



MANONMANIAM SUNDARANAR UNIVERSITY - TIRUNELVELI
PROGRAMMES



OPEN AND DISTANCE LEARNING (ODL) PROGRAMMES

(FOR THOSE WHO JOINED THE PROGRAMMES FROM THE ACADEMIC YEAR 2023-2024 ONWARDS)

B.SC PHYSICS					
Semester	Course	Title of the Course	Course Code	Course Type	Credits
VI	Core – XIII	Relativity and Quantum Mechanics	JMPH61	Theory	4
	Core–XIV	Solid State Physics	JMPH62	Theory	4
	Core–XV	Digital Electronics and Microprocessor 8085	JMPH63	Theory	4
	Core– Practical VII	Physics Practical–VII	JMPHP7	Practical	2
	Core-Practical VIII	Physics Practical-VIII	JMPHP8	Practical	2
	Elective-VI	Nano Science and Nanotechnology	JEPH61	Theory	2
	NMC/Substitute Paper	Applied Physics	JNPH61	Theory	3

RELATIVITY AND QUANTUM MECHANICS	
UNIT-I	SPECIAL THEORY OF RELATIVITY: Frames of reference – Galilean Relativity – Postulates of special theory of relativity–Lorentz transformations –length contraction–time dilation–concept of simultaneity – variation of mass with velocity – Einstein ‘s mass-energy relation – relativistic momentum – energy relation.
UNIT-II	FAILURE OF CLASSICAL PHYSICS: Black body radiation – Failure of Classical Physics to explain energy distribution in the spectrum of a black body–Planck ‘s Quantum theory–Wein ‘s distribution law–Rayleigh Jean’s law. Photo Electric Effect – Difficulty with Classical Physics – Einstein ‘s Photo Electric Equation – work function.
UNIT-III	CONCEPT OF MATTER WAVES: de Broglie ‘s concept of matter waves –expression for de Broglie ‘s wavelength –phase velocity–group velocity–relationship. Heisenberg ‘s Uncertainty Principle – Elementary proof of Heisenberg ‘s uncertainty relations.
UNIT-IV	OPERATORS AND SCHRÖDINGER EQUATION: Postulates of Quantum mechanics– Wave function and its interpretation– linear operators –Eigenvalue–Hermitian operator – Properties of Hermitian operator – Commutator Algebra. SCHRÖDINGER EQUATION: Schrodinger ‘s wave equation in time dependent form – Steady state Schrodinger ‘s wave equation – extension to three dimensions.
UNIT-V	APPLICATIONS OF SCHRÖDINGER EQUATIONS: Particle in a one-dimensional box– Particle in a rectangular three- dimensional box. Simple harmonic oscillator – One dimensional simple harmonic oscillator in quantum mechanics–zero-point energy. Reflection at a step potential–Transmission across a potential barrier – Barrier Penetration (tunnelling effect).
TEXT BOOKS	1. Modern Physics, R. Murugesan, Kiruthiga Sivaprasath, S. Chand and Co., 17th Revised Edition, 2014. 2. Concepts of Modern Physics, A. Beiser, 6thEd., McGraw-Hill, 2003. 3. <i>Special Theory of Relativity</i>, S.P. Puri, Pearson Education, India, 2013. 4. Quantum Mechanics, Ghatak and Loganathan, Macmillan Publications. 5. Quantum mechanics –Satyaprakash and Swati Saluja. KedarNath Ram Nath and Co.

SOLID STATE PHYSICS	
UNIT-I	BONDING IN SOLIDS, CRYSTAL STRUCTURE: types of bonding–ionic bonding – bond energy of NaCl molecule –covalent bonding — Van-der-Waals bonding–crystal lattice–lattice translational vectors– lattice with basis – unit cell – Bravais ‘lattices –crystal structure – packing of SCC, BCC, and FCC structures – structures of NaCl and diamond crystals – Miller indices – procedure for finding them.
UNIT-II	ELEMENTARY LATTICE DYNAMICS: lattice vibrations and phonons: linear mono atomic and diatomic chains. acoustical and optical phonons–Dulong and Petit ‘s Law–properties of metals– classical free Electron theory of metals (Drude-Lorentz)–Ohm ‘s law–electrical and thermal conductivities – Weidemann-Franz ‘law.
UNIT-III	MAGNETIC PROPERTIES OF SOLIDS: permeability, susceptibility, relation between them – classification of magnetic materials–properties of dia, para, ferro, ferri and antiferromagnetism– Langevin ‘s theory of diamagnetism–Weiss theory of Para magnetism– Curie-Weiss law – Weiss theory of ferro magnetism (qualitative only) – domains –B-H curve - hysteresis and energy loss – soft and hard magnets.
UNIT-IV	DIELECTRIC PROPERTIES OF MATERIALS: Basic definitions - polarization and electric susceptibility –local electric field of an atom – dielectric constant and polarisability – polarization processes: electronic polarization–calculation of polarisability–ionic, orientational and space charge polarization –internal field – Clausius-Mosotti relation -frequency dependence of dielectric constant –dielectric loss – effect of temperature on dielectric constant.
UNIT-V	FERRO ELECTRIC & SUPERCONDUCTING PROPERTIES OF MATERIALS: Ferro electric effect: Curie-Weiss Law-ferroelectric domains, – elementary band theory: band gap (no derivation) - Hall effect – measurement of conductivity (four probe method) - Hall coefficient. Superconductivity: general properties of super conducting materials–critical temperature–critical magnetic field–Meissner effect–isotope effect– type-I and type-II superconductors – London ‘s equation and penetration depth.

TEXT BOOKS	1. Introduction to Solid State Physics, Kittel, Willey Eastern Ltd (2003). 2. Solid state Physics, Rita John, 1st edition, Tata Mc Graw Hill publishers (2014). 3. Solid State Physics, RL Singhal, Kedarnath Ram Nath & Co., Meerut (2003) 4. Elements of Solid-State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India 5. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill 6. Solid State Physics, N.W. Ashcroft and N.D. Mermin, 1976, Cengage Learning 7. Solid-state Physics, H. Ibach and H. Luth, 2009, Springer 8. Elementary Solid-State Physics, 1/e M. Ali Omar, 1999, Pearson India 9. Solid-state Physics, M.A. Wahab, 2011, Narosa Publishing House, ND
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DIGITAL ELECTRONICS AND MICRO PROCESSOR 8085

UNIT-I	Decimal, binary, octal, hexadecimal numbers systems and their conversions – codes: BCD, gray and excess-3 codes –code conversions — binary addition, binary subtraction using 1's & 2's complement methods – Boolean laws–De- Morgan 's theorem –basic logic gates -universal logic gates (NAND & NOR) –standard representation of logic functions (SOP&POS)–minimization Techniques (Karnaugh map: 2,3,4 variables).
UNIT-II	Adders: half & ulladder–subtractors: half & full subtractor– parallel binary adder–magnitude comparator–multiplexers (4:1) & demultiplexers (1:4), encoder (8-line-to-3-line) and decoder (3- line-to-8-line), BCD to seven segment decoders.
UNIT-III	Flip-flops: R-S Flip- flop, J-K Flip-flop, T and D type flip-flops, master-slave flip-flop, truth tables, registers: - serial in serial out and parallel in and parallel out – counters asynchronous: -mod-8, mod-10, synchronous - ring counter and <u>up- down counter – A/D and D/ A converter.</u>

UNIT-IV	General memory operations, ROM, RAM (static and dynamic), PROM, EPROM, EEPROM, EAROM. IC–logic families: RTL, DTL, TTLlogic, CMOS NAND & NOR Gates, CMOS Inverter, Programmable Logic Devices – Programmable Logic Array (PLA), Programmable Array Logic (PAL).
UNIT-V	8085 Microprocessor: Introduction to microprocessor – pin configuration of 8085 – Flags – Registers (General and special purpose) –interrupts and its priority – instruction set of 8085 – addressing modes of 8085 - Assembly language programming using 8085–programs for addition, subtraction, multiplication and division (8-Bitonly).
TEXTBOOKS	1. M. Morris Mano, —Digital Design—3rd Edition, PHI, New Delhi. 2. Ronald J. Tocci. —Digital Systems-Principles and Applications l6/e. PHI. New Delhi. 1999.(UNITS I to IV) 3. S. Salivahana & S. Arivazhagan- Digital circuits and design 4. Microprocessor Architecture, Programming and Applications with the 8085 – Penram International Publishing, Mumbai. - Ramesh S.Gaonakar 5. Microcomputer Systems the 8086/8088 family–YU-Cheng Liu and Glen SA

NANOSCIENCE AND NANO TECHNOLOGY	
UNIT-I	NANO SCIENCE AND NANO TECHNOLOGY: Introduction Nanoscale. Nanostructures: 0D,1D,2D–surface to volume ratio–size effect –excitons–quantum confinement– metal-based nanoparticles (metal and metal oxide) – nanocomposites (non-polymer based) – carbon nanostructures – fullerene –SWCNT and MWCNT
UNIT-II	PROPERTIES OF NANO MATERIALS: Introduction –mechanical behavior –elastic properties – hardness and strength – ductility and toughness– optical properties – surface plasmon resonance – electrical properties – dielectric materials and properties–magnetic properties –super paramagnetism –properties of CNTs.
UNIT-III	FABRICATION METHODS AND VACUUM TECHNIQUES: Top-down and bottom-up approaches – electrochemical method – chemical & physical vapour depositions (CVD & PVD) – thermal evaporation. Lithography: photolithography–sol–gelmethods Synthesis of CNT.
UNIT-IV	CHARACTERIZATION TECHNIQUES: Atomic force microscopy – scanning electron microscopy – transmission electron microscopy. Powder XRD method: determination of structure and grain size analysis – UV-visible and photo luminescence spectroscopy.
UNIT-V	APPLICATIONS OF NANO MATERIALS:
	Medicine: drug delivery – photodynamic therapy Energy: fuel cells – rechargeable batteries–super capacitors. Sensors: nano sensors based On optical and physical properties– Nano electronics: CNTFET– display screens– GMR read/write heads —applications of CNTs.
TEXT BOOKS	1. K.K. Chattopadhyay and A.N. Banerjee, (2012), Introduction to Nanoscience and Nanotechnology, PHI Learning Pvt. Ltd., 2. M.A. Shah, Tokeer Ahmad (2010), <u>Principles of Nanoscience and Nanotechnology</u>, Narosa Publishing House Pvt Ltd. 3. Mick Wilson, etal (2005) <u>Nanotechnology</u>, Overseas Press.

COURSE	SIXTH SEMESTER–CORE PRACTICAL7
COURSE TITLE	PHYSICS PRACTICAL VII
GENERAL PHYSICS EXPERIMENTS-II	
Minimum of Six Experiments from the list: 1. Spectral response of photo conductor (LDR). 2. Potentiometer–Resistance and Specific resistance of the coil. 3. Potentiometer–E.M. F of a thermocouple. 4. Carey Foster ‘s bridge- Temperature coefficient of resistance of the coil. 5. Conversion of Galvanometer into Voltmeter and Ammeter 6. Young ‘s Modulus–Hyperbolic Fringes 7. Potentiometer–Temperature Coefficient of Resistance 8. Spectrometer-Hartmann ‘s interpolation formula 9. Self-inductance–Rayleigh’s Bridge 10. Impedance and power factor–LR Circuit 11. Comparison of mutual inductance M1/M2-Ballistic Galvanometer 12. Moment of Magnet- TanC position	

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COURSE	SIXTH SEMESTER CORE PRACTICAL 8
COURSE TITLE	PHYSICS PRACTICALVIII
ELECTRONICS EXPERIMENTS- II	
Minimum of Six Experiments from the list: 1. Operational amplifier–Voltage follower 2. Operational amplifier-differentiator and integrator. 3. Wein ‘s Bridge Oscillator using IC 741 4. Hartley oscillator-transistor. 5. Study of gate ICs–NOT, OR, AND, NOR, NAND, XOR 6. Verification of De Morgan's the orem using ICs–NOT, OR, AND 7. Verification of Boolean Algebra (any four) 8. NAND as universal building block. 9. NOR as universal building block. 10. Half adder/Full adder using ICs 11. Monostable Multivibrators using 555 Timer 12. Seven Segment Display using IC 7490 and IC 7447 13. Microprocessor 8085–addition (8bitonly) 14. Microprocessor 8085–subtraction (8bitonly)	

APPLIED PHYSICS

UNIT-I	Conventional energy sources Conventional energy sources–world ‘s reserve of conventional energy sources–various forms of energy-renewable and conventional energy systems- comparison
UNIT-II	Fossil fuels Fossil fuels–coal, oil, and natural gas-availability-statistical details-applications-merits and demerits.
UNIT-III	Biomass energy: Biomass energy-biomass classification-biomass conversion process-bio gas plants- wood gasification-advantages and disadvantages of biomass
UNIT-IV	Renewable energy sources Renewable energy sources-solar energy-importance-storage of solar energy - applications of solar energy -solar pond - solar water heater- solar crop dryers-solar cookers- solar cell.
UNIT-V	Geo thermal energy Geo thermal energy- Geothermal powerplant- wind energy and wind farms- wind mills.
TEXT BOOKS	1. Non-conventional energy sources- G.D Rai- Khanna Publishers, New Delhi 2. Solar energy-MP Agarwal -S Chand & Co. Ltd. 3. Solar energy-Suhas P Sukhative Tata McGraw-Hill Publishing Company Ltd., New Delhi. .