LECTURE PLAN
DEPARTMENT OF PHYSICS

NAME: PROF.G.P.Gupta DESIGNATION: ASST. PROF.

COURSE: B.Sc SEMISTER IV SESSION: 2018-2021

PAPER NAME: PHY-CC-8.T: MATHEMATICAL PHYSICS-III

SL. No	Topic/Sub Topic	Expected No. of Lecture
01.	Complex Analysis: Brief Revision of Complex Numbers and their Graphical Representation. Euler's formula, De Moivre's theorem, Roots of Complex Numbers. Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of singularity. Integration of a function of a complex variable. Cauchy's Inequality & Theorem. Cauchy's Integral formula. Laurent and Taylor's Theorem. Residues and Cauchy's Residue Theorem. (24 Lectures)	24
02.	Fourier Transforms: Fourier Integral theorem. Fourier Transform. Examples. Fourier transform of trigonometric, Gaussian, finite wave train & other functions. Representation of Dirac delta function as a Fourier Integral. Fourier transform of derivatives, Inverse Fourier transform, Convolution theorem. Properties of Fourier transforms (translation, change of scale, complex conjugation, etc.). Three dimensional Fourier transform with examples, Application of Fourier transforms to differential equations: one dimensional wave and diffusion/heat flow equations. (18 Lectures)	18
03.	Laplace Transforms: Laplace Transform (LT) of Elementary functions. Properties of LTs: Change of Scale Theorem, Shifting Theorem. LTs of 1st and 2nd order Derivatives and Integrals of Functions, Derivatives and Integrals of LTs. LT of Unit Step function.(18 Lectures)	18
	Total Lecture=	60

Reference Books:

1. Mathematical Methods for Physicists and Engineers, K.F Riley, M.P. Hobson and S. J. Bence,

3rd ed., 2006, Cambridge University Press

2. Mathematics for Physicists, P. Dennery and A.Krzywicki, 1967, Dover Publications

3. Complex Variables, A.S.Fokas & M.J.Ablowitz, 8th Ed., 2011, Cambridge Univ. Press

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NAME: PROF.G.P.Gupta DESIGNATION: ASST. PROF.

COURSE: B.Sc SEMISTER IV SESSION: 2018-2021

PAPER NAME: PHY-CC-9.T: ELEMENTS OF MODERN PHYSICS

SL. No	Topic/Sub Topic	Expected No. of Lecture
01.	Quantum Mechanics: Planck's quantum, Planck's constant and light as a collection of photons; Blackbody Radiation: Quantum theory of Light; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment.Wave description of particles by wave packets. Group and Phase velocities and relation between them, two slit experiment with electrons, probability, wave amplitude and wave functions, Bohr Correspondence Principle (12 Lectures)	12
02.	Position measurement-gamma ray microscope through experiment, Wave-particle duality, Heisenberg uncertainty principle (Uncertainty relations involving Canonical pair of variables): Derivation from Wave Packets impossibility of a particle following a trajectory; estimating minimum energy of a confined particle using uncertainty principle, Energy-time & Position-momentum uncertainty principle (10 Lectures)	10
03.	Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles; Momentum and Energy operators; stationary states; physical interpretation of a wave function, probabilities and normalization; Probability and probability current densities in one dimension. (10 Lectures)	10
04.	Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron Page 15 of 24 being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, Liquid Drop model: semi-empirical mass formula and binding energy.(8 Lectures)	08
05	Radioactivity: Stability of the nucleus; Law of radioactive decay; Decay constant, Mean life and halflife, successive disintegration; methods of measurement of half-life, spectra of emitters, Elementary idea of Alpha decay; Beta decay.(8 Lectures)	08
06	Fission and fusion- mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. (4 Lectures)	04
	Lasers: Spontaneous and Stimulated emissions. Einstein's A and B coefficients. Metastable states. Optical Pumping and Population Inversion. Three-Level laser system and He-Ne Laser and Ruby Laser.(8 Lectures)	08
	Total Lecture=	60

Reference Books:

1. Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill.

2. Introduction to Modern Physics, Rich Meyer, Kennard, Coop, 2002, Tata McGraw Hill

3. Introduction to Quantum Mechanics, David J. Griffith, 2005, Pearson Education.

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DEPARTMENT OF PHYSICS

NAME: PROF.G.P.Gupta DESIGNATION: ASST. PROF.

COURSE: B.Sc SEMISTER IV SESSION: 2018-2021

PAPER NAME: PHY-CC-10.T: DIGITAL SYSTEMS AND APPLICATIONS

SL. No	Topic/Sub Topic	Expected No. of Lecture
01	Introduction to CRO: Block Diagram of CRO. Electron Gun, Deflection System and Time Base. Deflection Sensitivity. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference. (10 Lectures)	10
02	Boolean algebra: De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Karnaugh Map -Idea of Minterms and Maxterms. Conversion of a Truth table into Equivalent Logic Circuit by (1) Sum of Products Method and (2) Product of Sum Method(12 Lectures)	12
03	Digital Circuits: Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion.BCD, Octal and Hexadecimal numbers. AND, OR and NOT Gates (realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates and their applications.(14 Lectures)	14
04	Arithmetic Circuits: Binary Addition. Binary Subtraction using 2's Complement.Half and Full Adders.Half & Full Subtractors, 4-bit binary Adder & Subtractor.(10 Lectures)	10
05	Data processing circuits: Basic idea of Multiplexers, De-multiplexers, Decoders, Encoders, BCD to 7 segments (4 Lectures)	04
06	Conversion: Resistive network (weighted and R-2R ladder), accuracy and resolution, A/D conversion (successive approximation). (4 Lectures)	04
	Timers: IC 555: block diagram and applications: Astable multivibrator and Monostable multivibrator. (6 Lectures)	06
	Total Lecture=	60

Reference Books:

1. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
2. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.

3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.

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SL. No	Topic/Sub Topic	Expected No. of Lecture
01	Measurement of Planck's constant using black body radiation and photo-detector	
02	To determine the Planck's constant using LEDs of at least 4 different colours.	
03	To determine the wavelength of laser source using diffraction of single slit.	
04	To determine the wavelength of laser source using diffraction of double slits.	
05	To design a switch (NOT gate) using a transistor.	
06	To verify and design AND, OR, NOT and NOR gates using NAND gates.	
07	To design a combinational logic system for a specified Truth Table.	
08	To convert a Boolean expression into logic circuit and design it using logic gate ICs.	
09	Half Adder, Full Adder and 4-bit binary Adder.	
10	Half Subtractor, Full Subtractor, Adder-Subtractor using Full Adder I.C.	
11	To design an astable multivibrator of given specifications using 555 Timer.	
12	To design a monostable multivibrator of given specifications using 555 Timer.	
13	To design a digital to analog converter (DAC).	
14	To study the analog to digital convertor (ADC).	

Reference Books :

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia

Publishing House

2. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Edn, 2011,Kitab Mahal

3. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.

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