DEPARTMENT OF PHYSICS

UNIVERSITY COLLEGE OF SCIENCE

MAHATMA GANDHI UNIVERSITY, NALGONDA

Semester wise Blow up of Syllabi (2017-18)

Blow up of Syllabi

M.Sc Physics Course under CBCS

(w.e.f academic Year 2017-18)

I - SEMESTER STARTS HERE

DEPARTMENT OF PHYSICS

MHATMA GANDHI UNIVERSITY-NALGONDA

M.Sc(Physics) I-Semester Blow up of the Syllabi

PHY 101T Paper-I SUB: MATHEMATICAL PHYSICS & NUMERICAL METHODS

Lecture No.	Topic	Remarks
UNIT-I		
Lecture-1	Introduction & Syllabus Analysis	
Lecture-2	Legendre Differential equation and its power series solution	
Lecture-3	Legendre polynomial function of first and second kind ,Generating function	
Lecture-4	Generating function, Corollary 1 &2	
Lecture-5	Orthogonal properties of Legendre polynomial and Rodrigues formula	
Lecture-6	Recurrence Relations and Problems	
Lecture-7	Recurrence Relations and Problems	
Lecture-8	Bessel Differential Equation and its power series solution	
Lecture-9	Bessel function of first and second kind, Generating function	
Lecture-10	Orthogonal properties of Bessel differential equation	
Lecture-11	Recurrence Relations and Problems	
Lecture-12	Recurrence Relations and Problems	
Lecture-13	Hermite Differential equation and its power series solution	
Lecture-14	Generating function, Orthogonal properties of Hermite polynomial	
Lecture-15	Rodrigues formula, Recurrence Relations and Problems	
Lecture-16	Beta and Gamma Functions, other forms of Beta and Gamma functions	
Lecture-17	Relation between Beta &Gamma Function, Problems	
UNIT-II		
Lecture-18	Fourier Transform : Properties of Fourier Transform	
Lecture-19	Fourier Transform : Properties of Fourier Transform	
Lecture-20	Infinite Fourier Sine and Cosine transforms	
Lecture-21	Derivative of Fourier transform –Fourier transform of a derivative-Fourier Sine and Cosine transform of derivatives	
Lecture-22	Fourier Sine and Cosine transform of	
Lecture-23	Derivatives Finite Fourier transforms (Sin and Cosine)	
Lecture-24	Applications of Fourier Transforms.	
Lecture-25	Laplace Transform: Properties of Laplace transforms	
Lecture-26	Derivative of Laplace transform – Laplace transform of a derivative, Laplace transform of periodic functions	
Lecture-27	Inverse Laplace transform and its properties	
Lecture-28	Inverse Laplace theorem ,Convolution theorem	
Lecture-29	Evaluation of inverse Laplace Transforms by Convolution theorem.	
UNIT-III		
Lecture-30	Solution of Algebraic Equations: Back substitution -Gauss Elimination method & Problems	
Lecture-31	Back substitution alternate methods & Problems	
Lecture-32	Gauss Jordan Elimination method & Problems	
Lecture-33	Pivoting and Problems on pivoting	
Lecture-34	Iterative Methods: Gauss-Seidel iterative method	

Lecture-35	Jacobi method iterative method & Problems	
Lecture-36	Comparison of direct and iterative methods and problems on all methods	
Lecture-37	Root-finding Methods: Bisection method &Problems	
Lecture-38	successive bisection method-method of false position &Problems	
Lecture-39	Newton-Raphson method &Problems	
Lecture-40	Secant method &Problems	
Lecture-41	Method of Successive approximations and Problems	
Lecture-42	Miscellaneous problems	
UNIT-IV		
Lecture-43	Introduction to interpolation , Linear Interpolation & Lagrange interpolation -Problems	
Lecture-44	Introduction to interpolation , Linear Interpolation & Lagrange interpolation -Problems	
Lecture-45	Newton interpolation method-Problems	
Lecture-46	Newton forward and backward interpolation method	
Lecture-47	Curve fitting- least square line fitting –Problems	
Lecture-48	Numerical differentiation& Numerical Integration	
Lecture-49	Numerical Integration- Gaussian Quadrature method	
Lecture-50	Newton-cotes Integration formula-Trapezoidal rule &Problems	
Lecture-51	Simpson's 1/3 rule and Problems	
Lecture-52	Simpson's 2/3 rule and Problems	
Lecture-53	Romberg rule and Miscellaneous problems	
Lecture-54	Numerical methods for ordinary differential equations-Taylor series method	
Lecture-55	Euler's method rule and Problems	
Lecture-56	Runge-Kutta second order method and Problems	
Lecture-57	Runge-Kutta fourth order method and Problems	

Recommended Books:

1. Applied Mathematics for Engineers and Physicists –Lious A Pipes and Lawrance R. Rarvill.
2. Mathematical Physics – AK Ghatak, IC Goyal and SL Chua-Macmillan India Ltd.
3. Mathematical Physics – Satya Prakash
4. Sastry: Introductory Methods of Numerical Analysis.
5. An Introduction to Numerical Analysis by Kendall E. Atkinson.
6. Numerical Methods – E.Balaguruswamy, Tata McGraw – Hill publishing Company Limited.

PHY 102T Paper-II SUB: CLASSICAL MECHANICS

Lecture	Topic	Remarks
UNIT-I	**Newtonian formalism**	
Lecture-1	Induction of Classical Mechanics & its Basics	
Lecture-2	Newton Law's(I,II & III)	
Lecture-3	Frame of reference(Inertial Frames & Non- Inertial Frames)	
Lecture-4	Fictitious Force (Pseudo Force)	
Lecture-5	Rotating Frames & Its Equation derivation	
Lecture-6	Conservation Theorems (Conservation of linear, angular momentums & energy)	
Lecture-7	Description of rotations in terms of Euler Angles	
Lecture-8	Euler's Equations of motion for a Rigid body(Newtonian method)	

Lecture-9	Minkowski space, world point & Word line	
Lecture-10	Space time diagrams (Light like curve, Space like curve & Time like curve)	
Lecture-11	Deduction of Lorentz transformation in force space	
Lecture-12	Four Vector	
Lecture-13	Examples of Four Vector (Position, Velocity)	
Lecture-14	Energy-momentum vectors , Acceleration, Force	
Lecture-15	Application of Four Vector	
UNIT-II Lagrangian formalism		
Lecture-16	Induction of Lagrangian formalism	
Lecture-17	Constraints	
Lecture-18	Generalized coordinate.	
Lecture-19	Principle of virtual work and D'Alembert's principle	
Lecture-20	Lagrange's equations from D'Alembert's principle	
Lecture-21	Lagrange's equations from D'Alembert's principle	
Lecture-22	Applications of Lagrange's equations (plane and L-C circuit)	
Lecture-23	Spherical pendulums,	
Lecture-24	Velocity dependent potential	
Lecture-25	Velocity dependent potential	
Lecture-26	Lagrangian for a charged particle in electromagnetic field	
Lecture-27	Euler's equations from Lagrange equations	
Lecture-28	Hamilton's principle- Lagrange equation's from Hamilton's principle	
Lecture-29	Hamilton's principle- Lagrange equation's from Hamilton's principle	
Lecture-30	Degrees of Freedom	
UNIT-III Hamiltonian formalism		
Lecture-31	Introduction of Hamiltonian formalism	
Lecture-32	Principle of Least Action	
Lecture-33	Hamilton's equations	
Lecture-34	Applications of Hamilton's equations(Motion of a particle in a central force field)	
Lecture-35	Projectile motion of a body	
Lecture-36	Cyclic coordinates	
Lecture-37	Conservation theories(Linear, Angular momentum)	
Lecture-38	Conservation of Energy	
Lecture-39	Canonical coordinates and canonical transforms	
Lecture-40	Conditions for a transformation to be canonical	
Lecture-41	Generating functions	
Lecture-42	Four Cases	
Lecture-43	Lagrange and Poisson brackets	
Lecture-44	Hamilton equations in Poisson bracket from	
Lecture-45	Hamilton-Jacobi theory	
UNIT-IV Mechanics of continuous systems		
Lecture-46	Introduction Mechanics of Continuous Systems	
Lecture-47	Small Oscillation & Normal Modes	
Lecture-48	Consideration of Potential Energy in one dimensional Oscillator.	
Lecture-49	General Theory of Small Oscillations	

Lecture-50	Secular equation & Eigen Value Equation	
Lecture-51	Solution of Eigen Value Equation	
Lecture-52	Analysis of the free vibrations of a linear triatomic molecule	
Lecture-53	Eigan Vectors, Generalized coordinates are related to normal coordinates	
Lecture-54	Principal axis transformation	
Lecture-55	Frequencies and normal coordinates	
Lecture-56	Lagrangian formulation for continuous systems	
Lecture-57	Symmetry Properties	
Lecture-58	Invariance Under GalilenTrasformation	
Lecture-59	Hamiltonian Formulation	
Lecture-60	Related Problems	

Reference Books:

1. Classical Mechanics : By Goldstein, Poole &Safko (Pearson 2002)
2. Classical Mechanics :By JC Upadhyaya (Himalaya Publishing House)
3. Introduction to Classical Mechanics : Takwale&Puranik (TMH)
4. Classical Mechanics :Rana&Joag (TMH)
5. Classical Mechanics of Particles and Rigid Bodies :Kiran C Gupta.
6. Lagrangian and Hamiltonian Mechanics: Calkin (Allied Publishers 2000)
7. Lagrangian Dynamics : Dave Wells (schaum series 19

PHY 103T Paper-III SUB: Solid State Physics

UNIT – I : Crystallography and Band Theory solids:		
Lecture No.	**Name of the Topic**	**Remarks**
Lecture -1	Introduction to crystal – types of crystal systems	
Lecture -2	Atomic packing in solids: FCC, BCC and HCP.	
Lecture-3	Crystal structures of FCC and BCC	
Lecture -4	Crystal structures of HCP	
Lecture -5	Symmetry operations-Point groups	
Lecture -6	Space groups and their notation.	
Lecture -7	Defects in solids- Classification of Defects	
Lecture -8	Calculation of number of Frenkel and Schottky Defects at given temperature.	
Lecture -9	Classical free electron theory of metals -	
Lecture -10	Failure of Free electron theory of metals-Bloch theorem	
Lecture -11	Behavior of electron in periodic potentials (Kronig- Penny model) - conditions	
Lecture -12	Behavior of electron in periodic potentials (Kronig- Penny model) - conditions	
Lecture -13	Energy Vs. Wave Vector (E vs. K) relation and Effective mass of electron	
Lecture -14	Negative effective mass and concept of hole	
Lecture -15	Density of states in a band its equation derivation.	
Lecture-16	Distinction between metals - Semiconductors and Insulators.	
UNIT – II: Semiconductor Materials		
Lecture-17	Introduction of Semiconductor Structure	
Lecture-18	Conduction in semiconductors-Band gap	
Lecture-19	Intrinsic semiconductors-Fermi level	
Lecture-20	Expressions for electron concentrations in intrinsic semiconductors	

Lecture -21	Expressions for hole concentrations in intrinsic semiconductors	
Lecture-22	Hall Effect in semiconductors- applications	
Lecture-23	Absorption of Light: Absorption Coefficient-Absorption Depth	
Lecture-24	Generation Rate -Types of Recombination - Band – to Band Recombination	
Lecture-25	Recombination through Defect Levels- Auger Recombination	
Lecture-26	P-N Junction Photo Diodes: Its working principle-Characterization-Applications	
Lecture-27	Light Emitting Diode - Its construction-Characterization-Applications	
Lecture-28	Laser diode - Characterization-Applications	
Lecture-29	Solar cell - Characterization-Applications -Problems	
Unit III: Thin Films		
Lecture -30	Introduction of thin films-thick films-Advantages of Thin Films	
Lecture-31	Thin film preparation by Thin Film nucleation	
Lecture-32	Thin Film growth - various stages	
Lecture-33	Thin film deposition technique by Evaporation	
Lecture-34	Thin film deposition technique by sputtering	
Lecture-35	Low pressure chemical vapor deposition (LPCVD)	
Lecture-36	Atmospheric pressure chemical vapor deposition (APCVD)	
Lecture-37	Thin film deposition technique by Plasma Enhanced	
Lecture-38	Thin film deposition techniques: Hot wire CVD andIon assisted deposition,	
Lecture-39	Thickness measurements: Gravimetri -Tolansky interference Technique and other	
Lecture-40	Electrical properties of thin Films	
Lecture-41	Optical properties of thin Films	
UNIT – IV: Lattice Vibrations and Thermal Properties		
Lecture-42	Introduction of Lattice Vibrations	
Lecture-43	Elastic waves in one dimensional array of identical atoms	
Lecture -44	Elastic waves in one dimensional array of identical atoms	
Lecture -45	Vibrational modes of a diatomic linear lattice	
Lecture -46	Dispersion relations for 1-D and 2-D lattices	
Lecture-47	Infrared absorption in ionic crystals	
Lecture-48	Phonons and verification of dispersion relation in crystal lattices	
Lecture-49	Lattice heat capacity	
Lecture-50	Einstein theory of specific heat	
Lecture- 51	Debye theory of specific heat	
Lecture-52	Lattice thermal conductivity – Phonon mean free path	
Lecture-53	Origin of thermal expansion	
Lecture-54	Gruneisen relation its equation.	

Reference Books:

1 .Solid State Physics – A.J. Deckker
2.Introduction to Solid State Physics – C. Kittel
3.Solid State Physics- RL Singhal
4.Elements of Solid State Physics – J.P. Srivastava
5.Elements of Solid State Physics -- Ali Omar
6.Thin films by Goswami
7.Thin films by K.L.Chopra. 8. Solid State Physics – S.O.Pillai

PHY 104T Paper-III SUB: Electronics Devices and Circuits

Unit- I Special purpose electronics devices		
Lecture	Topic	Remarks
Lecture-1	Introduction to semiconductor devices, PN junction diode	
Lecture-2	Zener diode characteristics and applications	
Lecture-3	Tunnel diode characteristics and applications	
Lecture-4	Varactor diode characteristics and applications	
Lecture-5	Transistor introduction, operating modes	
Lecture-6	I/O Characteristics of CE,CC,CB Configurations	
Lecture-7	Transistor Biasing Configurations- Fixed bias,	
Lecture-8	Voltage divider bias, Transistor Biasing with Emitter Feedback	
Lecture-9	h parameters from transistor characteristics, Transistor as switch	
Lecture-10	Introduction to FET, and characteristics of JFET	
Lecture-11	MOSFET construction and their parameters	
Lecture-12	Characteristics of DMOSFET,EMOSFET	
Lecture-13	SCR – Construction and Characteristics	
Lecture-14	SCR in Power rectification	
Lecture-15	UJT construction characteristics, a relaxation oscillator	
Unit- II Power supply, Amplifiers, Oscillators		
ecture-16	Transistor regulating power supply	
Lecture-17	Switch mode power supply	
Lecture-18	IC voltage regulators –LM 78XX, LM79XX and LM 317 Series	
Lecture-19	Introduction to need of amplification, gain measurement	
Lecture-20	RC coupled CE amplifier- frequency response	
Lecture-21	Emitter follower- frequency response	
Lecture-22	Impedance measurements	
Lecture-23	Introduction to feedback, feedback topologies	
Lecture-24	Positive and negative feedback techniques	
Lecture-25	Advantages negative feedback	
Lecture-26	Introduction to oscillators, Barkhausen Criterion	
Lecture-27	Phase shift oscillator	
Lecture-28	Wein Bridge oscillator	
Lecture-29	Hartley and colpitts oscillator	
Lecture-30	Crystal oscillator	
Unit- III Operational amplifiers		
Lecture-31	Introduction to operational amplifier,	
Lecture-32	Characteristics	
Lecture-33	Open and closed loops configurations	
Lecture-34	Inverting op-amp	
Lecture-35	Non inverting op-amp	
Lecture-36	Voltage follower, its applications	
Lecture-37	Addition, subtraction	
Lecture-38	Differentiator	
Lecture-39	Integrator	
Lecture-40	Analog computation- solution to second order DE	
Lecture-41	Logarithmic amplifier	
Lecture-42	Anti Logarithmic amplifier	
Lecture-43	Sine wave generator	
Lecture-44	Square wave generator	
Lecture-45	Saw tooth voltage generators	

Unit- IV Active filters, timer circuits		
Lecture-46	Introduction to filters	
Lecture-47	Active filters- first order active low pass filter	
Lecture-48	second order active low pass filter	
Lecture-49	first order active high pass filter	
Lecture-50	second order active high pass filter	
Lecture-51	Band pass filter	
Lecture-52	Band stop filter	
Lecture-53	555 timer	
Lecture-54	Astable and mono stable operation using 555 timer	
Lecture-55	VCO	
Lecture-56	Schmitt trigger	
Lecture-57	phased locked loop	
Lecture-58	PLL-IC565	
Lecture-59	Basic principle of frequency multiplication/ division	
Lecture-60	Analog phase detector	

Recommended Text Books:

1.Electronics Devices and circuit thery- Robert L.Boylestrad & Louis Nasheisky
2. Integrated Electronics – Millmann & Halkies (Tata magraw hill)
3.Microelectronics – Millmann & Grable
4.Operational amplifiers _ Ramakanth A Gaykwad (Printic Hall)
5.Fundamental of electronics & applications by J.D.Ryder

Reference Books

1.Hand book of electronics – Gupta and Kumar
2.Principle of Electronics –V.K.Mehta and Rohit Mehta
3.Introduction to semiconductor devices by Tyagi (John Wiley & sons)
4.Semiconductor by SM Sze, Wiley(1985)

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II - SEMESTER STARTS HERE

DEPARTMENT OF PHYSICS
MHATMA GANDHI UNIVERSITY-NALGONDA
M.Sc(Physics) II-Semester Blow up of the Syllabi

PHY 201T Paper-I SUB: QUANTUM MECHANICS

Lecture No.	Topic	Remarks
UNIT-I –Basics of Quantum Mechanics		
Lecture -1	Introduction- Basic Principle of quantum Mechanics	
Lecture -2	Mathematical development- Linear Vector Space	
Lecture -3	Properties of state vector-Dirac Ket and Bra notation	
Lecture-4	Eigen value equation, Eigen Kets and Eigen values	
Lecture -5	Degenerate and Non degenerate states, Completeness relation	
Lecture-6	Wave function in Position and momentum space	
Lecture -7	Normalization and Orthogonalityof Wave function, change Basis	
Lecture -8	Observables in Quantum mechanics, observable measurements, Expectation values	
Lecture-9	Operators – Hermitian Operator and their Properties	
Lecture-10	Commuting and non-commuting Operators, Physical significance	
Lecture -11	Matrix representation of state vector and operator	
Lecture-12	Parity operator and its physical significance	
Lecture -13	Projection operator and its physical significance	
Lecture -14	Basic commutation relations	
Lecture -15	Uncertainty principle any two non-commuting operators	
UNIT-II – Exactly solvable Problems		
Lecture -16	Schrodinger picture: Transformation to other pictures	
Lecture -17	Heisenberg picture	
Lecture-18	Interaction picture	
Lecture -19	Linear harmonic oscillator-solution to Schrodinger method	
Lecture-20	Continue previous Lecture-Energy Eigen values, Eigen Functions	
Lecture -21	Properties of Stationary states	
Lecture -22	Linear Harmonic oscillator- Solution by Operator method-Raising and Lowering operators	
Lecture -23	Continues previous Lecture -Eigen function	
Lecture -24	Number Operator, and its commutation relations	
Lecture -25	Particle moving in Spherical symmetric potential-solution of Spherical harmonics of Schrodinger equation	
Lecture -26	Hydrogen Atom-Solution of radial part of the Schrodinger equation	
Lecture -27	Continues previous Lecture: Energy Eigen values, Radial wave function	
Lecture -28	Radial Probability density, Discussion Of Bound states	
Lecture -29	Hydrogen Orbital's	
UNIT-III-Angular Momentum		
Lecture -30	Introduction to Orbital angular momentum- Its operators	
Lecture-31	Commutation Relations of $\mathbf{L^2}$ **and** L_Z	
Lecture -32	Commutation Relations of L_x, L_y, L_z	
Lecture-33	Eigen values, Eigen Functions $\mathbf{L^2}$ **and** L_Z	
Lecture-34	General angular momentum **J** and its Commutation relations between $\mathbf{J^2}$ **and** J_Z J_x, J_y, J_+, J_-	
Lecture -35	Continues previous Lecture and Eigen values of $\mathbf{J^2}$ **and** J_Z	
Lecture -36	Continues previous Lecture,	
Lecture-37	Matrix Representation for $\mathbf{J^2}$ **and** J_Z	
Lecture -38	Matrix Representation for J_x, J_y, J_+, J_-	
Lecture -39	Spin angular momentum and its operators	

Lecture-40	Paulis spin matrices	
Lecture -41	Properties of spin matrices(commutation relations)	
Lecture-42	Addition Angular Moment: Clebsch-Gordon Coefficients	
Lecture -43	Selection rules of C-G Coefficients, Recursion relations	
Lecture -44	C-G coefficients for $\boldsymbol{J_1 = \frac{1}{2}}$ **and** $\boldsymbol{J_2 = \frac{1}{2}}$	
Lecture 45	C-G coefficients for $\boldsymbol{J_1 = \frac{1}{2}}$ **and** $\boldsymbol{J_2 = 1}$	
Lecture -45	Introduction about perturbation	
UNIT-IV- Approximation Methods		
Lecture-46	Time independent perturbation theory- basic concepts	
Lecture -47	Non- degenerate energy levels: First order correction to energy and First order correction to wave function	
Lecture-48	Non- degenerate energy levels: second order correction to energy and second order correction to wave function	
Lecture -49	Example of Harmonic oscillator (effect of potential addition to $\mathbf{ax^2}$ term	
Lecture -50	Example of Harmonic oscillator (effect of potential addition to $\mathbf{bx^3}$ and $\mathbf{cx^4}$ **term**	
Lecture -51	Time independent perturbation in degenerate case First order correction energy	
Lecture-52	Stark effect for hydrogen atom for n=2 level	
Lecture -53	Variation method-basic principle	
Lecture-54	H-atom as example using different trial wave functions	
Lecture-55	Helium atom in ground state	
Lecture-56	WKB approximation	
Lecture-58	Connection formulae	
Lecture -59	Validity of WKB method, Barrier Penetration	
Lecture-60	WKB method Application to Alpha decay	

Reference Books:

1. Quantum mechanics – L.I.Shiff.
2. A Text of Quantum Mechanics-P.M.Mathews & Venkatesan.
3. Quantum Mechanics by E Merzbacher (John Wiley)
4. Modern Quantum Mechanics by Sakurai (Addison Wesley)

PHY 202T Paper-II SUB: Statistical Mechanics

Unit- I Relation between thermodynamics and statistical mechanics		
Lecture	**Topic**	**Remarks**
Lecture-1	Basic concepts of Thermodynamics to approach Statistical mechanics	
Lecture-2	Relation between thermodynamics and statistical mechanics	
Lecture-3	Micro states and macro states of system, Phase space	
Lecture-4	Phase space	
Lecture-5	Ensembles-Mean value and Ensemble average	
Lecture-6	Density distribution in Phase space	
Lecture-7	Liouville's theorem	
Lecture-8	Apriori probability postulate, Micro canonical Ensemble	
Lecture-9	Canonical ensembles	
Lecture-10	Micro canonical ensembles, Quantization of phase space	
Lecture-11	Entropy and thermal equilibrium	
Lecture-12	Mechanical, Concentration equilibrium	
Lecture-13	Connection between Statistical and thermodynamic quantities	
Lecture-14	Entropy of perfect gas using Micro canonical ensemble	
Lecture-15	Gibbs paradox, Sackur-Tetrode equation	

Unit- II statistics-Distribution laws		
Lecture-16	Maxwell-Boltzmann Statistics-Distribution law	
Lecture-17	Maxwell velocity distribution	
Lecture-18	Equipartition theorem	
Lecture-19	Canonical ensemble-partition function and relation to thermodynamic functions	
Lecture-20	Ideal gas in Canonical ensemble	
Lecture-21	Grand canonical Ensemble- Partition function	
Lecture-22	Ideal gas in Grand canonical ensemble	
Lecture-23	Quantum Statistical mechanics- postulates- Idistinguishability	
Lecture-24	Bose –Einstein Statistics and distribution law	
Lecture-25	Fermi-Dirac Statistics and distribution law	
Lecture-26	Evolution of Constants in above statisstics	
Lecture-27	Translation Partition function and thermodynamic quantities	
Lecture-28	Rotational Partition function and thermodynamic quantities	
Lecture-29	Vibrational Partition function and thermodynamic quantities	
Lecture-30	Specific Heat of diatomic molecules	
Unit- III		
Lecture-31	Ideal Bose-Einstein gas Energy	
Lecture-32	Ideal Bose-Einstein gas Pressure	
Lecture-33	Bose-Einstein condensation	
Lecture-34	Thermal Properties of Bose Einstein Gas	
Lecture-35	Liquid Helium	
Lecture-36	Two fluid model-and second sound	
Lecture-37	Phonons, rotons,	
Lecture-38	super fluidity	
Lecture-39	Ideal Fermi gas Energy and pressure in case slight degeneracy	
Lecture-40	Ideal Fermi gas Energy and pressure in case strong degeneracy	
Lecture-41	Thermodynamic functions of degenerate Fermi gas	
Lecture-42	Electron gas in metals,	
Lecture-43	Electron specific heat	
Lecture-44	Thermionic Emission	
Lecture-45	White Dwarfs	
Unit- IV		
Lecture-46	Introduction to fluctuation	
Lecture-47	Fluctuation-mean square deviation	
Lecture-48	Fluctuation in Energy, few examples	
Lecture-49	Fluctuation in Pressure, volume	
Lecture-50	Fluctuation in volume, examples	
Lecture-51	Fluctuation in concentration, examples	
Lecture-52	Brownian motion	
Lecture-53	Classification of Phase transition	
Lecture-54	First order Phase transition, example	
Lecture-55	Second order Phase transition, example	
Lecture-56	Ising model	
Lecture-57	Bragg-Williams Approximation	
Lecture-58	One dimensional Ising model a application to Ferro magnetic systems	
Lecture-59	Order disorder transitions	
Lecture-60	Problem solving	

Reference Books

1. Introductioon to phase transition and critical Phenomena HE Stanley (Clendon Press,Oxford)

2. Heat and Thermo dynamics by Zemansky(THM)

PHY 203T Paper-III SUB: ELECTROMAGNETIC THEORY

Lecture	Topic	Remarks
UNIT-I	**Electro-Static Potentials and Maxwell's Field Equations**	
Lecture-1	Induction of Electro-Static Potentials and Maxwell's Field Equations	
Lecture-2	Special techniques for calculating electrostatic potential: Poisson's and Laplace's equations	
Lecture-3	Solutions of Laplace's equations for electrostatic potential in Cartesian	
Lecture-4	Solutions of Laplace's equations for electrostatic potential in spherical	
Lecture-5	Solutions of Laplace's equations for electrostatic potential in spherical	
Lecture-6	Solutions of Laplace's equations for electrostatic potential in cylindrical coordinates	
Lecture-7	Multipole expansion of the energy of a system of charges in an electrostatic field	
Lecture-8	The scalar magnetic potential	
Lecture-9	The vector magnetic potential	
Lecture-10	Derivation of Maxwell's equations	
Lecture-11	General wave equation	
Lecture-12	Gauge transformations Lorentz and Coulomb gauges Momentum	
Lecture-13	angular momentum and free energies of electromagnetic field	
Lecture-14	Poynting Theorem(work energy theorem in electrodynamics).	
Lecture-15	Related Problems	
UNIT-II	**Propagation of Plane Electromagnetic Waves**	
Lecture-16	Introduction of Propagation of Plane Electromagnetic Waves	
Lecture-17	Electromagnetic (EM) waves in unbounded media	
Lecture-18	EM wave equation for a homogeneous isotropic dielectric medium	
Lecture-19	EM wave equation for a homogeneous isotropic dielectric medium	
Lecture-20	Propagation of plan EM waves in free space	
Lecture-21	-Propagation of EM waves in homogeneous isotropic dielectric medium	
Lecture-22	Impedence, Poynting Vector of the medium	
Lecture-23	Impedence, Poynting Vector of the free space	
Lecture-24	Related Problems	
Lecture-25	Energy transmitted by a plane EM wave	
Lecture-26	Propagation of EM wave in conducing medium	
Lecture-27	Attenuation and Skin effect	
Lecture-28	Energy transmitted	
Lecture-29	Polarization of EM wave	
Lecture-30	Related Problems	
UNIT-III	**Interaction of Electromagnetic Waves with Mater**	
Lecture-31	Introduction of Interaction of Electromagnetic Waves with Mater	
Lecture-32	Propagation of EM waves in bounded media-–- - - - - -—-	
Lecture-33	Boundary conditions for EDB and H	
Lecture-34	Reflection and Refraction of plane EM waves at plane interface between two dielectrics	
Lecture-35	Laws of reflection and refraction	

Lecture-36	Fresnel's relations(E Polarized –Perpendicular to the plane of incidence)	
Lecture-37	Fresnel's relations(E Polarized –Parallel to the plane of incidence)	
Lecture-38	Reflection (R) and Transmission(T) coefficients	
Lecture-39	Brewster's angle	
Lecture-40	Total internal reflection	
Lecture-41	Reflection and Refraction of plane EM waves at plane interface between non-conducing and conducting medium	
Lecture-42	Reflection and Refraction of plane EM waves at plane interface between non-conducing and conducting medium	
Lecture-43	Metallic reflection and its applications	
Lecture-44	Dispersion in non-conductors	
Lecture-45	Normal and anomalous dispersion.	
UNIT-IV Electromagnetic Fields and Radiating Systems		
Lecture-46	Introduction of Electromagnetic Fields and Radiating Systems	
Lecture-47	Electromagnetic radiation	
Lecture-48	Inhomogeneous wave equation for potentials	
Lecture-49	Retarded potentials	
Lecture-50	Multipole expansion of EM radiation for harmonically oscillating source	
Lecture-51	Long wavelength approximation	
Lecture-52	Oscillating electric dipole radiation	
Lecture-53	Oscillating magnetic dipole radiation	
Lecture-54	Radiation from centerfed linear antenna	
Lecture-55	Radiation from accelerated charges	
Lecture-56	LienardWiechert potentials	
Lecture-57	Potentials for a Charging uniform motion – Lorentz formula	
Lecture-58	Electromagnetic field of a charge in arbitrary motion	
Lecture-59	Electric quadrupole radiation	
Lecture-60	Related Problem	

Reference Books:

1 Classical Electrodynamics by SP Puri, Tata McGraw-Hill Publishing Co., Ltd (2000).
2. Introduction to Electrodynamics by DJ Griffiths, Prentice- Hall of India (1998).
3. Electrodynamics by Gupta, Kumar and Singh, PragathiPrakashan Publishing (2007).
4. Electricity and Magnetism by MH Nayfeh and MK Brussel, John Wiley and Sons (1985).
5. Classical Electrodynamics by JD Jackson, John Wiley and Sons (1999).
6. Foundations of Electromagnetic Theory by JR Rietz, FJ Milford and Christy, Publishing house (1986)
7. Engineering Electromagnetics by WH Hayt and JA Buck Tata Mc-Graw Hill (2001)
8. Electromagnetic waves and Radiating systems by EC Jordan and KG Balmain, Prentic Hall (1968)

PHY 204T Paper-IV SUB: Statistical Mechanics

Unit- I Combinational Logic		
Lecture	Topic	Rem arks
Lecture-1	Introduction to logic gates	
Lecture-2	Demorgan's theorem, Boolean algebra,	
Lecture-3	Boolean laws, Sum of Product (SOP)	
Lecture-4	Product of Sum (POS) forms	
Lecture-5	fundamental product, Min terms and Max terms	
Lecture-6	Karnaugh maps (up to 4 variables)	
Lecture-7	Logic families and their performance characteristics	

Lecture-8	RTL (Resistor Transistor Logic)	
Lecture-9	DTL(Diode Transistor Logic)	
Lecture-10	I^2L (Integrated Injection Logic)	
Lecture-11	TTL (Transistor Transistor Logic)	
Lecture-12	ECL (Emitter Coupled Logic)	
Lecture-13	PMOS (P-Type Metal- Oxide-Semi conductor)	
Lecture-14	NMOS(N-Type Metal- Oxide-Semi conductor)	
Lecture-15	CMOS logic (Complimentary Metal- Oxide-Semi conductor)	
Unit- II Sequential Logic		
Lecture-16	Introduction to flip-flops	
Lecture-17	RS flip-flop, operating principals and truth tables	
Lecture-18	RS flip-flop, operating principals and truth tables	
Lecture-19	D flip- flop, operating principals and truth tables	
Lecture-20	D flip- flop, operating principals and truth tables	
Lecture-21	JK flip- flop, operating principals and truth tables	
Lecture-22	MS- JK flip- flop, operating principals and truth tables	
Lecture-23	T flip- flop, operating principals and truth tables	
Lecture-24	Shift and control shift registers and their operations.	
Lecture-25	Shift and control shift registers and their operations.	
Lecture-26	BCD Asynchronous counter	
Lecture-27	modulo-N counters Synchronous and ring counters	
Lecture-28	Encoders and Decoders.	
Lecture-29	RAM,ROM	
Lecture-30	PROM(Programmable Read Only Memory) EPROM(Erasable Programmable Read Only Memory)	
Unit- III Data converters:		
Lecture-31	Introduction to ADC,DAC	
Lecture-32	Digital to Analog converters (DAC) binary weigher	
Lecture-33	R-2R ladder type	
Lecture-34	The Switched Current Source type DAC	
Lecture-35	Analog to digital converters (ADC)	
Lecture-36	Dual slope integrated type	
Lecture-37	simultaneous type	
Lecture-38	successive approximation	
Lecture-39	counter type.	
Lecture-40	The Tracking Type ADC Converter	
Lecture-41	Realization of A/D converter using D/A converter	
Lecture-42	Multiplexer	
Lecture-43	De Multiplexer	
Lecture-44	Problems Solving of DAC Type	
Lecture-45	Problems Solving of ADC Type	
Unit- IV Microprocessors:		
Lecture-46	Introduction to microprocessors	
Lecture-47	Organization and Architecture of Intel 8085.	
Lecture-48	Signal diagram explanation of various functional modules of 8085	
Lecture-49	Flag Register and explanation of various flags with suitable examples	
Lecture-50	Interrupts, Stack	
Lecture-51	formats, addressing modes,	
Lecture-52	instruction groups of 8085	
Lecture-53	Data transfer, Arithmetic,	

Lecture-54	logical branch.	
Lecture-55	I/O and machine control group	
Lecture-56	Interfacing stepper motor	
Lecture-57	Traffic lights to 8085	
Lecture-58	Assembly Language Programs for sorting data	
Lecture-59	Arranging data in Ascending or Descending	
Lecture-60	BCD addition	

Reference Books

1.Microprocessor Architecture, Programming and applications with 8085/8086- Ramesh-S-gaonkar

2. Microprocessor and Microcomputers – B.Ram(TMH)

3. Introduction to Microprocessor – Aditya P.Mathur (TMH)

4. Advanced Microprocessor and Peripherals –A.K.Ray and K.M. Bhurcha

DEPARTMENT OF PHYSICS

UNIVERSITY COLLEGE OF SCIENCE

MAHATMA GANDHI UNIVERSITY, NALGONDA

Semester wise Blow up of Syllabi (2017-18)

Blow up of Syllabi

M.Sc Physics Course under CBCS

(w.e.f academic Year 2017-18)

III - SEMESTER STARTS HERE

DEPARTMENT OF PHYSICS

MHATMA GANDHI UNIVERSITY-NALGONDA

M.Sc(Physics) III-Semester Blow up of the Syllabi

PHY 301T Paper-I SUB: Nuclear Physics

Unit-I Nuclear Force and Nuclear Models		
Lecture	**Topic**	**Remarks**
Lecture-1	Systematic of nuclear force-strength, range, charge independence	
Lecture-2	Deuteron problem-Ground state of Deuteron	
Lecture-3	Magnetic dipole, electric Quadra poles of Deuteron	
Lecture-4	square well potential of Deuteron	
Lecture-5	Exchange force theories- Yukawa theory	
Lecture-6	Majoranna, Bartlett, Heisenberg theories	
Lecture-7	The liquid drop model	
Lecture-8	semi empirical mass formula-Volume, Surface and coulomb energy terms	
Lecture-9	semi empirical mass formula-Asymmetry ,pairing energy terms	
Lecture-10	semi empirical mass formula applications-Mass parabola, stability limits	
Lecture-11	Shell model, states based on square well potential	
Lecture-12	harmonic oscillator potential	
Lecture-13	Predictions-spins and parities of nuclear ground states	
Lecture-14	magnetic moments, electric quadrupole moments	
Lecture-15	Problems on semi empirical mass formula	
UNIT-II Nuclear Decay Processes		
Lecture-16	Radioactivity	
Lecture-17	Gamow's theory of alpha decay-Gamow's formula	
Lecture-18	Gamow's theory of alpha decay- Gamow's factor	
Lecture-19	fine structure of α-spectrum	
Lecture-20	Problems on alpha decay	
Lecture-21	neutrino of hypothesis	
Lecture-22	Fermi's theory of β-decay	
Lecture-23	Coulomb correction	
Lecture-24	Fermi-Kurie plot, angular momentum	
Lecture-25	selection rules for β-decay	
Lecture-26	Forbidden transactions in β-decay	
Lecture-27	Problems on β-decay	
Lecture-28	Gamma decay	
Lecture-29	Multipole radiation	
Lecture-30	selection rules	
Unit- III Nuclear Radiation Detection		
Lecture-31	Interaction of charged particles with matter	
Lecture-32	Stopping power of charged particles- Bohr's theory	
Lecture-33	Bethe's formula	
Lecture-34	Range-energy relation	
Lecture-35	Measurements of range and stopping power for electron-ionization, Back scattering by nuclei	
Lecture-36	Scattering by atomic electron, Brems strahlung radiation	
Lecture-37	problems on range and energy	
Lecture-38	Interaction of gamma rays with matter	

Lecture-39	Photoelectric effect	
Lecture-40	Compton Effect	
Lecture-41	pair production	
Lecture-42	Gamma ray detection using gas-scintillation counter	
Lecture-43	Different processes in scintillation counter	
Lecture-44	solid state detector-Diffused junction detector	
Lecture-45	solid state detector-Surface barrier detector	
Unit- IV	**Nuclear Reactions & Particle Physics**	
Lecture-46	Classification of nuclear reactions	
Lecture-47	Kinematics and Q-value of reactions	
Lecture-48	Basic theory of direct nuclear reactions-Born approximation	
Lecture-49	stripping and pick-up reactions, characteristics	
Lecture-50	cross-sections	
Lecture-51	cross-sections- examples and applications	
Lecture-52	Compound nucleus formation	
Lecture-53	Theory of Fission reaction	
Lecture-54	Theory of fusion reaction	
Lecture-55	Elementary Particles Classification and their Quantum Numbers (Charge, Spin, Isospin etc)	
Lecture-56	Fundamental Forces-Gravitational, Electromagnetic	
Lecture-57	Fundamental Forces-strong, weak interactions	
Lecture-58	Conservation of Parity, Strangeness	
Lecture-59	Conservation of Lepton and Baryon numbers	
Lecture-60	Quark model.	

Recommended Books:

1. Concepts of Nuclear Physics; B.L.Cohen (TMH)
2. Introductory Nuclear Physics: Kenneth S.Krane (Wiley)
3. Nuclear and Particle Physics:Blin-Stoyle (Chapman and Hall)
4. Nuclear Physics;I.Kaplan (Narosa 2002)
5. Introductory Nuclear Physics: W.Wong
6. Introductory Nuclear Physics: S.B.Patel
7. Nuclear Physics: Tayal

PHY 302T Paper-II SUB: ADVANCED QUANTUM MECHANICS

Lecture No.	**Topic**	**Remarks**
UNIT-I -scattering Theory		
Lecture -1	Introduction to scattering	
Lecture -2	Laboratory and center of mass frames of reference	
Lecture-3	Differential and total cross-section	
Lecture-4	Asymptotic from of scattering wave function	
Lecture-5	Green's function to analysis scattering amplitude	
Lecture-6	Scattering amplitude by Green's method	
Lecture -7	Born approximation method	
Lecture-8	screened potential - Born approximation	
Lecture-9	square well potential- Born approximation	
Lecture-10	Partial wave analysis	
Lecture-11	phase shift-Optical Theorem	
Lecture-12	Scattering amplitude in terms of phase shift	
Lecture-13	Relationship between phase shift and Potential	
Lecture-14	Scattering by Hard sphere.	
Lecture-15	Scattering by square well potential	

UNIT-II - Time dependent Perturbation theory		
Lecture-16	Introduction of Time dependent perturbation theory	
Lecture-17	Time development of operators	
Lecture -18	Time development of state vector(Evolution operator)	
Lecture-19	Variation constants (coefficients)	
Lecture-20	Transition probability (first and second order time dependent perturbation)	
Lecture-21	Selection rules for transition	
Lecture-22	Constant perturbation	
Lecture -23	Transition probability closely spaced levels-Fermi golden rule	
Lecture-24	Harmonic perturbation-transition probability rate	
Lecture -25	Interaction of atom with electromagnetic radiation	
Lecture -26	Transition rates in atom (due to absorption of incident em radiation), emission probability	
Lecture-27	Electric Dipole approximation	
Lecture-28	Find transition probability using dipole approximation	
Lecture-29	Einstein Coefficients	
UNIT-III-Many electron atoms		
Lecture-30	Introduction of many electron atoms(indistinguishable, symmetric and asymmetric wave function	
Lecture-31	Pauli principle- inclusion of spin function, slater determinant	
Lecture -32	Central field approximation	
Lecture-33	Thomas-Fermi atom Model	
Lecture -34	Self consistent Field method of Hartee	
Lecture-35	Hartee –fock equation	
Lecture-36	Physical interpretation of Hartee –fock equation	
Lecture -37	Constants of motion in central field approximation-	
Lecture -38	Corrections in central field approximation	
Lecture -39	Born Oppenheimer method- molecular orbital theory	
Lecture-40	MO treatment of Hydrogen Molecule $\square_{\square}^{+}$ ions	
Lecture -41	MO treatment of Hydrogen Molecule	
Lecture -42	Valance bond treatment of Hydrogen Molecule $\mathbf{H_2^+}$ ions	
UNIT-IV		
Lecture-43	Valance bond treatment of Hydrogen Molecule	
Lecture -44	Introduction to Relativistic Quantum Mechanics	
Lecture -45	Klein –Gordon equation	
Lecture-46	Interpretation of Klein –Gordon equation	
Lecture-47	Dirac Equation for free particle	
Lecture-48	Dirac Matrices	
Lecture -49	Properties of Dirac Matrices	
Lecture -50	Covariant form of Dirac Matrices-Probability density	
Lecture-51	Gamma matrices and its properties	
Lecture-52	Plane wave solution for Dirac matrices	
Lecture-53	energy eigen functions	
Lecture -54	Energy spectrum significance of negative energy states	
Lecture-55	Spin angular momentum of Dirac particle	
Lecture-56	Spin angular momentum of Dirac particle	
Lecture-57	Dirac equation in the presence of EM field	

Reference Books:

1. Quantum mechanics – L.I.Shiff.

2. A Text of Quantum Mechanics-P.M.Mathews & Venkatesan.
3. Quantum Mechanics by E Merzbacher (John Wiley)
4. Modern Quantum Mechanics by Sakurai (Addison Wesley)

PHY 303/E T Paper-III SUB: MICROWAVES & ANTENNA SYSTEMS
(Electronic Communication Specializations)

Unit- I Introduction to Microwaves & Microwave transmission lines		
Lecture	Topic	Remarks
Lecture-1	Introduction to Microwaves & Microwave transmission lines	
Lecture-2	Microwave characteristics-microwave bands	
Lecture-3	Advantages & Disadvantages of microwaves	
Lecture-4	Microwave Applications	
Lecture-5	Transmission line equations	
Lecture-6	Transmission line solutions	
Lecture-7	Losses in Transmission line	
Lecture-8	Reflection coefficient	
Lecture-9	Transmission coefficient	
Lecture-10	Standing wave and Standing wave ratio.	
Lecture-11	Line impedance and Admittance.	
Lecture-12	Impedance matching	
Lecture-13	Determination of Characteristics Impedance	
Lecture-14	Microwave Coaxial Connectors	
Lecture-15	Problems solving on Transmission line equations	
Unit- II Microwave Waveguides		
Lecture-16	Introduction to microwave wave guides	
Lecture-17	Maxwell equations in time domain & Frequency Domain	
Lecture-18	Electric & Magnetic wave equations	
Lecture-19	Poynting theorem	
Lecture-20	Rectangular waveguide, solutions of wave equations in Rectangular coordinates,	
Lecture-21	TE Mode in rectangular waveguides.	
Lecture-22	TM Mode in rectangular waveguides.	
Lecture-23	Power Transmission and Power losses in rectangular waveguide.	
Lecture-24	Circular waveguides. Solutions of wave equations in cylindrical coordinates	
Lecture-25	TE Mode in Circular waveguides.	
Lecture-26	TM Mode in Circular waveguides.	
Lecture-27	TEM Mode in Circular waveguides	
Lecture-28	Mode excitation in Wave guides	
Lecture-29	Field patterns	
Lecture-30	Problems solving on rectangular & Circular waveguides	
Unit- III Microwave Components & Microwave Sources		
Lecture-31	Microwave hybrid circuits	
Lecture-32	Scattering(S) parameters or Matrix – S Matrix formulation.	
Lecture-33	Waveguide Tees – E –Plane	
Lecture-34	Waveguide Tees H – Plane	
Lecture-35	Waveguide Magic Tees	
Lecture-36	Hybrid Rings, Directional Couplers,	
Lecture-37	Faraday rotation and its applications	
Lecture-38	Gyrator, Microwave Circulators	
Lecture-39	Microwave Isolators.	
Lecture-40	Klystron, Reentrant cavities,	

Lecture-41	velocity modulation	
Lecture-42	Bunching process.	
Lecture-43	Power output and Beam loading, Efficiency of Klystron	
Lecture-44	Reflex Klystron, Velocity modulation	
Lecture-45	Power output and Efficiency.	
Unit- IV Antennas & Wave propagation& Internet Technologies		
Lecture-46	Antenna fundamentals, Magnetic and Electric fields.	
Lecture-47	Antenna operation, Polarization, Antenna reciprocity.	
Lecture-48	Basic antenna, Dipole antenna	
Lecture-49	radiation resistance	
Lecture-50	Dipole length, antenna Q and band width,	
Lecture-51	Radiation pattern,	
Lecture-52	Directivity, Antenna gain	
Lecture-53	V.H.F Antennas: Reflector (corner) Antennas	
Lecture-54	loop antenna.	
Lecture-55	Microwave Antennas: Parabolic reflector antenna	
Lecture-56	gain, beam width	
Lecture-57	feed methods	
Lecture-58	Horn antenna	
Lecture-59	Internet applications	
Lecture-60	How the Internet works.	

Reference Books

1. Microwave Integrated Circuits – K.C.Guptha
2. Electronic Communication – Dennis Rody and John Collins
3. Electronic Communication Systems – Kennedy and Devins
4. Antenna Theory –K D Prasad.
5. Concepts & Applications of Microwave Engineering – Sanjay kumar & Saurabh Shukla

PHY 303/NCE T Paper-III SUB: PHOTO VOLTAICS (NCEP Specialization)

UNIT–I : ENERGY RESOURCES - INTERACTION OF LIGHT WITH SEMICONDUCTOR		
Lecture No.	**Name of the Topic**	**Remarks**
Lecture-1	Introduction of Energy Resources and their Classifications	
Lecture -2	Conventional and Non-Conventional Energy Resources	
Lecture-3	Need have RE source - advantages and limitations of RE source	
Lecture -4	Energy from the sun - solar spectral distribution	
Lecture-5	Solar constant- solar insolation - Declination-Azimuth Angles	
Lecture-6	Direct Radiation –Diffuse Radiation-Total Solar Radiations.	
Lecture-7	Solar intensity at earth's surface and outside earth's surface.	
Lecture-8	Solar intensity measurements by – Pyranometer and Pyrheliometer	
Lecture-9	Interaction of light with semiconductor	
Lecture-10	Direct and Indirect band gap semiconductor	
Lecture-11	Recombination processes -Radioactive recombination.	
Lecture-12	Recombination processes -Radioactive recombination.	
Lecture-13	Auger recombination, Recombination through traps	
Lecture-14	Basic equations of Semiconductor Device physics-Derivation of Poisson's and Current density equations	
Lecture-15	Derivation of Continuity equations and set of equations	

UNIT- II : JUNCTION DIODES AND SOLAR CELL PARAMETERS		
Lecture-16	Introduction of p-n junction and I-V equation	
Lecture -17	Energy band diagram of p-n junction	
Lecture-18	Derivation of P-n junction potential (Built-in-voltage)equation	
Lecture-19	Carrier concentration profile – Diffusive flow in Quasi – neutral regions,	
Lecture-20	Dark characteristics: Minority carriers in quasi neutral regions-Minority carrier currents	
Lecture-21	P-n junction under Illumination – Characteristics	
Lecture-22	Photo-Voltaic systems (PVS) and their merits - limitations	
Lecture-23	Formation of PV– Cell and Principle of Solar cell (PV– Cell)	
Lecture-24	Types of PV cell and I-V equation of Solar cell	
Lecture-25	Solar cell output parameters: Short circuit current, Open circuit voltage and their equations	
Lecture-26	Solar cell output parameters: Fill Factor, Efficiency	
Lecture-27	Effect of finite cell dimensions on I_o – Effect of temperature on solar cell performance	
Lecture-28	Efficiency losses : Short circuit current losses – Open circuit voltage losses	
Lecture-29	Fill factor losses - Series, Shunt resistance losses– resistance due to Ohmic contacts.	
Lecture -30	Problems	
UNIT- III : DESIGN AND FABRICATION OF SOLAR CELLS		
Lecture -31	Introduction to Preparation of PV cell : stage 1) Purification of SiO_2 from Metallurgical grade Silicon (MGSi – Si)	
Lecture -32	Stage 2) Metallurgical grade Si to Semiconductor grade Si (MGSi to SGSI) : (i) High purity Si-containing gases	
Lecture -33	MGSi to SGSI : (ii). High purity Solid Poly crystalline Si	
Lecture-34	Stage 3) Semiconductor grade Si to Single crystal Si-wafers (SGSI to SCW) : (i). CZ process	
Lecture-35	SGSI to SCW : (ii). FZ process	
Lecture-36	Stage 4) Single crystal Si-wafers to Solar cell (SCW to PV-Cell)	
Lecture-37	Types of Solar Cell – their properties	
Lecture-38	PV Module-PV Panel-PV Array - construction	
Lecture-39	Preparation of homo junction and hetero junction –PV cell and their properties and applications	
Lecture-40	Thin film solar cells-their properties and applications	
Lecture-41	Solar cell interconnection- Collection probability of generated carriers	
Lecture-42	Solar cell -Junction depth- Lateral resistance of top layer	
Lecture-43	Doping of the substrate- back surface fields	
Lecture-44	Solar cell -Top layer limitations (Dead layers- high doping effects) - Top contact design	
Lecture-45	Solar cell -Optical design (Anti reflection coating- Texture surfaces & grid structure)	
UNIT- IV : BATTERIES		
Lecture-46	Introduction to Batteries -Basic components of a Battery	
Lecture-47	Cell to Battery- Classification of Batteries-Primary- Batteries and Secondary Batteries	
Lecture-48	Definitions of fundamental quantities of Batteries	

Lecture -49	Factor affecting on battery performance	
Lecture-50	Different types of battery arrangement –series-parallel and mixed	
Lecture -51	Electrochemical batteries –characteristics	
Lecture -52	Large capacity approaches : Pumped hydro storage-storage of Air-Storage of Hydrogen	
Lecture -53	Power conditioning equipment: (i). DC to AC Inverter	
Lecture -54	(ii). AC to DC Converter- merits	
Lecture -55	Difference b/w conventional battery and Fuel cell.	
Lecture -56	Batteries for PV systems: Lead acid battery Charging and discharging	
Lecture -57	Nickel Cadmium (Ni-Cd) Battery Charging and discharging	
Lecture -58	Advantages of batteries for bulk energy storage- Comparison of batteries	
Lecture -59	Design of PV - powered DC fan without battery and DC pump- Solar PV system	
Lecture -60	Design of PV - powered DC fan without battery and DC pump- Solar PV system	

References:

1. Solar Cells-Operating Principles Technology and system application by Martin A. Green
2. Energy Technology: S.Rao & B.B.Parulekar
3. Solar Photovoltaics: Chetan Singh Solanki
4. Non-Conventional Energy Resources:D.S. Chauhan. S.K. Srivastava
5.Photovoltaic systems-Analysis & Design: A.K. Mukerjee -Thakur.

PHY 304/E T Paper-IV SUB: ANALOG & DIGITAL TRANSMISSION TECHNIQUES AND INFORMATION THEORY (Electronic Communication Specializations)

Unit-I Analog signal Transmission		
Lecture	Topic	Remarks
Lecture-1	Introduction on Analog Signals	
Lecture-2	Need for modulation	
Lecture-3	Frequency spectrum for sinusoidal AM	
Lecture-4	Power Calculation of AM	
Lecture-5	Modulation Index (m_a)	
Lecture-6	Amplitude Modulation Systems(Introduction)	
Lecture-7	Suppressed Carrier Systems (DSB-SC)	
Lecture-8	Single-Side band Modulation Systems (SSB)	
Lecture-9	Detection of AM signals	
Lecture-10	Frequency Modulation (FM), Frequency Spectrum for Sinusoidal FM	
Lecture-11	Frequency Modulation Methods	
Lecture-12	Detection of FM waves	
Lecture-13	FM Demodulation with Discriminator	
Lecture-14	Phase Modulation (PM)	
Lecture-15	Problems on carrier and modulating signal power, signal voltage, AM Index etc.	
UNIT-II **Digital Transmission of Analog Signals**		
Lecture-16	Introduction on Analog to Digitals	

Lecture-17	Sampling theorem	
Lecture-18	Sampling of Band pass Signal	
Lecture-19	The discrete of Fourier Transform	
Lecture-20	Pulse Amplitude Modulation (PAM) Channel Bandwidth for PAM,	
Lecture-21	Natural sampling, Flat – top sampling	
Lecture-22	Signal recovery through holding	
Lecture-23	Quantization of signals, Quantization of error	
Lecture-24	Pulse Code Modulation (PCM), PCM system	
Lecture-25	Signal Companding	
Lecture-26	Digital Signal Companding	
Lecture-27	Review of analog and digital signal Companding	
Lecture-28	Multiplexing PCM signals	
Lecture-29	Differential PCM	
Lecture-30	Delta modulation	
Unit- III Digital Modulation Techniques & information Theory		
Lecture-31	ASK, Generation and Detection	
Lecture-32	FSK, Generation and Detection	
Lecture-33	PSK, Generation and Detection	
Lecture-34	Differential Phase Shift Keying (DPSK)	
Lecture-35	Information Theory: Discrete messages	
Lecture-36	Average information, Entropy	
Lecture-37	Shanon- Feno Coding transmission	
Lecture-38	Information rate,	
Lecture-39	Shannos's theorem, Channel Capacity,	
Lecture-40	Capacity of Gaussian- channel	
Lecture-41	Band width – S/N trade off	
Lecture-42	Use of orthogonal signals to attain shannon's limit	
Lecture-43	Error Probability	
Lecture-44	Efficiency of Orthogonal signal transmission	
Lecture-45	Review of the Digital Transmission	
Unit- IV Coding		
Lecture-46	Need for coding	
Lecture-47	Parity check bit coding for Error detection	
Lecture-48	coding for error detection and Correction	
Lecture-49	Block Codes	
Lecture-50	Coding and Decoding for block codes	
Lecture-51	Decoding the Received Code word	
Lecture-52	Single Parity-Check Bit Code	
Lecture-53	Repeated Codes	
Lecture-54	Hadamard Code	
Lecture-55	Hamming Code	
Lecture-56	Algebraic Codes	
Lecture-57	Burst-error correction	
Lecture-58	Convolution Coding and Decoding, Error in Convolution Codes	
Lecture-59	Automatic Repeat Request (ARQ)	
Lecture-60	Efficiency of ARQ's	

Reference Books

1. Communication Systems Analog and Digital- R.P.Singh and S.D.Spare, TMH, 2004

2. Digital and Analog Communication Systems – K.SamShanmugam, John Wiely, 2005

3. Communication Systems – B.P.Lathi, BS Publications 2006

4.Principles of Communication Systems - H-Taub and D.L.Schilling and GoutamSahe, 3rd Ed.TMH

5.Digital Communications – john Proakis, TMH, 1983

PHY 304/NCE T Paper-IV SUB: HYDROGEN ENERGY (NCEP Specialization)

Lecture	Topic	Remarks
Unit-I Fundamentals of Hydrogen		
Lecture-1	Distinguish between conventional and non-conventional Energies	
Lecture-2	Introduction, Energy conversion	
Lecture-3	Physical properties of hydrogen -State and Phase	
Lecture-4	Triple point of Hydrogen	
Lecture-5	Toxicity Other gases accompanying Hydrogen	
Lecture-6	Chemical Properties -Density and specific gravity	
Lecture-7	Specific volume, Expansion ratio	
Lecture-8	Hydrogen content	
Lecture-9	Energy content, Energy density	
Lecture-10	Flammability, Ignition Energy	
Lecture-11	Auto ignition temperature, Burning speed	
Lecture-12	Octane number	
Lecture-13	Quenching gap, Flame characteristics	
UNIT-II Production of Hydrogen		
Lecture-14	Methods of production of Hydrogen - Production from fossil Sources	
Lecture-15	production of Hydrogen- steam reforming	
Lecture-16	partial oxidation,	
Lecture-17	Production by Electrolysis	
Lecture-18	Production by Alkaline electrolysis	
Lecture-19	Production by polymer electrolyte membrane(PEM) electrolysis	
Lecture-20	Production by photo electrolysis	
Lecture-21	Photo-biological Hydrogen Production	
Lecture-22	Production by thermo chemical water splitting	
Lecture-23	Production by Artificial photosynthesis	
Lecture-24	Production from Solar energy	
Lecture-25	Production from Biomass	
Lecture-26	Production from Coal gasification	
Lecture-27	Production from auto thermal reforming	
Lecture-28	Chemical byproducts of fuel reaction.	
Unit- III Hydrogen Storage and Transportation		
Lecture-29	Classification of hydrogen storage devices and systems	
Lecture-30	Hydrogen storage methods- Liquid hydrogen storage	
Lecture-31	Metal hydrides,	
Lecture-32	Gas on solids, adsorption	
Lecture-33	Physisorption and chemisorption	
Lecture-34	material based storage	
Lecture-35	Hydrogen storage in nanostructure carbons	
Lecture-36	Challenges of hydrogen storage	

Lecture-37	Hydrogen transportation- pipe line	
Lecture-38	Hydrogen transportation-road, train	
Lecture-39	Hydrogen leakage, methods to detect the leakage	
Lecture-40	Bubble Testing Method, Pressure Decay Method	
Lecture-41	Thermal Conducting Detection Method	
Lecture-42	Semiconducting oxide method	
Lecture-43	Electrochemical, Ultrasonic Methods	
Lecture-44	Utilization of Hydrogen gas, Hydrogen as an alternative fuel for motor vehicles	
Lecture-45	safety and management, application of hydrogen energy	
Unit- IV Fuel Cells		
Lecture-46	Introduction, Explanation of Fuel cell	
Lecture-47	Theory of electro-chemistry applied to fuel cells	
Lecture-48	Principle and operation of fuel cells	
Lecture-49	Fuels , Oxidants and electrolyte materials for fuel cells	
Lecture-50	Classification and types of fuel cells	
Lecture-51	Types of Fuel Cells- Acidic Electrolyte fuel cells	
Lecture-52	Alkaline Electrolyte fuel cells, molten carbonate fuel cells(MCFC)	
Lecture-53	Solid Oxide Fuel Cells (SOFC), Methanol fuel cell	
Lecture-54	Fuel cell with permeable ion exchange membrane(PEMFC), phosphoric acid fuel cell(PAFC),	
Lecture-55	Zinc-Air fuel cell(ZAFC),	
Lecture-56	Regenerative fuel cell(RFC),Reversible fuel cell	
Lecture-57	Electrical circuit and quantities, Performance characteristics of fuel cells	
Lecture-58	Heat generated by fuel cells, Gibbs-Helmholtz equation	
Lecture-59	Advantages, limitations	
Lecture-60	Applications of fuel cells	

Reference;

1. Non Conventional Energy Resources-S. Hasan saeed, D.K. Sharma.
2. Non Conventional Energy Resources –D.S. Chauhan, S.K.Srivastava.
3. Energy Technology- S.Rao and Dr.B.B.Parulekar .
4. Non Conventional Energy Sources- G.D .Rai

DEPARTMENT OF PHYSICS

UNIVERSITY COLLEGE OF SCIENCE

MAHATMA GANDHI UNIVERSITY, NALGONDA

Semester wise Blow up of Syllabi (2017-18)

Blow up of Syllabi

M.Sc Physics Course under CBCS

(w.e.f academic Year 2017-18)

IV - SEMESTER STARTS HERE

DEPARTMENT OF PHYSICS
MHATMA GANDHI UNIVERSITY-NALGONDA
M.Sc(Physics) IV-Semester Blow up of the Syllabi

PHY 401T Paper-I SUB: Modern Optics & Spectroscopy

Unit-I Principles of Lasers & Laser Systems		
Lecture	**Topic**	**Remarks**
Lecture-1	Introduction to Laser light	
Lecture-2	Emission and absorption of Radiation	
Lecture-3	Einstein Relations(coefficients), their significance	
Lecture-4	Pumping Mechanisms – Optical feedback	
Lecture-5	Laser Rate equation for Two level systems	
Lecture-6	Rate equation for Three level systems	
Lecture-7	Rate equation for Four level systems	
Lecture-8	Pumping threshold conditions	
Lecture-9	Laser modes of rectangular cavity	
Lecture-10	Properties of Laser beams	
Lecture-11	Classification of laser systems- Gas and solid lasers and Energy level schemes	
Lecture-12	Construction and working principle of He-Ne laser	
Lecture-13	Construction and working principle of CO_2 laser	
Lecture-14	Construction and working principle of Ruby laser	
Lecture-15	Construction and working principle of Neodymium-YAG laser	
UNIT-II Holography & Non –Linear Optics		
Lecture-16	Introduction to holography and photography	
Lecture-17	Basic principle of Holography	
Lecture-18	Recording of Amplitude and phase	
Lecture-19	Recording medium-reconstruction of Original wave front	
Lecture-20	Image formed by wave front reconstruction	
Lecture-21	Gabor Hologram- Limitation of Gabor Hologram	
Lecture-22	Different types of Holograms-Fourier transform Holograms	
Lecture-23	Volume Holograms	
Lecture-24	Spatial frequency filtering, Applications of Holograms	
Lecture-25	Non-Linear Optics- Harmonic generation	
Lecture-26	Second Harmonic generation	
Lecture-27	Phase matching condition	
Lecture-28	Optical mixing	
Lecture-29	Paramagnetic generation of light	
Lecture-30	Self focusing of light	
Unit- III Atomic Spectra		
Lecture-31	Introduction to atomic energy levels	
Lecture-32	Different series in alkali spectra(main features)	
Lecture-33	Ritz combination principle	
Lecture-34	Terms for equivalent & non equivalent electron atoms	
Lecture-35	Term value in alkali spectra and quantum defect	
Lecture-36	L-S coupling Energy level and spectra	
Lecture-37	j-j coupling Energy level and spectra	

Lecture-38	Spin-Orbit Interaction	
Lecture-39	Doublet Structure in Alkali spectra(Fine Structure)	
Lecture-40	Transition selection rules, intensity rules	
Lecture-41	Alkali- like spectra	
Lecture-42	Lamb shift	
Lecture-43	Many electron atoms, isotope shift	
Lecture-44	Hyperfine splitting of spectral lines, selection rules	
Lecture-45	Lande interval rule,	
Unit- IV	**Molecular Spectra**	
Lecture-46	Introduction to Molecular bonding and energy states	
Lecture-47	Types of molecular spectra, region of Spectrum	
Lecture-48	Salient features of rotational spectra	
Lecture-49	Rotational spectra of diatomic molecules as rigid rotor	
Lecture-50	Selection rules and analysis of rotational spectrum	
Lecture-51	Energy levels and spectra of a non-rigid rotor	
Lecture-52	Selection rules and analysis of a non-rigid rotor rotational spectrum	
Lecture-53	Effect of isotopic substitution on rotational spectra	
Lecture-54	Salient features of Vibrational-Rotational spectra	
Lecture-55	Vibrational spectra of diatomic molecule as harmonic oscillator	
Lecture-56	Vibrational spectra of diatomic molecule as anharmonic oscillator	
Lecture-57	Transition rules, analysis of spectrum	
Lecture-58	Diatomic molecule as rigid rotor and harmonic oscillator	
Lecture-59	Diatomic molecule as non-rigid rotor and anharmonic oscillator	
Lecture-60	Applications vibrational spectroscopy, problem solving	

Reference Books

1. Opto electronics – Introduction –Wilson & JFB Hawkes 2nd Edition
2. Atomic Spectra & Atomic Structure –Gerhard Hertzber

PHY 402T Paper-II SUB: Physicsof Phonons and nano materials

Unit-I	**Phonons and diffussion in solids**	
Lecture	**Topic**	**Remarks**
Lecture-1	Introduction to Lttice vibraton	
Lecture-2	Phonons and their Properties	
Lecture-3	Crystal momentum, Neutron diffracton from Phonons	
Lecture-4	Thermal conductivity of solids	
Lecture-5	Role of phonons in thermal conductivity	
Lecture-6	Normal and umklapp Process	
Lecture-7	Photon-phonon interacton, To and Lo phonons	
Lecture-8	Solid state diffusion, Selfdiffusion, Impurity diffusion	
Lecture-9	Fick's Second law,Diffussion coeefficient	
Lecture-10	Solutions of diffusion coeffisients	
Lecture-11	Random walk diffusion and correlated and uncorrelated motions,	
Lecture-12	Diffusion in a simple cubic structure	
Lecture-13	Diffusion under external field, Nernst-Einstein relation,	
Lecture-14	Correlation factor'f', Kirkendall shift. Ionic conductivity,	
Lecture-15	Ionic conductivity of alkali halides and effect of divalentimpurities on ionic conductivity	
UNIT-II	**Superconductivity**	
Lecture-16	Introducton to superconductivity, Occurrence of superconductivity	

Lecture-17	Experimental observations –persistent currents	
Lecture-18	effect of magnetic field, Meissner effect	
Lecture-19	Type I and type II superconductors.	
Lecture-20	Isotope effect, entropy	
Lecture-21	heat capacity and thermal conductivity	
Lecture-22	Energy gap	
Lecture-23	Theoretical explanations:-penetrationdepth	
Lecture-24	London equations	
Lecture-25	Cooper pairs and elements of BCS theory.	
Lecture-26	Giaver tunneling	
Lecture-27	Josephson effects (Basic ideas only)	
Lecture-28	Josephson effects (Basic ideas only)	
Lecture-29	Elements of high temperature superconductors (basic concepts	
Lecture-30	Applications of superconductors.	
Unit- III Classification & Synthesis of Nanomaterials		
Lecture-31	Introduction to Nanomaterials	
Lecture-32	Role of size in nanomaterials	
Lecture-33	Classification of Nano structured materials-0D, 1D	
Lecture-34	Classification of Nano structured materials- 2D, 3D.	
Lecture-35	Nanowires	
Lecture-36	Nanoclusters, Quantum wells	
Lecture-37	Properties of nano materials	
Lecture-38	Application of nano materials	
Lecture-39	Synthesis routes and Methods: Top down	
Lecture-40	Synthesis routes and Methods: Bottom up	
Lecture-41	Physical methods: Inert gas condensation-Arc discharge	
Lecture-42	RF Plasma-vapour deposition	
Lecture-43	Chemical Methods: Chemical nucleation theory for cluster formation,	
Lecture-44	Metal nanocrystal by reduction method	
Lecture-45	Hybrid methods: Sol-gel process	
Unit- IV Characterization Methods		
Lecture-46	Characterization: Introduction	
Lecture-47	Structure of Nanomaterials-X-Ray Diffraction (XRD)	
Lecture-48	The powder method	
Lecture-49	Electron Microscopy: Atomic Force Microscopy (AFM)	
Lecture-50	Scanning Electron Microscope(SEM)	
Lecture-51	Transmission Electron Microscope (TEM)	
Lecture-52	Spectroscopy Techniques: Introduction	
Lecture-53	Continue to previous lecture	
Lecture-54	Fourier Transform Infrared Spectroscopy (FTIR),	
Lecture-55	Continue to previous lecture	
Lecture-56	Raman Spectroscopy	
Lecture-57	Raman Spectroscopy	
Lecture-58	DSC(Differential Scanning Calorimetry)	
Lecture-59	UV-VIS spectroscopy	
Lecture-60	Continue to previous lecture	

Recommended Text Books:

1. Solid state physics -G.Burns
2.Solid state physics – Dekker

3. Solid state physics – Wahab
4.Text book of nanoscience and nano technology- B.S.Murthy, P.Shankar, Baldev raj, BB Rath and James
. 5.Murday,University press,IIM,Metellurgy and Meterial science
6.Principles of nano science and Technology-M.A.Shah,Tokkeer Ahmad,Narosa Publishig house
7.Sprin Hand book of nano technology- Bharath Bhushan
8.Chemistry of Nano materials: Synthesis, Properties and applicatons by C.N.R.Rao, et al
9.Nano materials Hand book- Yury Gogosti

PHY 403/E Paper – III Sub: Optical Fiber Communication
(Electronic Communication Specializations)

Unit-I Optical Fiber Preparation &Wave guiding		
Lecture	Topic	Remarks
Lecture-1	Basic Structure of Optical Fiber	
Lecture-2	Ray Theory of Transmission, Total Internal Reflection	
Lecture-3	Acceptance Angle, Numerical Aperture	
Lecture-4	Step Index Optical Fiber, Graded Index Optical Fiber	
Lecture-5	Single Mode and Multi-Mode Optical Fibers	
Lecture-6	Fiber Material Preparation Techniques (Vapor Phase Deposition Technique)	
Lecture-7	Outside Vapor Phase oxidation Process(OVPO) Vapor Axial Deposition(VAD)	
Lecture-8	Modified Chemical Vapor Deposition(MCVD), Plasma Activated Chemical Vapor Deposition(PCVD).	
Lecture-9	Fiber drawing processes-Double Crucible Method	
Lecture-10	Cable Designing, Splices & Connectors.	
Lecture-11	Electromagnetic Mode Theory for Optical Propagation(Derivation)	
Lecture-12	Mode theory of circular waveguides	
Lecture-13	Single mode fibers,	
Lecture-14	Graded index fiber – WKB approximations for estimating number of modes.	
Lecture-15	Problems	
Unit-II Transmission Characteristics		
Lecture-16	Attenuation, Absorption,	
Lecture-17	Intrinsic Absorption, Extrinsic Absorption	
Lecture-18	Leaky Modes, Rayleigh Scattering losses	
Lecture-19	Macro and Micro Bending losses	
Lecture-20	Radiation Losses, Core and Cladding Losses	
Lecture-21	Signal distortion in optical waveguides (Pulse broadening)	
Lecture-22	Intermodal and Intermodal (Chromatic) Dispersion	
Lecture-23	Material Dispersion	
Lecture-24	Waveguide Dispersion	
Lecture-25	Polarization-mode Dispersion	
Lecture-26	Electrical Vs. Optical Bandwidth,	
Lecture-27	Bandwidth-Length Product	
Lecture-28	Dispersion Calculation	
Lecture-29	Mode- Field Diameter.	
Lecture-30	Review	
Unit- III Optical sources and detectors		
Lecture-31	Basic Semiconductor Properties	
Lecture-32	Light source materials	
Lecture-33	Internal quantum efficiency	
Lecture-34	modulation capability, transient response	

Lecture-35	power bandwidth product	
Lecture-36	Planar LED, Dome LED	
Lecture-37	Surface Emitter LED	
Lecture-38	Edge Emitter LED	
Lecture-39	Characteristics of Photo detectors	
Lecture-40	Photo emissive Diode	
Lecture-41	Photoconductive Diode and Photo Voltaic Diode	
Lecture-42	Injection laser diodes, PIN Photo detectors,	
Lecture-43	Avalanche Photodiodes (APD)	
Lecture-45	Photo Transistor	
Unit- IV Communication systems		
Lecture-46	Optical Time Division Multiplexing (OTDM),	
Lecture-47	Coarse Wavelength Division Multiplexing (CWDM)	
Lecture-48	Dense Wavelength Division Multiplexing (DWDM)	
Lecture-49	Coherent optical fiber detection system	
Lecture-50	Coherent detection principle, Coherent system performance	
Lecture-51	Comparison of direct and coherent detection performance	
Lecture-52	Practical coherent system constraints	
Lecture-53	Homodyne System Experiment Gas Lasers,	
Lecture-54	Homodyne System Experiment Gas Lasers	
Lecture-55	Heterodyne System Experiment Using External Cavity Lasers	
Lecture-56	Heterodyne System Experiment Using External Cavity Lasers	
Lecture-57	Heterodyne System Experiment Using External Cavity Lasers	
Lecture-58	Heterodyne System Experiment Using External Cavity Lasers	
Lecture-59	Heterodyne System Experiment Using a Distributed- Feedback (DFB) Laser Transmitter	
Lecture-60	Heterodyne System Experiment Using a Distributed- Feedback (DFB) Laser Transmitter	

Reference:

1.Optical Fiber Communication – Gerad Keiser 3rd Ed.MGH2000

2.Optical Fiber Communication – John M Senior, 2nd Ed.PHI,1999

3.Optical Fiber Communication – SC Guptha, PHI

4.Optical Fibers – T.Gowar

5.Optical Fiber Communication – Joseph C Palais PEA 4th Ed. 2nd Indian Reprint 2002

6.Optical Fiber Communication Principles and systems–A,SalvarajanS.Kar and T.Srinivas,TMH, 2002

7.Introduction to Fiber Optics- A. Ghatak and Tyagarajan(Cambridge UniversityPress)

PHY 403/NCE Paper – III Sub: SOLAR THERMAL ENERGY (NCEP Specialization)

Lecture No.	**Topic**	**Remarks**
Unit-I :Heat transfer systems		
Lecture-1	Introduction to Modes of heat transfer	
Lecture -2	Conduction mode of heat transfer- Fourier's Law of Heat Conduction	
Lecture-3	One – Dimension heat conduction through plane wall -composite walls-their equations	
Lecture-4	One – Dimension heat conduction through -hallow cylinders-pipes-their equations	
Lecture-5	Thermal conduction- Thermal resistance	
Lecture-6	Analogy between heat conduction and electricity flow	
Lecture-7	The energy balance of heat transfer system	
Lecture-8	Convection mode heat transfer and its types	

Lecture -9	Mechanism of natural and forced convection	
Lecture-10	Dimensionless numbers and their physical significance	
Lecture -11	Radiation heat transfer- Radiative heat transfer coefficient	
Lecture-12	Radiation heat transfer- Radiative heat transfer coefficient	
Lecture -13	Blackbody-heat exchange and Sky Radiation its equation	
Lecture-14	Combined heat transfer systems: Convection and Radiation in parallel	
Lecture -15	Convection and Conduction in series -Combined heat transfer systems	
Lecture -16	Overall heat transfer coefficient - Problems	
Unit- II. Liquid Flat Plate Collector and Solar Concentrators		
Lecture -17	Introduction of solar collector – Liquid flat plate collector.	
Lecture-18	Materials for flat plate collector: Absorber plate – Insulation and Cover plates.	
Lecture-19	Efficiency of flat plate collector its limits	
Lecture- 20	Efficiency of flat plate collector its limits	
Lecture-21	Improving efficiency of flat plate collector	
Lecture -22	Overall heat loss coefficient of flat plate collector	
Lecture-23	Heat loss from the top of collector plate - Selective surfaces of flat plate collector.	
Lecture -24	Flat plate air heating collectors: Types of air heating collectors,	
Lecture-25	Testing of solar collector.	
Lecture -26	Classification of solar concentrators	
Lecture-27	Parameters characterizing concentrators	
Lecture -28	Thermodynamic limits to concentration	
Lecture -29	Performance analysis of cylindrical parabolic collectors	
Lecture-30	Compound parabolic collectors	
Lecture -31	Materials for solar concentrators:	
Lecture-32	Materials for solar concentrators:	
	a. Materials for reflecting and refracting surfaces	
	b. Materials for the Absorber, Absorber Cover- Absorber surface coating	
	c. Heat transfer fluids on the insulation on the portion of the Absorber	
Unit- III. Solar Refrigeration - Air Conditioning and Solar Energy Storage		
Lecture- 33	Introduction to Solar refrigeration - Air conditioning- Carnot Refrigeration cycle	
Lecture-34	Absorption cooling - Principle of absorption cooling	
Lecture-35	Basics of absorption cooling	
Lecture-36	Lithium Bromide - Water (Li-Br- H_2O) absorption system	
Lecture-37	Aqua-Ammonia absorption (H_2O – NH_3) system	
Lecture-38	Intermittent absorption refrigeration system	
Lecture-39	Vapors compression refrigeration.	
Lecture-40	Need of thermal energy storage	
Lecture-41	Size and duration of storage	
Lecture -42	Thermal energy storage: Operating modes	
Lecture -43	Single tank storage system	
Lecture -44	Sensible heat storage	
Lecture -45	Storage in phase change materials	
Lecture -46	Storage in reversible chemical reactions.	
Unit- IV Applications of Solar Energy		

Lecture -47	Introduction to solar energy applications - Classifications	
Lecture-48	Solar water heating - built in storage type of solar water heater	
Lecture-49	Introduction of solar cookers -Types of Solar Cookers- Direct (focusing) type- Solar Cookers	
Lecture -50	Indirect (box type) - Solar Cookers	
Lecture-51	Advanced type-Solar Cookers	
Lecture-52	Basics of Solar desalination	
Lecture-53	Simple Solar Still - basics of Solar Still	
Lecture-54	Wick type solar still - Solar energy for industrial use.	
Lecture-55	Solar dryers - Basics of solar drying – Classifications of solar dryers	
Lecture-56	Natural Convection type- solar drying	
Lecture-57	Mixed mode type- solar drying	
Lecture-58	Solar furnace- basics principle of Solar furnace	
Lecture -59	Types of Solar –Furnaces and components of solar furnaces	
Lecture -60	Types of Solar –Furnaces and components of solar furnaces	
Lecture -61	Typical solar furnaces design and its working.	

Reference:

1. Solar Energy: H P Garg and J Prakash (TMH)
2. Solar Energy: S P Sukhatme (TMH)
3. Solar Energy: G N Tiwari (Narosa)
4. Heat Transfer by J P Holman, McGraw Hill
5. Heat Transfer: Principles and Applications by Dutta, Binay K, PHI Publication

PHY 404/E T Paper – IV Sub: SATELLITE & MOBILE COMMUNICATION
(Electronic Communication Specializations)

Unit-I Satellite Communication- I		
Lecture	**Topic**	**Remarks**
Lecture-1	Introduction to communication system	
Lecture-2	Satellite orbit and positioning	
Lecture-3	Satellite speed ,height , period	
Lecture-4	Angle of inclination ,Azimuth and elevation	
Lecture-5	Geo synchronous orbits	
Lecture-6	Position co-ordinates in latitude and longitude	
Lecture-7	Satellite communication system- Repeaters	
Lecture-8	Satellite transponders and transponder configurations	
Lecture-9	Frequency allocations for transponder channels	
Lecture-10	Multi channel Architecture	
Lecture-11	Satellite sub systems	
Lecture-12	Power sub system	
Lecture-13	Telemetry command and control sub systems	
Lecture-14	Satellite orbit control application Sub Systems	
Lecture-15	Satellite Applications	
UNIT-II Satellite Communication –II		
Lecture-16	Ground Stations	
Lecture-17	Antenna sub systems	
Lecture-18	Receiver sub systems	
Lecture-19	Transmitter sub systems	
Lecture-20	Power sub systems. Telemetry and control sub systems	

Lecture-21	International and Regional satellites	
Lecture-22	Domestic satellites	
Lecture-23	Communication satellites	
Lecture-24	Surveillance satellites	
Lecture-25	Navigation satellites	
Lecture-26	Global positioning systems (GPS) Space segment	
Lecture-27	Control segment and Atomic clocks	
Lecture-28	GPS Receivers	
Lecture-29	GPS Applications	
Lecture-30	Problems solving	
Unit- III Mobile-Cellular Communications		
Lecture-31	Introduction to cellular Mobile System	
Lecture-32	Significance of cellular Mobile System	
Lecture-33	Frequency spectrum Allocation	
Lecture-34	Trunking efficiency	
Lecture-35	A basic cellular System	
Lecture-36	Performance criteria	
Lecture-37	Operation of cellular Systems	
Lecture-38	Hexagonal shaped cells	
Lecture-39	Planning a cellular System	
Lecture-40	Elements of cellular System design	
Lecture-41	Frequency Re-use	
Lecture-42	Co-Channel interference reduction factor	
Lecture-43	Hand off mechanism	
Lecture-44	Cell Splitting	
Lecture-45	Components of cellular System	
Unit- IV	**Analog and Digital Cellular Systems**	
Lecture-46	Definitions of terms and functions	
Lecture-47	Introduction to Digital technology	
Lecture-48	Advantages of Digital systems	
Lecture-49	ARQ Techniques	
Lecture-50	Digital speech	
Lecture-51	Digital Mobile telephony	
Lecture-52	Multiple access schemes	
Lecture-53	Time division Multiple access (TDMA)	
Lecture-54	Code division Multiple access (CDMA)	
Lecture-55	Frequency division Multiple access (FDMA)	
Lecture-56	Global system for Mobile	
Lecture-57	Architecture for GSM	
Lecture-58	Layer modeling(OSI Model)	
Lecture-59	Transmission	
Lecture-60	GSM Channels & Channel Modes	

Reference Books

1. Wireless Digital Communications – Kamilo Feher
2. Communications – Dennis Roddy & John Coolen, PHI, 2000.
3. Principles of Communication system – H.Taub & D.L.Schilling,2nd Ed.TMH 1999
4. Electronic Communication Systems- George Kennedy, TMH
5. Cellular and Mobile Communications- V.Jeyasri, Arokiamary,1st Ed.Technical Pub.2009

Paper – IV (PHY 404/NCEP Sub: ENERGY CONVERSI (NCEP Specialization)

Unit-I Wind energy – Wind turbine-Wind Turbine Plants (15H)		
Lecture	**Topic**	**Remarks**
Lecture-1	Introduction to wind energy, Definition of Wind Energy	
Lecture-2	origin of wind, Nature of wind , mean wind velocity	
Lecture-3	power in a wind stream	
Lecture-4	power of a wind turbine for given incoming wind velocity, wind turbine efficiency	
Lecture-5	forces on blades of a propeller, Wind form site selection	
Lecture-6	Types of wind turbine, Construction and working of Horizontal axis wind turbine generator unit (mono blade)	
Lecture-7	HAWT(Twine ,Three blade)	
Lecture-8	yaw control, pitch control, Tethering effect	
Lecture-9	Blade design of HAWT	
Lecture-10	Construction and working of vertical axis wind turbine generator unit (Darrieus Rotor, H – rotor)	
Lecture-11	Blade design of VAWT, Problems on power, force and efficiency	
Lecture-12	Grid connection, Energy storage requirements with wind energy systems	
Lecture-13	wind turbine generator with battery storage facility, with diesel generator	
Lecture-14	wind turbine generator with Solar cell ,wind hybrid	
Lecture-15	Applications of wind energy, merits and limitations of wind energy	
UNIT-II Geothermal energy (15H)		
Lecture-16	Introduction, Nature of geothermal fields, Origin of geothermal resources	
Lecture-17	Non-uniform geothermal gradients	
Lecture-18	Geothermal energy resources-Hydrothermal (convective) resources	
Lecture-19	Geo pressured resources	
Lecture-20	Hot Dry Rock(HDR) resources (petro geothermal systems),	
Lecture-21	Molten rock-chamber systems	
Lecture-22	Vapor Dominated(steam) Geothermal electrical power plant	
Lecture-23	Liquid Dominated(Hot water)Geothermal electrical power plant	
Lecture-24	Liquid Dominated Flashed steam Geothermal electrical power plant	
Lecture-25	Liquid Dominated double Flashed steam Geothermal electrical power plant	
Lecture-26	Liquid Dominated Total flow Geothermal electrical power plant	
Lecture-27	comparison of flashed steam and total flow concept	
Lecture-28	Binary cycle Liquid Dominated Geothermal electrical power plant	
Lecture-29	Binary cycle Geothermal electrical power plant Hot brine	
Lecture-30	Advantages and Disadvantages and Applications of geothermal energy.	
Unit- III Ocean Energy (15H)		
Lecture-31	Introduction, Ocean Thermal Electric Conversion (OTEC),	
Lecture-32	methods of OTEC power generation, open cycle OTEC systems	
Lecture-33	closed or Anderson OTEC cycle, hybrid cycle	
Lecture-34	energy from tides-origin of tides	
Lecture-35	basic principle of Tidal power	
Lecture-36	Terms and definitions of tidal power	
Lecture-37	Components of tidal power plants	
Lecture-38	operation methods of utilization of tidal energy-single, double basin	

	arrangement	
Lecture-39	Estimation of energy and power in simple single basic tidal systems & double cycle system	
Lecture-40	Problems on energy and power	
Lecture-41	Ocean waves, Parameters of progressive wave	
Lecture-42	Energy & power form waves	
Lecture-43	Problems on energy and power in ocean waves	
Lecture-44	wave energy conversion devices	
Lecture-45	Advantages and disadvantages of wave energy	
Unit- IV Bio Energy (15H)		
Lecture-46	Introduction, Availability of Biomass	
Lecture-47	Materials for biogases,	
Lecture-48	, Biomass conversion process (Direct combustion, thermo chemical conversion, Biochemical conversion	
Lecture-49	Production of Bio gas, Biogas Generation	
Lecture-50	Factors affecting generation of gases	
Lecture-51	Types of Biogas plants-Batch type Biogas plant	
Lecture-52	Continuous type Biogas plant	
Lecture-53	Movable Drum type plant	
Lecture-54	Fixed Dome type plant	
Lecture-55	Comparison between Movable Drum type and Fixed Dome type plants	
Lecture-56	Biogas plants in India- Deenabandhu Biogas plant	
Lecture-57	Gayatri model plant, , spherical Biogas plant	
Lecture-58	Manipal model	
Lecture-59	Mud jar Biogas plant	
Lecture-60	Selection of site for Biogas plant	

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