

MANONMANIAM SUNDARANAR UNIVERSITY

TIRUNELVELI

UG COURSES – AFFILIATED COLLEGES

B.Sc. Physics
(Choice Based Credit System)

(with effect from the academic year 2016-2017 onwards)

(44th SCAA meeting held on 30.05.2016)

Sem	Pt I/II/ III/IV V/VI	Sub No.	Subject status	Subject Title	Hrs/ week	Credits	Marks				
							Maximum			Passing minimum	
							Int.	Ext	Tot.	Ext	Tot.
V	I	33	Core - 7	Basic Electronics	4	4	25	75	100	30	40
	II	34	Core - 8	Solid State Physics	4	4	25	75	100	30	40
	III	35	Elective – 1 (Select any one)	A)Spectroscopy B) Mathematical Physics	5	5	25	75	100	30	40
		36	Elective - 2	A) Communication Electronics B) Numerical Methods	5	5	25	75	100	30	40
		37	Practical -5	Non Electronics (No examination in the Fifth Semester)	3	-	50	50	100	20	40
		38	Practical - 6	Electronics (No examination in the Fifth Semester)	3	-	50	50	100	20	40
		39	Practical - 7	Computer Programming with C ++ (No examination in the Fifth Semester)	2	-	50	50	100	20	40
	IV	40	Skill Based subject (Common)	Personality Development / Effective Communication	4	4	25	75	100	30	40
				Subtotal	30	22					

VI	I	41	Core - 9	Digital Electronics	6	4	25	75	100	30	40
	II	42	Core - 10	Atomic And Nuclear Physics	6	4	25	75	100	30	40
	III	43	Core - 11	Quantum Mechanics	5	4	25	75	100	30	40
		44	Elective – 3 (select any one)	A.) Medical Physics B.) Energy Physics	5	5	25	75	100	30	40
		45	Practical - 5	Non Electronics	3	4	50	50	100	20	40
		46	Practical - 6	Electronics	3	4	50	50	100	20	40
		47	Practical - 7	Computer Programming with C ++	2	4	50	50	100	20	40
				Subtotal	30	29					

BASIC ELECTRONICS

UNIT-I: LINEAR CIRCUIT ANALYSIS

Constant voltage source, constant current source, conversion of voltage source into current source - Maximum power transfer theorem - Thevenin's theorem - Norton's theorem - hybrid parameters - determination of h parameter - equivalent circuit - the h parameters of a transistor.

UNIT-II: SEMICONDUCTORS DIODES AND DEVICES

PN Junction - V – I characteristics of PN Junction - Crystal diode as a rectifier - Zener diode - V – I characteristics of Zener diode - Tunnel diode. Half wave rectifier, centre - tap full wave rectifier - Full wave bridge rectifier - Comparison of Rectifiers - Filter Circuits - Types (capacitor filter, choke input filter, Π filter) - Zener diode as voltage stabilizer.

UNIT-III: TRANSISTOR AMPLIFIERS

Transistor action - Transistor connections - common emitter - common base - common collector - Analysis of amplifiers using h- parameters - RC coupled amplifier - transformer coupled amplifier - power amplifier - classification of power amplifiers (Class A, Class B and Class C) - Push pull amplifier - FET parameters - JFET characteristics.

UNIT-IV: OSCILLATIONS AND WAVE SHAPING CIRCUITS

Feedback principle and Barkhausen criterion - Hartley, Colpitt's, and Phase shift oscillators using transistors – Astable - Monostable and Bistable multi vibrators using transistors - Schmitt trigger - clipping and clamping circuits - Differentiating circuit - Integrating circuit.

UNIT-V: OPERATIONAL AMPLIFIER

Op-Amp - pin diagram- characteristics of ideal Op - Amp - DC and A.C analysis of Op-Amp - Bandwidth of an Op-Amp - Slew rate - Frequency response - Op- Amp with negative feedback - applications - Inverting amplifier - Input and output impedance of Inverting amplifier - Non inverting amplifier - Voltage follower- Summing amplifier - Adder - Subtractor - Integrator – Differentiator-low pass ,high pass and band pass filters

Books for study

1. Principles of Electronics - V.K.Mehta & Rohit Mehta-S.Chand &Co.

Books for reference

1. Electronic fundamentals and applications - John D. Ryder –Prentice Hall
2. Electronic principles - Malvino
3. Electronic devices and circuits - David Bell- Prentice Hall
4. Basic Electronics - B.Basavaraj, H.N.Shivashankar-2nd edition-Universities press
5. Physics of semiconductor devices - Dilip K.Roy - Universities press

SOLID STATE PHYSICS

UNIT-I: CRYSTAL LATTICES

Seven classes of crystals - Bravais Lattice in three dimensions - crystal structure - Simple Cubic, Face Centered Cubic, Body Centered Cubic and Hexagonal Close packed structure - Sodium Chloride, Zinc Blende and Diamond Structure. Miller Indices and crystal planes - procedure for finding Miller Indices - interplanar spacing - Diffraction of X-Rays - Bragg's Law - reciprocal lattices - reciprocal lattice to SCC, BCC and FCC lattices.

UNIT-II: TYPES OF MAGNETIC MATERIALS

Classical Theory of Diamagnetism - Langevin's Theory of Para magnetism - Weiss Theory of Para magnetism - Ferromagnetism - Explanation of Heisenberg's internal field and quantum theory of ferromagnetism - Domain theory of ferromagnetism - Anti ferromagnetism - ferrites - Fundamental Definitions of Dielectrics - Different types of Electric Polarizations- electronic, ionic, orientation and space charge Polarizations - Dielectric Loss - Internal Field - Clausius – Mosotti Relation

UNIT-III: BONDING IN SOLIDS

Types of bonds in crystals - Ionic, covalent, Metallic, Vander waal's and Hydrogen Bonding - Bond energy of sodium chloride molecule - Comparison between ionic and covalent solids - variation of inter atomic force with inter atomic spacing -cohesive energy - cohesive energy of ionic solids - application to sodium chloride crystal - evaluation of Madelung constant for sodium chloride.

UNIT-IV: SUPER CONDUCTIVITY

Introduction - General Properties of Superconductors - effect of magnetic field -Meissner effect - effect of current - thermal properties - entropy - specific heat -energy gap - isotope effect - London equations - Josephson effect - AC & DC Josephson effects - applications - Type-I and Type-II Superconductors - Explanation for the Occurrence of Super Conductivity - BCS theory - Application of Superconductors - High T_C superconductors.

UNIT-V: NANOTECHNOLOGY

Nanomaterials-synthesis and classification —techniques used in synthesis of nanomaterials-chemical vapour deposition-sol-gel technique-electro deposition method-ball milling method-characterisation - properties and applications of nanomaterials- fullerene, graphine and carbon nanotubes

Books for Study

1. Solid State Physics - P.K.Palanisamy - SCITECH Publications pvt Ltd.Chennai
2. Nano-essentials and understanding - Pradeep.T.Mc-Graw-Hill Ltd.

Books for reference

1. Introduction to Solid State Physics - Kittel - Wiley and Sons,New Delhi
2. Material Science and Engineering - V. Raghavan - PHI
3. Introduction to Solids -Azaroff - TMH
4. Material Science - M.Arumugam - Anuradha Publishers
5. Solid State Physics - H.C.Gupta -Vikas publishing house pvt.Ltd.
6. Principles of Nanoscience and technology - Shah M.A.Ahmed,Narosha publishing house pvt.Ltd.

Major Elective – I (A)

SPECTROSCOPY

Unit - I

Microwave Spectroscopy

Rotation of molecules – Classification of molecules – Rotation spectra of diatomic molecules – Intensities of Spectral lines – Effect of Isotopic Substitution – Non-rigid rotator – Spectrum of a Non-Rigid Rotator –Polyatomic Molecules – Symmetric Top molecules – Asymmetric Top molecules -Techniques and Instrumentation – Chemical analysis by Microwave spectroscopy.

Unit – II

Infrared Spectroscopy

I.R. Spectroscopy – Vibrating diatomic molecules – Simple Harmonic Oscillator - Anharmonic oscillator – Diatomic vibrating rotator – IR Spectrum of carbon monoxide - Interaction of rotations and vibrations – Vibration of Polyatomic molecules – Analysis by IR techniques.

Unit – III

Raman Spectroscopy

Raman effect: Discovery – Quantum theory of Raman effect – Classical theory of Raman Effect – Pure rotational Raman Spectra- Linear molecules – Raman Spectrum of symmetric top molecules - Vibrational Raman spectra – Rule of mutual exclusion – Overtone and Combination Vibrations - Rotational Fine Structure – Polarization of light and the Raman Effect - Structure determination from IR and Raman spectroscopy.

Unit – IV

Electronic spectroscopy

Born - Oppenheimer approximation – Vibrational coarse structure: Progressions – Frank-Condon principle – Dissociation energy and Dissociation products – Rotational Fine Structure of Electronic Vibration Transitions - Fortrat diagram - Predissociation – Diatomic molecules.

Unit – V

5. Instrumentation

Instrumentation and Techniques in Infrared spectroscopy – Sources – Monochromators – Sample cells – Detectors – Single beam Infra red spectrometer – Double beam Infra red spectrometer.

Book For Study

Fundamentals Of Molecular Spectroscopy - Colin N Banwell Elaine- M Mccash Fifth Edition

Book For Reference

- 1.Molecular structure and spectroscopy - G. Aruldas, PHI Learning Pvt. Ltd, India.
- 2.Hand book of Analytical Instruments -R.S. Khandpur, Tata MC Grow Hill Ltd.
- 3.Spectroscopy -G.R. Chatwal and S.K. Anand, Himalaya publishing House, New Delhi.

Major Elective – I (B)

MATHEMATICAL PHYSICS

UNIT-1 – VECTORS

Vectors and scalars-Vector algebra-The scalar product-The vector (cross or outer) product-The triple scalar product-The triple vector product-The linear vector space V_n - Vector differentiation -Space curves - Motion in a plane - A vector treatment of classical orbit theory - Vector differential of a scalar field and the gradient - Conservative vector field - The vector differential operator - Vector differentiation of a vector field - The divergence of a vector - The operator ∇^2 , the Laplacian - The curl of a vector.

UNIT – 2: DIFFERENTIAL EQUATION

First-order differential equations - Separable variables -Exact equations-Integrating factors - Bernoulli's equation- Second-order equations with constant coefficients - Nature of the solution of linear equations - General solutions of the second-order equations - Finding the complementary function - Finding the particular integral - Rules for D operators - The Euler linear equation - Solutions in power series.

UNIT – 3: MATRIX

Definition of a matrix - Four basic algebra operations for matrices - Equality of matrices - Addition of matrices - Multiplication of a matrix by a number - Matrix multiplication - The commutator - Powers of a matrix - Functions of matrices - transpose of a matrix - Symmetric and skew-symmetric matrices - The matrix representation of a vector product - The inverse of a matrix - A method for finding A^{-1} - Systems of linear equations and the inverse of a matrix - Complex conjugate of a matrix - Hermitian conjugation - Hermitian/anti-Hermitian matrix - Orthogonal matrix (real) - Unitary matrix - Rotation matrices - Trace of a matrix.

UNIT – 4: LAPLACE TRANSFORMATION

Definition of the Laplace transform - Existence of Laplace transforms - Laplace transforms of some elementary functions - Shifting (or translation) theorems - The first shifting theorem - The second shifting theorem - The unit step function - Laplace transform of a periodic function - Laplace transforms of derivatives - Laplace transforms of functions defined by integrals - A note on integral transformations.

UNIT -5: PARTIAL DIFFERENTIAL EQUATIONS

Linear second-order partial differential equations - Solutions of Laplace's equation: separation of variables - Solutions of the wave equation: separation of variables - Solution of Poisson's equation. Green's functions - Laplace transform solutions of boundary-value problems

Books for study

**Mathematical Methods for Physicists: A concise introduction, - TAI L. CHOW -
CAMBRIDGE UNIVERSITY PRESS.**

Books for Reference

- 1. Mathematical physics-** Piyoosh kumar tyagi , RBSA Publishers
- 2. Mathematical physics-** Satya prakash-Sultan Chand & Co:
- 3. Mechanics and mathematical physics -R.Murugesan-** Sultan Chand & Co:
- 4. Mathematical physics-Gupta-** Sultan Chand & Co:

Elective -II (A)

COMMUNICATION ELECTRONICS

Unit – I Amplitude Modulation and Transmission

Introduction – Amplitude Modulation – AM envelop – AM frequency spectrum and bandwidth – Phasor representation of AM with carrier – Coefficient of modulation or percentage modulation or modulation index – Degrees of modulation – AM power distribution – AM Current relation and efficiency - Modulation by complex information signal - Doubleside band suppressed carrier AM - Single side band suppressed carrier AM – Vestigial side band amplitude modulation – AM modulator circuits – Emitter modulations or low power AM – Collector modulator or medium and high power AM modulator - AM transmitters – Broadcast AM transmitters – Low level of AM transmitter – High level AM transmitter.

Unit – II Amplitude Modulation Reception

Comparison of AM system – Quadrature amplitude modulation – Principles of AM detection – AM receivers – Receiver parameters – Tuned radio frequency (TRF) receiver or straight receiver – Principles of superhetrodyne –Double frequency conversion AM receiver.

Unit – III Angle Modulation – Transmission

Introduction – Frequency modulation – Phase modulation – Phase deviation and modulation index – Multitone modulation – Transmission band width of FM – Conversion of PM to FM or frequency modulator – Conversion of FM to PM / phase modulators – Commercial broadcast FM – Phasor representation of an FM and PM – Average power of an AM/FM wave – Generation of FM – Direct method of FM generation – Reactance tube modulator – Indirect method of FM wave generation – FM transmitters – Indirect method – Comparison of AM and FM.

Unit – IV FM Reception

FM detectors – Balanced slope detector – Foster seely discriminator – Ratio detector – FM super heterodyne receiver – FM noise suppression – Threshold extension by FMFB technique.

Unit – V Digital modulation techniques

Introduction – BFSK – Binary phase shift keying – Quadrature PSK – Differential PSK – Performance comparison of digital modulation schemes – M ary FSK – Correlative coding – Duobinary encoding.

Book For Study

Principles Of Communication Engineering-Dr. K.S. Srinivasan, Second Edition : 2010.

Book For Reference

1. Electronic communication systems – George Kennedy & Bernard Davis, Tata Mcgraw Hills, 4th edition, 2008
2. Electronic communication Systems – Blake, Joseph J. Adams ki, Sun Yifeng, Delamer publication, 2nd edition, 2012 (Rupa Publication, India).
3. Fundamentals of Electrical engineering – Wayne tomasi

Elective -II (B)

NUMERICAL METHODS

UNIT-I: Errors and Root of equations

What is Numerical analysis-Numbers and their accuracy-errors-measurement of errors-round off error-truncation error-absolute error-relative error-percentage error-inherent error-accumulated error-general error formula-convergence

Root of equations-Iteration method-Maclaurin's series method-Newton-Raphson method-Von-Mises Formula-Bisection method

UNIT-II: Matrix and linear equations

Introduction- Pivotal condensation method- system of linear equations- Gauss Elimination method- Gauss Seidal Iteration Method-Gauss Jordan elimination method- Matrix Inversion method

UNIT-III: Interpolation and approximation

Linear Interpolation –Quadratic Interpolation - Lagrange's interpolation –Richardson's Extrapolation –Aitken's iterated Interpolation

UNIT-IV: Numerical Differentiation and Integration:

Numerical Differentiation-Approximation of derivatives using interpolation polynomials-Taylor series method

Numerical Integration - trapezoidal rule-simpson's 1/3 and 3/8 rules

UNIT –V: Differential Equations

Introduction-Euler's method (Adams Bashforth first order method)- Backward Euler method-Taylor's series method- Runge-kutta method - Predictor corrector methods

Books for study and Reference:

1. Introductory methods of numerical analysis – S.S. Sastry, Prentice Hall of India, New Delhi (2000)
2. Numerical methods – A. Singaravelu, Meenakshi Agency, Chennai (2001).
3. Numerical method in Science and Engineering – M.K. Venkataraman, PHI – New Delhi (1997)
4. Mechanics and Mathematical methods, R. Murugesan, S. Chand & Co, New Delhi (1999).

Digital Electronics

Unit 1: Number systems, Binary arithmetic and Codes

Decimal , binary, Octal, decimal and hexadecimal number systems and their inter- conversions - Binary arithmetic-Binary addition-binary subtraction-1's and 2's complements-- BCD codes, ASCII code, Excess-3code, Gray code.

Unit 2 : Boolean algebra and Logic gates

Boolean algebra-De Morgan's theorem –Positive logic and negative logic systems-Basic logic gates, OR, AND, NOT (symbol, Boolean equation, truth table, circuit diagram and working)-NAND, NOR, EX-OR (symbol, Boolean equation, truth table only)-NAND and NOR as universal building blocks.

Unit 3 : Arithmetic circuits,,Flip-flops and multivibrators

Half and full adders- Half and full subtractors-RS Flip-flop-clocked RS Flip-flop, JK Flip-flop, JK master slave Flip-flop, D Flip-flop, T Flip-flop

555 timer-Astable multivibrator, monostable multivibrator-Frequency divider

Unit 4 : Karnaugh map and combinational circuit applications

Karnaugh map - 2,3and 4 variables –simplification-SOP and POS form of Boolean functions - - Don't care conditions-Multiplexer, Demultiplexer, Encoder, Decoder, parity generator and checker.

Unit 5 : Shift Registers and Counters

Types of registers- Serial in –Serial out-Serial in-Parallel out- Parallel in- Serial out- Parallel in- Parallel out-Asynchronous counters and Synchronous counters- Ring counter- Binary counter- Up-Down counter- Mod-5 counter- Mod-10 counter (decade counter)-A/D and D/A converters

Books for study

Digital principles and applications - Albert Paul Malvino & Donald P. Leach

Books for reference

1. Digital logic and computer design - Morris Mano - Prentice Hall of India, Pvt. Ltd.
2. Gothmann W. H., Digital Electronics - Prentice Hall of India, Pvt. Ltd.
3. Metha V. K. Mehtha. R. Principles of electronics, S. Chand & Co.
4. Fundamentals of Digital Electronics and Microprocessors - Anokh Singh, A. K. Chhabra, S. Chand & Co.

ATOMIC AND NUCLEAR PHYSICS

Unit I :Atomic Structure :Introduction –Vector atom model –Quantum numbers associated with vector atom model– coupling schemes –L-S- and J-J couplings- Pauli's exclusion principle- application to periodic table-magnetic dipole moment due to orbital motion of the electron- magnetic dipole moment due to spin-Stern and Gerlach experiment –optical spectra-spectral notation- selection rules-fine structure of sodium D line-Zeeman effect-experimental arrangement for the normal Zeeman effect-Quantum mechanical explanation of the normal Zeeman effect- Anomalous Zeeman effect – stark effect

Unit II Introduction to the Nucleus

General properties of the nucleus- nuclear binding energy –BE/A curve and its significance-mass defect and packing fraction—proton electron hypothesis- proton neutron hypothesis -Nuclear forces –characteristics –Meson theory of nuclear forces –Models of Nuclear structure – Liquid drop model –Binding Energy formula – Shell Model –nuclear reactions-Q-value of nuclear reactions .

Unit III Radio activity

Natural radio activity –alpha,beta and gamma rays-properties-Soddy Fajan's displacement law- natural radio active series-law of radio active disintegration-half life period –mean life period – Radio carbon dating-law of successive disintegration– range of α particle – Geiger Nuttal law- theory of α decay- β decay- β - ray spectra –neutrino theory of β decay-neutrino and its properties- electron capture. γ decay-nuclear isomers- Mossbauer effect and its applications-radio isotopes and their uses.

Unit IV :Nuclear reactors,Particle accelerators and detectors

Nuclear fission –energy released in fission-. Nuclear reactor-uses of reactor- Nuclear fusion – Thermo nuclear reactions-controlled thermo nuclear reaction-Principle and action of atom bomb and hydrogen bomb-fusion reactor –Detectors-G.M.Counter-scintillation counter-bubble chamber-wilson cloud chamber-Accelerators-cyclotron-synchrocyclotron-betatron-synchrotrons

Unit V :Cosmic rays and elementary particles

Cosmic rays-introduction-discovery-latitude,altitude and azimuth effects-Longitudinal effect-north –south effect-seasonal and diurnal changes-primary and secondary cosmic rays-nature of Cosmic rays- Cosmic ray showers-van allen belt- origin of Cosmic radiation.

Elementary particles-introduction-particles and antiparticles-antimatter-the fundamental interaction-elementary particle quantum numbers-conservation laws and symmetry-the quark model

Book for study

1. Modern Physics- R.Murugesan, S. chand & Co

Ref erence Books

1. Modern Physics- Seghal Chopra & Seghal, Sultan chand & Co 1998
2. Perspective of Modern Physics-Arther Beiser –Tata-Mc Graw Hill Publishing Company
- 3.Atomic and Nuclear Physics-Shatendra Sharma-Pearson Publications
4. Atomic Physics-Gupta and Kum ar -S. chand & Co
- 5.Fundamental Physics-Halliday and Resnick

QUANTUM MECHANICS

Unit –I DEVELOPMENT OF QUANTUM MECHANICS

Inadequacy of classical mechanics-Black body radiation – Theoretical laws of Black body radiation (Wein's displacement law –Wein's Radiation formula – Rayleigh Jeans law) – Planck's Quantum hypothesis – photoelectric effect-Einstein's explanation for photoelectric effect-Compton effect – Einstein's quantum theory of specific heat-Quantum states of energy .

Unit – II WAVE PROPERTIES OF MATTER

Wave particle duality-Phase and Group Velocity – Analytical expression for a Group of waves – Wave packets formed by Superposition of Number of Plane waves – De Broglie Hypothesis – Derivation of De Broglie relation – Phase velocity of De Broglie Waves – Relation between De Broglie wave and Phase velocity – Davison and Germer's experiment on electron diffraction-Diffraction of Atoms and Molecules

Unit – II I HEISENBERG UNCERTAINTY PRINCIPLE

Uncertainty Principle - Elementary Proof of Heisenberg's Uncertainty Relation and its Physical significance – Elementary Proof of the Heisenberg's Uncertainty Relation between energy and Time-Illustration of uncertainty relation by Thought experiments-consequences of uncertainty relation

Unit – IV SCHRÖDINGER'S WAVE EQUATION:

Basic postulates of Quantum mechanics –Schrodinger's equation – 1D and 3D wave equation into the Time-dependent and Time-independent part – Physical Interpretation of the Wave Function ψ – Operators in quantum Mechanics,Eigen Function, Eigen value and Eigen Value equation – Expectation values – Orthogonality of Energy Eigen function - Schrodinger's Wave equation for the Complex Conjugate Wave function $\psi^*(x, y, z, t)$ – Probability current Density – Ehrenfest's Theorem – Momentum wave function for free particle – Momentum Eigen function – Exact statement and proof of Uncertainty Principle for One Dimensional wave packet

Unit –IV APPLICATIONS OF QUANTUM MECHANICS

Free particle – Potential step – Rectangular Potential barrier- Tunnel effect – emission of α particles from Radioactive element - Square well potential- free states-Particle in 1D box – Particle in 3D box – simple harmonic oscillator – 1D simple harmonic oscillator in quantum mechanics – Particle in 1 D square well potential of finite Depth.

Books for Study

Elements of Quantum Mechanics, Kamal Singh & S P Singh-Chand &Co;

Books for Reference

- 1.Mathews P.M. and Venkatesh k. Quantum Mechanics Tata McGraw Hill Publishing Ltd.
- 2.Gipta,Kumar,Sharma -Quantum Mechanics-JaiPrakash Nath Company
3. Quantum Mechanics-G.Arul Das-PHI Private Learning Ltd.
4. Quantum Mechanics-V.Murugan-Pearson publication
5. Quantum Mechanics-Mahesh C.Jain- PHI Private Learning Ltd

**MSU/2016-17/UG-Colleges/Part-III (B.Sc. Physics)/Semester-VI/ Ppr.no.44(A)/
ELECTIVE – 3(A)**

MEDICAL PHYSICS

UNIT-I: X-RAYS

Electromagnetic spectrum - production of x-rays - x-ray spectra - Brehmsstrahlung - Characteristic x-ray - X-ray tubes - Coolidge tube - x-ray tube design - tube cooling - stationary mode - Rotating anode x-ray tubes - Tube rating - quality and intensity of x-ray. X-ray generator circuits - half wave and full wave rectification - filament circuit - kilo voltage circuit - high frequency generator - exposure timers - HT cables.

UNIT –II:RADIATION SAFETY AND HEALTH PHYSICS

Introduction to Radioactivity-Artificial and natural - radioactivity -Physical features of radiation- units of radiation- conventional sources of radiation, Interaction of different types of radiation with matter -penetration power in living cells-radiation damage to the cell-effect of radiation on cells- measurement of ionizing radiation- measurement of biological damage-Linear energy transfer(LET)- radiation risk-radiation dosimetry-security of radio active material-radio active waste management

UNIT –III: BIO MEDICAL INSTRUMENTATION

Development of biomedical instrumentation-biometrics-introduction to the man-instrument system- components of man-instrument system-transducers for biomedical applications-biomedical computer applications-computer analysis of ECG-computerized axial tomography(CAT) Scanners

UNIT-IV: MEDICAL IMAGING PHYSICS

Radiological imaging - Radiography - Filters - grids - cassette - X-ray film - film processing - fluoroscopy - computed tomography scanner - principle function -display - generations - mammography. Ultrasound imaging - magnetic resonance imaging - thyroid uptake system - Gamma camera (Only Principle, function and display)

UNIT-V : LASERS IN MEDICINE

Introduction to laser-principle and production of laser- effects of laser radiation on tissues, - photo thermal effects, photochemical effects –photodynamic therapy, Laser applications in therapy and diagnosis-ophthalmology,Fibreoptic endoscopy and dentistry.Laser as a beautician’s tool-laser hazards-biological effects,

Books for study

1. Basic Radiological Physics Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)
2. The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and Boone Lippincot Williams and Wilkins, Second Edition (2002)
- 3..Biomedical instrumentation-Leslie Cromwell,Fred J.Weibel-Erich A.Pfeiffer-Pearson Publications
- 4.Lasers in Medicine-R W Wayanant, Plenum Publishing Co

Books for Reference

1. Nuclear medicine physics: Chandra - Lippincot Williams and Wilkins (1998)
2. The Physics of radiology: John R Gunni ingham and Johns - Charles C Thomas USA (1990)
3. Medical Imaging Physics : William R Hendee - Mosby, 3rd edition (1992)
4. Advanced Medical Radiation Dosimetry: Govindarajan KN Prentice - Hall of India Pvt. Ltd. New Delhi (1992) .

**MSU/2016-17/UG-Colleges/Part-III (B.Sc. Physics)/Semester-VI/ Ppr.no.44 (B)/
Elective - 3 (B)**

ENERGY PHYSICS

UNIT I - INTRODUCTION TO ENERGY SOURCES

World's reserve of Commercial energy sources and their availability-India's production and reserves-Conventional and non-conventional sources of energy, comparison – Coal- Oil and natural gas –applications - Merits and Demerits

UNIT II – SOLAR THERMAL ENERGY

Solar constant -Solar spectrum-Solar radiations outside earth atmosphere - Solar radiation at the earth surface-Solar Radiation geometry-Solar radiation on tilted surfaces-Basic Principles of Liquid flat plate collector –Materials for flat plate collector - Construction and working- Solar distillation–Solar disinfection - Solar drying-Solar cooker(box type)-Solar water heating systems – Swimming pool heating.

UNIT III - PHOTOVOLTAIC SYSTEMS

Introduction-Photovoltaic principle-Basic Silicon Solar cell- Power output and conversion efficiency-Limitation to photovoltaic efficiency-Basic photovoltaic system for power generation-Advantages and disadvantages-Types of solar cells- Application of solar photovoltaic systems - PV Powered fan – PV powered area lighting system – A Hybrid System.

UNIT IV- BIOMASS ENERGY

Introduction-Biomass classification- Biomass conversion technologies-Bio-gas generation-Factors affecting bio-digestion -Working of biogas plant-Advantages and disadvantage of floating and fixed dome type plant-Bio-gas from plant wastes-Methods for obtaining energy from biomass- Thermal gasification of biomass-Working of downdraft gasifier- Advantages and disadvantages of biological conversion of solar energy.

UNIT V - WIND ENERGY AND OTHER ENERGY SOURCES

Wind Energy Conversion-Classification and description of wind machines, wind energy collectors-Energy storage-- Energy from Oceans and Chemical energy resources-Ocean thermal electric conversion-Basic principle tidal power, advantages and limitation of tidal power generation-Energy and power from waves-wave energy conversion devices- Fuel cells- and application of fuel cells- batteries- advantages of battery for bulk energy storage- Hydrogen as alternative fuel for motor vehicles.

Books for study

1. Kothari D.P., K.C. Singal and Rakesh Ranjan, Renewable energy sources and emerging Technologies, Prentice Hall of India, 2008.
2. Solar Energy-principles of thermal collection and storage-S.P.SUKHAME-tata-McGraw-Hill publishing company ltd.

Books for References

1. Chetan Singh Solanki, Solar Photovoltaics Fundamentals, Technologies and Applications, 2nd Edition, PHI Learning Private Limited, 2011.
2. Rai G. D, Non conventional Energy sources, 4th Edition, Khanna Publishers, 2010.
3. Jeffrey M. Gordon, Solar Energy: The State of the Art, Earthscan, 2013.
4. Kalogirou S.A., Solar Energy Engineering: Processes and Systems , 2nd Edition, Academic Press, 2013.
5. Zobia A.F.and Ramesh Bansal, Handbook of Renewable Energy Technology, World Scientific, 2011.

**MSU/2016-17/UG-Colleges/Part-III (B.Sc. Physics)/Semester-VI/ Ppr.no.45/
Major Practical - 5**

NON ELECTRONICS

(12 experiments compulsory)

1. Young's modulus of glass-Elliptic fringes
2. Spectrometer-Cauchy's constants
3. Spectrometre-Hartman's formula
4. Spectrometre- i_1 - i_2 curve
5. Spectrometre-Biprism
6. Newton's Rings – determination of R_1, R_2 and f of the lens
7. Absolute determination of capacitance -BG
8. Absolute determination of mutual inductance & comparison of mutual inductance -BG
9. High resistance by leakage-BG
10. Potentiometre-calibration of volt meter(high range)
11. Potentiometre-temperature coefficient of resistance
12. Network theorems (thevenin's & norton's)- verification
13. Thermoemf-Mirror Galvanometre
14. Conversion of galvanometer into voltmeter & ammeter
15. Self inductance-Anderson's bridge

**MSU/2016-17/UG-Colleges/Part-III (B.Sc. Physics)Semester-VI/ Ppr.no.46/
Major Practical - 6**

ELECTRONICS

(12 experiments compulsory)

1. Dual power supply using IC
2. Diode characteristics(pn diode & zener diode)
3. Transistor characteristics
4. FET characteristics
5. NAND & NOR as universal building block
6. Half Adder & Full Adder
7. Colpitt's Oscillator and Hartley Oscillator
8. Single stage amplifier-with and without feedback
9. OPAMP-Adder&Subtractor
10. OPAMP-Differentiator & Integrator
11. OPAMP-Low pass and high pass filter
12. Astable multivibrator using IC555
13. Monostable multivibrator using IC555
14. Wienbridge oscillator
15. Full wave rectifier without and with filters.

**MSU/2016-17/UG-Colleges/Part-III (B.Sc. Physics)/Semester-VI/ Ppr.no.47/
Major Practical - 7**

Computer Programming IN C++

1.a. Arithmetic operations--use do while loop

b.To test the validity of any entered character whether it belongs to the alphabetical set or a number or a special character.

2.To find the sum of series using for loop.

a. $Sum = 1+3+5+\dots\dots\dots+n.$

b. $Sum = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots\dots\dots\frac{x^n}{n!}$

c. $Sum = 1^2+ 2^2+ 4^2 +\dots\dots\dots+n^2$

3.To find the factorial of a number by using function declaration with/without using the return statement.

4.To read a set of numbers from a standard input device and to find out the largest number in the given array using function declaration. Also sort them in the ascending or the descending order.

5.To read the elements of the given two matrices of order m*n and to perform the matrix addition and display the transpose of the result.

6.a.To display the name of the day in a week depending upon the number entered through key board using Switch-Case statement

b)To read the data variables (such as Day, Month and Year) of the class by the member function and display the contents of class objects on the screen in the format DD/MM/YYYY.

7. To generate a series of Fibonacci numbers using constructor

8. To read the following information from the keyboard in which basic class consists of Name, Roll No. and Sex. The derived class contains the data members Height and weight. Display the contents of the class. Use inheritance concept.

9. a. An OOP to find the period of a pendulum of given length L, in a gravitational field. Accept the required values using the keyboard. Also display the results.
- b. Develop a program in C++ to calculate the Young's modulus of a material from the data obtained from uniform bending method.
10. Solve Quadratic equation.
11. Multiplication of two matrices.
12. Define a class to represent a bank account details

Data members

1. Name of the depositor
2. Account name
3. Type of account
4. Balance amount in the account

Member function

- 1.to assign initial values
- 3.to withdraw an amount
- 4.to display name and balance