc) and the importance of using the proper terminology. Terms such as praja , janata, loktantra, prajatantra, ganatantra, swarajya, rashtra desh	**15L**

II	Indian Knowledge System from Ancient to Modern Era:An Overview:Concept of matter, Life and universe, Gravity, Sage agastya's model of battery, velocity of light, cosmology and modern concepts	**15L**
		30L

Programme: B.Sc.				**Semester:II**	
Course: Major/Minor (3+1=4 credits) DSC : **Electricity and Magnetism**				**Course Code: BH.USPH201**	
Teaching Scheme				**Evaluation Scheme (Theory)**	
Lecture (Periods per week)	**Practical (Periods per week per batch)**	**Tutorial (Periods per week per batch)**	**Credits (Theory +Practical)**	**Continuous Internal Assessment (CIA)**	**End Semester Examination (ESE)**
3	2	---	3+1	40%	60%
Pre-requisites:					

Course Outcomes:

1. Understanding of Electric Field and Potential. Evaluation of Electric Field and Potential for different

types of charge distributions.

2. Study of Electric and Magnetic Fields in matter. Understand the concept of polarizability, Magnetization

and Electric Displacement Vector.

3. Study of Steady and Varying electric currents.

4. Understanding of different aspects of alternating currents and its applications.

5. Understand the Magnetostatics, Lorentz Force and Energy stored in magnetic Field.

6.Comprehend the different aspects of Electromagnetic induction and its applications.

Unit	syllabus	Periods
I	**Electric field and potential** Coulomb law, Gauss' theory, its integral and differential forms, line integral of Electric field, Electric field and potential due to an arbitrary charge distribution. Electrostatic energy, energy stored in an Electric field. Electric field and potential due to long charged wire, Spherical shell, sphere, disc, dipole.	**15L**
II	**Electric and Magnetic fields in Matter** Moments of charge distributions, Polar and non-polar molecule, polarization vector, electric displacement vector, three electric vectors, dielectric susceptibility and permittivity, polarizability, Clausius-Mossotti relation.Magnetization, magnetic susceptibility, diamagnetic, paramagnetic and ferromagnetic substances, Hysteresis and B-H curve, Langevin's theories of Diamagnetism and paramagnetism, Weiss theory of ferromagnetism.	**15L**
III	**Magnetostatics** Lorentz force, Bio-Savert's law, Ampere's law, Application of Biot-Savert law, magnetic field due steady current in a long straight wire, Interaction between two wires, field due a Helmholtz coil, solenoid and current loop, magnetic vector potential, permeability, Energy stored in Magnetic field.	**15L**
	TOTAL	**45L**
	REFERENCE/Suggested Reading **1. Edward M. Purcell : Electricity and Magnetism** **2. J.H. Fewkes&J.Yarwood : Electricity & Magnetism, Vol. I** **3. D C Tayal : Electricity and Magnetism ", Himalaya Publishing House Pvt. Ltd., 2019.** **4. D.J.Griffiths : Introduction to Electrodynamics .** **5. Lal and Ahmed : Electricity and Magnetism** **6. H. K. Malik and A.K. Singh "Engineering Physics", McGraw Hill Education (India) Private Limited, 2018.** **7. Richard P. Feynman, Robert B. Leighton, Matthew Sands, "The Feynman Lectures on Physics Vol. 2", Pearson Education Limited, 2012.** **Suggested Online Link:**	

	1. MIT Open Learning - Massachusetts Institute of Technology, https://openlearning.mit.edu/ **2. National Programme on Technology Enhanced Learning (NPTEL), https://www.youtube.com/user/nptelhrd** **3. SwayamPrabha - DTH Channel, https://www.swayamprabha.gov.in/index.php/program/current_he/8**	

Practicals	
Sr. No.	**Aim of the practical**
	1. Frequency of A.C. Mains. 2. Calibration of Voltmeter by potentiometer. 3. Calibration of ammeter by potentiometer. 4. Specific resistance determination. 5. Conversion of a Galvanometer into a Voltmeter. 6. Conversion of a Galvanometer into Ammeter. 7. Variation of magnetic field along the axis of a current carrying circular coil. 8. Comparison of capacities by Ballistic Galvanometer. 9. Determination of Ballistic Constant. 10. Electrochemical equivalent. 11. De Sauty's bridge- C1/ C2 12. R1/R2 by potentiometer. 13. Study of R-C, L-C-R circuits. 14. Determination of self inductance, mutual inductance. 15. Magnetic field determination by search coil and ballistic galvanometer.
	References/Suggested Readings: 1. B.L. Worsnop, H.T. Flint, "Advanced Practical Physics for Students", Methuen & Co., Ltd., London, 1962. 2. S. Panigrahi, B. Mallick, "Engineering Practical Physics", Cengage Learning India Pvt. Ltd.,2015. 3. Indu Prakash: Practical Physics 4. S.L. Gupta, V. Kumar, "Practical Physics", PragatiPrakashan, Meerut, 2014. Suggestive Digital Platforms / Web Links: 1. Virtual Labs at Amrita Vishwa Vidyapeetham, https://vlab.amrita.edu/?sub=1&brch=74 2. Digital Platforms /Web Links of other virtual labs may be suggested:

Programme: B.Sc.					Semester: II
Course: OE **General Physics for All-II**					**Course Code: BH.USPHOE201 (Open ELECTIVE)**
Teaching Scheme				**Evaluation Scheme (Theory)**	
Lecture (Periods per week)	**Practical (Periods per week per batch)**	**Tutorial (Periods per week per batch)**	**Credits (Theory +Practical)**	**Continuous Internal Assessment (CIA)**	**End Semester Examination (ESE)**
3	2		(3+1)=4	40	60

Pre-requisites:

Course Objectives:

- 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, projects etc

Unit	syllabus	Periods
I	**WAVES :** Wavelength; frequency;Transverse and longitudinal;wave speed on a stretched string;the wave equation;the principle of superposition for waves;interference of waves;standing waves and resonance,sound waves:speed of sound ;interference;beats;the Doppler effect;supersonic speeds;shocks waves.	**15**
II	**THERMODYNAMICS :** Temperature;zeroth law of thermodynamic;the Celsius and Fahrenheit scales;thermal expansion;temperature and heat;first law of thermodynamics;irreversible process and entropy;second law of thermodynamics ;engines; refrigerator.	**15**
III	**KINETIC THEORY OF GASES** Avogadro's number;ideal gas;pressure,temperature and RMS Speed ;translational kinetic energy;mean free path ;the Distribution of molecular speeds;the molar specific heat of an ideal gas;degree of freedom;adiabatic expansion.	**15**

	TOTAL	**45**
	References Books: 1. Fundamental physics by Halliday and Resnick,11th edition. 2. *University Physics* By Sears and Zemansky	

Practicals	
Sr. No.	**Aim of the practical**
	1. Use of Vernier calipers, Micrometer Screw Gauge, Travelling Microscope 2. Graph Plotting : Experimental, Straight Line with intercept, Resonance Curve etc 3. Spectrometer: parallax removing by Schuster's Method or wave front method 4. Use of DMM 5. Absolute and relative errors calculation

Programme: B.Sc.				**Semester: II**	
Course: Basic physics of communication system-II				**Course Code: BH.USPHVAC201**	
Teaching Scheme				**Evaluation Scheme (Theory)**	
Lecture (Periods per week)	**Practical (Periods per week per batch)**	**Tutorial (Periods per week per batch)**	**Credits (Theory +Practical)**	**Continuous Internal Assessment (CIA)**	**End Semester Examination (ESE)**
2	–		2	40	60

Pre-requisites:		
Course Objectives: 1. To introduce digital communication, radio transmitters, communication recievers. 2.		
Unit	**syllabus**	**Periods**
I	**Digital communication techniques, Radio transmitters, Communication receivers.** 1. Digital transmission of data, parallel and serial transmission, data conversion, pulse modulation, digital signal processing. 2. Transmitter fundamentals, carrier generators, power amplifiers, impedance matching networks, typical transmitter circuits. 3. Basic principles of signal reproduction, super heterodyne receiver frequency conversion intermediate frequency and images, noise, typical receiver circuits, receivers and transceivers.	**15 L**
II	**555 circuits, PAM, PPM, PWM, Amplitude Shift keying, Multiplexing and Demultiplexing.** 1. 555 block diagram, Astable, Monostable, Voltage Controlled Oscillator, Use of 555 for Pulse Amplitude Modulation, Pulse Position Modulation, Pulse width Modulation, Amplitude shift keying. 2. Multiplexing principles, frequency division multiplexing, time division multiplexing, pulse code modulation, duplexing. 3. Digital codes, principles of digital transmission, transmission efficiency, modem concepts and methods, wide band modulation, broadband modem techniques, error detection and correction, protocols.	**15 L**
	TOTAL	**30 L**

Practicals (if required)

Sr. No.	Aim of the practical
1	555 Astable
2	555 Monostable
3	555 Voltage Controlled Oscillator
4	555 Pulse amplitude Modulation
5	555 Pulse position Modulation
6	555 Pulse Width Modulation
7	Multiplexer
8	Demultiplexer

Programme:				**Semester: II**	
Course: Fundamental Physics in Medical Applications -II				**Course Code: BH.USPHVSEC201**	
Teaching Scheme				**Evaluation Scheme (Theory)**	
Lecture (Periods per week)	**Practical (Periods per week per batch)**	**Tutorial (Periods per week per batch)**	**Credits (Theory +Practical)**	**Continuous Internal Assessment (CIA)**	**End Semester Examination (ESE)**
2	–		2	40	60
Pre-requisites:					
Course Objectives:					

Unit	**syllabus**	**Periods**
I	**RADIATION SOURCES** X-Ray source - Coolidge tube- equipment controls - kV and mA and their influence - attenuation of radiation - photoelectric effect	**15L**

II	- Rayleigh scattering - Compton effect - pair production - focal spot, optical focus - radiography equivalence gamma ray sources - characteristics curie, roentgen, Gray, rhm, Sievert - natural and artificial sources - advantages and disadvantages of artificial sources.	**15L**
II	**PHYSICS OF MEDICAL DIAGNOSTICS** Computed Tomography (CT): principle and generation of CT, Magnetic Resonance Imaging (MRI): basic principle and image characteristics, Ultrasound Imaging: interaction of sound waves with body tissues	**15L**
	TOTAL	**45L**
	References: UNIT 1: **TEXTBOOKS** 1. McGonnagle," Non destructive testing", McGraw Hill, New York, 1984 2. B. Hull and V.John, "Non destructive testing" McMillan Education LTD., London, 1988. **REFERENCES** 1. R. Halmshaw, Industrial Radiology: Theory and Practice, Springer, 1995. 2. SV Rainey, H. W. Hogben, The Elements of Industrial Radiography, Association of Engineering and Shipbuilding Draughtsmen, 1956. 3. Ancel St. John, Herbert Rudolf Isenburger, Industrial Radiography, Wiley, 1934. **Unit 2:** **TEXTBOOKS** 1. C. K. Warrick. Anatomy and Physiology for Radiographers. Oxford University Press, 2001. 2. Jerrold T. Bushberg. The Essential Physics for Medical Imaging (2nd Edition). Lippincott Williams & Wilkins, 2002. 3. Jean A. Pope. Medical Physics. Imaging Heinemann Publishers, 2012. 4. Faiz M. Khan and Roger A. Potish. Treatment Planning in Radiation Oncology. Williams and Wilkins, USA, 2003. **REFERENCES**	

	1. D. Baltas. The physics of modern brachytherapy for oncology. Taylor and Francis. 2007. 2. J. R. Brobek. Physiological Basis of Medical Practice. Williams and Wilkins, London, 1995. 3. G. S. Pant. Advances in Diagnostic Medical Physics. Himalaya Publishing House, 2006. 4. Faiz M Khan. The Physics of Radiation Therapy (3rd edition). Lippincott Williams & Wilkins, USA, 2003. 5. Jatinder R. Palta and T. Rockwell Mackie. Intensity Modulation Radiation Therapy. Medical Physics publishing, Madison, Wisconsin, 2003. 6. Peter Hoskin, Catherine Coyle. Radiotherapy in Practice. Oxford University Press, 2011. 7. W. R. Handee. Medical Radiation Physics. Year Book Medical Publishers Inc., London, 2003	

Practicals (if required)	
Sr. No.	**Aim of the practical**
	1. Visit to the nearest radiological center 2. Report writing

Continuous Internal Assessment (CIA) of 40 marks in theory.

Test Marks: 20
Marks

CIA/Term/Project
Work for 20 Marks:

a Report writing
b Online courses (discipline related) with an evaluation done by the conducting organization (min 8 weeks of 30 hrs)

c Internship after college hours (3 hrs /day for 1 month) (evaluation based on documentary proof and viva)

d Participation in a 3-day workshop for skill enhancement with submission of report for evaluation w.r.t to skill obtained)

e Involvement in administrative work of department like admission, PTA organising events (Min 30 hrs) (report certified by HOD for evaluation)

f Publish articles in newspapers and journals g Discipline related surveys

h Running own enterprise (with proof and report) i Instrument maintenance of the dept

j Involvement in the organization of conferences, workshops seminars, etc k Any other assignments with approval of BOS

Rubrics of evaluation for ESE

Unit	**Knowledge**	**Understanding**	**Analysis & critical thinking**	**Total marks/unit**
1	05	06	04	15
2	05	06	04	15
3	05	06	04	15
4	05	06	04	15
Total per objective	**20**	**24**	**16**	**60**
% weight-age	**33**	**40**	**27**	**100**