

Branch Name:	BACHELOR OF PHYSIOTHERAPY
Program Code:	PT101
Course Title:	BIOMEDICAL PHYSICS
Course Code:	2PT1010105
Pre-requisite Course:	- NONE -

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)			Credit	Evaluation Scheme (Marks)					
Lecture	Tutorial	Practical		Theory(T)		Practical(P)		Total Marks	
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	Theory	Practical
2.5	-	01	06	40	10	-	-	50	-

COURSE OUTCOMES:

At the end of the course the candidate will be able to.

1. Describe the fundamentals of general physics and able to relate its application in physiotherapy.
2. Understand basic physical principles of sound, light and heat and their application in physiotherapy field.
3. Understand basic aspects of electricity and electronics as related to its application in electrotherapy instruments.
4. Describe in brief, certain common electrical components such as capacitors, transformers, valves & transistors and will be able to identify such components.

General Physics (Mechanics):

Subject Contents:

Sr. No.	Topic	Total Hours
1	Basic Concepts a) Centre of Gravity (COG) b) Line of Gravity (LOG) c) Planes and axis of motion (mechanical and anatomical)	05
2	Principles of stability a) Base of Support (BOS) b) Height c) COG and LOG d) Mass of body e) The impact of forces f) Friction g) Segmentation h) Visual factors i) Psychological and Physiological factors	05

3	Force, Motion and Work a) Definition, unit, resolution of forces. b) Magnitude of force c) Centripetal and Centrifugal force. d) Point of application of force e) Direction of force and Resistance f) Arm of lever g) Perpendicular distance h) Composite effect of two or more forces i) Methods of determining the components of force and work, j) Principles of motion: k) Causes of motion, l) Motions experienced by the body, m) Newton's laws of motion. n) Types of motion, direction and quantity of motion, o) Speed, p) Velocity, q) Work, r) Energy and Power s) Movements of body as a whole and of segments of body in air, water and on surface	10
4	a) Force of gravity b) Centre of gravity c) Line of gravity and base	02
5	Friction a) Force of friction b) Static and dynamic friction c) Limit of friction d) Friction a necessity and evil.	04
6	Musculoskeletal mechanics a) Anatomical levers b) Angle of pull c) Mechanical advantage d) Wheel and axle e) Pulley f) Fixed and movable pulley g) Pendulums h) Elasticity i) Spring - properties of spring and application	08
7	Fluid mechanics a) Viscosity- definition b) Coefficient of viscosity c) Streamline and turbulent flow d) Effect of temperature and pressure on viscosity e) Principle of Archimedes f) Laws of floatation g) Hydrostatic pressure h) Buoyancy i) Surface tension j) Excess pressure in spherical liquefied drop k) Physical property of water	08

8	Heat a) Heat transfer b) Properties of thermal radiation c) Specific heat d) Thermal capacity e) Energy conversion f) I and II law of thermodynamics g) Physical effects of heat – expansion, evaporation, thermionic emission etc. h) Concept of heat and temperature, measurement of heat thermometry i) Thermometer. j) Method of measuring body temperature. k) Human body temperature. l) Biophysics of superficial heat and cold	04
9	Sound a) Origin of sound b) Characteristics of sound waves c) Velocity of sound in air and water d) Effect of temperature, pressure, density of medium, humidity, wind on sound waves. e) Frequencies of sound waves f) Infrasonic, Normal hearing band and Ultrasonics g) Reflection, Refraction and Attenuation of Sound waves h) Acoustic Impedance i) Interference of sound waves j) Resonance, Echo, Doppler effect k) Fresnel and Fraunhofer zones in Ultrasonics	04
Electricity and Electronics:		
1	Fundamentals of Low frequency currents a) Production of electricity, mains supply, b) A.C. currents & Faradic type current c) D.C. currents – Types d) Fundamentals of electrical charges e) Static electricity f) Physics of direct currents g) Ohm's law h) Conductors i) Capacitors j) Rheostats k) Potentiometers l) Ammeters m) Oscilloscopes n) Types of electrodes o) Skin resistance p) Electrodes - Types & significance q) Gels	10

2	Fundamentals of High frequency currents a) Magnetism b) E.M.F. Conduction c) Lenz's Law d) Transformers and its types. e) Thermionic valves. f) Semi-conductors: types, transistors g) Electronic circuits– oscillators, pulse generators	05
3	Electromagnetic spectrum a) Electromagnetism and its production b) Physical properties of electromagnetic radiations c) Electromagnetic spectrum d) Laws of transmission- reflection, refraction, absorption, attenuation e) Grothus' law f) Cosine law g) Inverse square law h) Practical application of all Laws i) Uses of Electromagnetic waves j) Environmental currents and fields – risk factors on prolonged exposure to electromagnetic field	08
4	Production, Physical principles, Panel diagram, testing of apparatus a) S.W.D. b) Ultra-sound c) U.V.R. d) I.F.T. and Beat frequency currents e) I.R. f) LASER (no panel diagram).	20
5	Light a) Emission and absorption spectra b) Electromagnetic spectrum c) Laws of transmission, reflection, refraction, absorption. d) Internal reflection and fibre optics e) Interference of light. f) LASER and its application	08
6	Therapeutic continuous / interrupted direct currents & their various wave forms, A.C. current	05
7	Bio-physics of superficial heat & cold (Only basic principles) a) Home remedies, b) Paraffin wax bath c) Whirl pool d) Contrast bath e) Hydro-collator hot packs / cold packs f) Cryotherapy	25
8	a) Electric Shock b) Earth Shock	02

List of References:

Text Books:

1. Clayton's Electrotherapy: Theory and Practice- Edward Bellis Clayton.9th Edition.
2. Electrotherapy Simplified- Nanda Basanta Kumar-2nd Edition.

3. Basics of Electrotherapy- Subhash M.Khatri, 2nd Edition.
4. Principles of Ex. Therapy – Dena Gardiner 4th edition.

Reference Books:

1. Electrotherapy Explained, Law & Reed. 4th Edition.
2. Fundamentals of Electrotherapy and Biomedical Physics, Ashish Kakkad 2nd edition.
3. Therapeutic Exercise foundation and techniques- Kisner 8th edition.

List of Open Source Software/learning website:

- k-hub.in e library/A single platform for all e resources (K-hub, E Resource)
 - User Name- KB4605VNG
 - Password- BL@69BX!
- knowledgegainer.delnet.in (Delnet, E Resource)
 - User Name-gjspum
 - Password- spu10924

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Discuss the basic concepts of Stability and motion.	1 Remembering 2 Understanding
CLO2	Describe the different laws of Electromagnetic Spectrum and its applications.	1 Remembering, 2 Understanding
CLO3	Basic Principles & concepts of Musculoskeletal mechanics.	2 Understanding 3 Applying 5 Evaluate
CLO4	Basic Principles & concepts of Fluid mechanics.	2 Understanding 3 Applying 5 Evaluate
CLO5	Basic Concept of various Electrotherapy modalities and its uses in Physiotherapy.	1 Remembering 2 Understanding 3 Applying
CLO6	Understand the basic concepts of Electricity and electronics and applications in physiotherapy.	1 Remembering 2 Understanding 3 Applying

Mapping of CLOs with Pos & PSOs

Course Learning Outcomes	Program Outcomes (POs)								Program Specific Outcomes (PSOs)							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CLO1	M		M						M		M					
CLO2				L								H	L			
CLO3	H	M	M							H					L	
CLO4	M						L		M			M				
CLO5					H							M				
CLO6						M		H	M					M		M

H= High M=Medium L=Low