

**MOTHER TERESA WOMEN'S UNIVERSITY
KODAIKANAL**

Department of Physics

Allied Physics

COURSE	ALLIED PAPER
COURSE TITLE	ALLIED PHYSICS – I
CREDITS	3
COURSE OBJECTIVES	To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

UNITS	COURSE DETAILS
UNIT-I	WAVES, OSCILLATIONS AND ULTRASONICS: simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonics: medical field – lithotripsy, ultra sonography –ultra sono imaging - ultrasonics in dentistry – physio therapy, ophthalmology – advantages of noninvasive surgery – ultrasonics in green chemistry.
UNIT-II	PROPERTIES OF MATTER: <i>Elasticity:</i> elastic constants – bending of beam – theory of non- uniform bending – determination of Young's modulus by non-uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum <i>Viscosity:</i> streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method, <i>Surface tension:</i> definition – molecular theory – droplets formation– shape, size and lifetime – COVID transmission through droplets, saliva – drop weight method – interfacial surface tension.
UNIT-III	HEAT AND THERMODYNAMICS: Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen – Linde's process of liquefaction of air– liquid Oxygen for medical purpose– importance of cryocoolers– thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle – efficiency – entropy – change of entropy in reversible and irreversible process.
UNIT-IV	ELECTRICITY AND MAGNETISM: potentiometer – principle – measurement of thermo EMF using potentiometer –magnetic field due to a current carrying conductor – Biot - Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit – types of switches in household and factories– Smart Wi-Fi switches– fuses and circuit breakers in houses

UNIT-V	DIGITAL ELECTRONICS AND DIGITAL INDIA: logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan’s theorem – verification – overview of Government initiatives: software technological parks under MeitY, NIELIT- semiconductor laboratories under Dept. of Space – an introduction to Digital India
UNIT-VI	PROFESSIONAL COMPONENTS: expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. R.Murugesan (2001), Allied Physics,S. Chand and Co, NewDelhi. 2. Brijlaland N.Subramanyam (1994), Waves and Oscillations,Vikas Publishing House, New Delhi. 3. Brijlaland N.Subramaniam (1994), Properties of Matter,S.Chandand Co., New Delhi. 4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8th edition), S.Chand and Co.,New Delhi. 5. R.Murugesan (2005), Optics and Spectroscopy, S.Chand and Co, NewDelhi. 6. A.Subramaniyam, Applied Electronics 2nd Edn., National Publishing Co., Chennai.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Resnick Halliday and Walker(2018). Fundamentals of Physics (11thedition), JohnWiley and Sons, Asia Pvt. Ltd., Singapore. 2. V.R.Khanna and R.S.Bedi (1998), Textbook of Sound 1stEdn. Kedharnaath Publication and Co., Meerut. 3. N.S.Khareand, S.S.Srivastava (1983), Electricity and Magnetism 10th Edn., Atma Ramand Sons, New Delhi. 4. D.R.Khannaand H.R. Gulati (1979). Optics, S. Chand and Co. Ltd., New Delhi. 5. V.K.Metha (2004). Principles of electronics 6th Edn. S.Chand and company.
WEB RESOURCES	<ol style="list-style-type: none"> 1. https://youtu.be/M_5KYncYNyc 2. https://youtu.be/ljJLJgIvaHY 3. https://youtu.be/7mGqd9HQ_AU 4. https://youtu.be/h5jOAw57OXM 5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/ 6. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://www.youtube.com/watch?v=gT8Nth9NWPMhttps://www.youtube.com/watch?v=9mXOMzUruMQandt=1shttps://www.youtube.com/watch?v=m4u-SuaSu1sandt=3shttps://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

COURSE	ALLIED PAPER
COURSE TITLE	ALLIED PHYSICS –II
CREDITS	3
COURSE OBJECTIVES	To understand the basic concepts of optics, modern Physics, concepts of relativity and quantum physics, semiconductor physics, and electronics.

UNITS	COURSE DETAILS
UNIT-I	OPTICS: interference – interference in thin films – colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – diffraction of light vs. sound – normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster’s law – optical activity – application in sugar industries
UNIT-II	ATOMIC PHYSICS: atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli’s exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect – Zeeman effect (elementary ideas only) – photo electric effect – Einstein’s photoelectric equation – applications of photoelectric effect: solar cells, solar panels, optoelectric devices
UNIT-III	NUCLEAR PHYSICS: nuclear models – liquid drop model – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses – controlled and uncontrolled chain reaction – nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor – breeder reactor – importance of commissioning PFBR in our country – heavy water disposal, safety of reactors: seismic and floods – introduction to DAE, IAEA – nuclear fusion – thermonuclear reactions – differences between fission and fusion.
UNIT-IV	INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES: frame of reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence – introduction on gravitational waves, LIGO, ICTS opportunities at International Centre for Theoretical Sciences
UNIT-V	SEMICONDUCTOR PHYSICS: p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment) – USB cell phone charger – introduction to e-vehicles and EV charging stations
UNIT-VI	PROFESSIONAL COMPONENTS: expert lectures – seminars – webinars – industry inputs – social accountability – patriotism

TEXT BOOKS	<ol style="list-style-type: none"> 1. R.Murugesan (2005), Allied Physics, S.Chand and Co, New Delhi. 2. K.Thangaraj and D.Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai. 3. Brijlal and N.Subramanyam (2002), Text book of Optics, S.Chandand Co, New Delhi. 4. R.Murugesan (2005), Modern Physics, S.Chandand Co, New Delhi. 5. A.Subramaniyam Applied Electronics, 2nd Edn., National Publishing Co., Chennai.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11thEdn.,John Willey and Sons, Asia Pvt. Ltd., Singapore. 2. D.R.Khanna and H.R.Gulati (1979). Optics, S.Chand and Co.Ltd., New Delhi. 3. A.Beiser (1997), Concepts of Modern Physics, Tata McGraw Hill Publication, New Delhi. 4. Thomas L. Floyd (2017), Digital Fundamentals, 11thEdn., Universal Book Stall, New Delhi. 5. V.K.Metha (2004), Principles of electronics, 6th Edn. ,S.Chandand Company, New Delhi.
WEB RESOURCES	<ol style="list-style-type: none"> 1. https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318andv=D38BjgUdL5Uandfeature=emb_logo 2. https://www.youtube.com/watch?v=JrRrp5F-Qu4 3. https://www.validyne.com/blog/leak-test-using-pressure-transducers/ 4. https://www.atoptics.co.uk/atoptics/blsky.htm - 5. https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects