

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Subhendu Chandra (SC), Dr. Atri Sarkar (AS),

Dr. Kathakali Biswas (KB)

Paper Name & Code: DSCC-2, Basic Physics-II, Sem - II

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Basic Electricity and Magnetism (KB)	Electrostatics: Coulomb's law, Electric field, Electric field lines. Superposition Principle. Electric flux. Idea of charge density (linear, surface, volume) and continuous charge distributions. Gauss' Law (in integral form) with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field.	Introduction to Electrodynamics by D.J. Griffiths	3	Chalk and Talk	
	Introduction to electrostatic potential, Equipotential surfaces. Calculation of potential for linear, surface and volume charge distributions: simple cases (e.g.: uniform line charge, disc, spherical shell, sphere etc.). Potential and field due to a physical dipole; Torque, force and Potential Energy of an electric dipole in a uniform electric field.	Electricity and Magnetism by D. Chattopadhyay and P.C. Rakshit	4		
	Electrostatic energy of system of charges, a charged sphere. Conductors in an electrostatic Field. Mechanical force on the surface of a charged conductor. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Capacitance for parallel-plate, cylindrical, spherical capacitors (without dielectrics). Energy stored in Electrostatic field.	Foundations of Electricity & Magnetism by B. Ghosh	4		

Subject Name/Code: Physics Major

LESSON PLAN

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Name of Faculty: Dr. Gayatri Pal (GP), Dr. Subhendu Chandra (SC), Dr. Atri Sarkar (AS),

Dr. Kathakali Biswas (KB)

Paper Name & Code: DSCC-2, Basic Physics-II, Sem - II

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Basic Electricity and Magnetism (GP)	Lorentz force: Force on a moving charge in simultaneous electric and magnetic fields, force on a current carrying conductor in a magnetic field. Trajectory of charged particles in uniform electric field, crossed uniform electric and magnetic fields. Basic principle of cyclotron.	Introduction to Electrodynamics by D.J. Griffiths	3	Chalk and Talk	
	Magnetostatics: Concept of current density (linear, surface, volume). Equation of continuity. Biot and Savart's law, magnetic field due to a straight conductor, circular coil, Helmholtz coil, solenoid. Ampere's circuital law with applications (Infinite long wire, infinite solenoid, infinite current sheet). Magnetic field due to a small current loop - concept of magnetic dipole. Torque and force on magnetic dipole in a uniform magnetic field.	Electricity and Magnetism by D. Chattopadhyay and P.C. Rakshit Foundations of Electricity & Magnetism by B. Ghosh	8		

Subject Name/Code: Physics Major

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Name of Faculty: Dr. Gayatri Pal (GP), Dr. Subhendu Chandra (SC), Dr. Atri Sarkar (AS),

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Paper Name & Code: DSCC-2, Basic Physics-II, Sem - II

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Introduction to Thermodynamics (AS)	Kinetic theory: Macroscopic and microscopic description of matter, Postulates of molecular kinetic theory of an ideal gas, Relation between microscopic and macroscopic state variables, Maxwell's velocity distribution, Concept of pressure and temperature.	Thermal physics by A.B. Gupta and H.P. Roy	3	Chalk and Talk	
	Zeroth and First Law of Thermodynamics: Extensive and intensive thermodynamic variables. Thermodynamic equilibrium, zeroth law of Thermodynamics & concept of temperature. Concept of work & heat, State Functions, internal energy and first law of Thermodynamics, its differential form, first law & various processes. Applications of first law: General relation between CP and CV, work done during isothermal and adiabatic processes, compressibility and expansion coefficient.	Heat and Thermodynamics by M.W. Zemansky and Richard Dittman	9		

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Paper Name & Code: DSCC-2, Basic Physics-II, Sem - II

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Introduction to Thermodynamics (SC)	Second Law of Thermodynamics: Reversible and irreversible process with examples. Interconversion of work and heat. Heat engines. Carnot's cycle, Carnot engine & efficiency. Refrigerator & coefficient of performance, Kelvin-Planck and Clausius statements for the second law and their equivalence. Carnot's Theorem. Applications of second law of Thermodynamics: Thermodynamic scale of temperature and its equivalence to perfect gas scale.	Thermal physics by A.B. Gupta and H.P. Roy	10	Chalk and Talk	
	Entropy: Concept of Entropy, Clausius theorem. Clausius inequality, Second law of Thermodynamics in terms of Entropy. Entropy of a perfect gas. Principle of increase of Entropy. Entropy changes in reversible and irreversible processes with examples. Entropy of the universe. Principle of increase of Entropy. Temperature- Entropy diagrams for different cycles. Third law of Thermodynamics. Un-attainability of absolute zero.	Heat and Thermodynamics by M.W. Zemansky and Richard Dittman	6		
Total			50		

Subject Name/Code: Physics Major

LESSON PLAN**Department Name: Physics****Name of Faculty: Dr. Shininee Das Gupta (SDG)****Paper Name & Code: Scientific Writing Skills (LATEX) , SEC 2**

Planned				Content Delivery Technique	Remarks / Comments
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned		
1. Introduction to LATEX	The difference between WYSIWYG and WYSIWYM. Preparing a basic LATEX file. Compiling LATEX file.	1) https://www.latex-project.org/	2	LATEX software	
2. Document classes	Different type of document classes, e.g.. article, report, book and beamer.	2) http://mirror.iopb.res.in/tex-archive/info/lshort/english/lshort.pdf	5		
3. Page Layout	Titles, Abstract, Chapters, Sections, subsections, paragraph, verbatim	3) Walking with LATEX, Suman Bandyopadhyay, Techno World	4		
	References, Equation references, citation		4		
4. List structures	Itemize, enumerate, description etc	4) https://tug.org/texlive/	3		
5. Representation of mathematical equations	Inline math, Equations, Fractions, Matrices		4		
	Trigonometric, logarithmic, exponential functions	3			

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Shinjinee Das Gupta (SDG)

Paper Name & Code: Scientific Writing Skills (LATEX) , SEC 2

Unit / Group / Module / Article		Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
5. Representation of mathematical equations	Scaling of Parenthesis, brackets etc.	1) https://www.latex-project.org/	2	LATEX software	
6. Customization of fonts	Bold fonts, emphasize, mathbf, mathcal etc, Changing sizes, Large, Larger, Huge, tiny etc.	2) http://mirror.iopb.res.in/tex-archive/info/lshort/english/lshort.pdf	3		
7. Writing tables	Creating tables with different alignments, placement of horizontal, vertical lines	3) Walking with LATEX, Suman Bandyopadhyay, Techno World	3		
8. Figures	Changing and placing the figures, alignment Packages: amsmath, amssymb, graphics, graphicx, Geometry, algorithms, color, Hyperref etc. Use of different LATEX commands and environments, changing the type style, symbols from other languages. Special characters.	4) https://tug.org/texlive/	7		
	Preparing projects (writing report, CV, article etc)		20		
		Total	60		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Atri Sarkar (AS),

Dr. Kathakali Biswas (KB),

Paper Name & Code: Minor-2, Basic Physics-II

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Basic Electricity and Magnetism (KB)	Electrostatics: Coulomb's law, Electric field, Electric field lines. Superposition Principle. Electric flux. Idea of charge density (linear, surface, volume) and continuous charge distributions. Gauss' Law (in integral form) with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field.	Introduction to Electrodynamics by D.J. Griffiths	3	Chalk and Talk	
	Introduction to electrostatic potential, Equipotential surfaces. Calculation of potential for linear, surface and volume charge distributions: simple cases (e.g.: uniform line charge, disc, spherical shell, sphere etc.). Potential and field due to a physical dipole; Torque, force and Potential Energy of an electric dipole in a uniform electric field.	Electricity and Magnetism by D. Chattopadhyay and P.C. Rakshit	4		
	Electrostatic energy of system of charges, a charged sphere. Conductors in an electrostatic Field. Mechanical force on the surface of a charged conductor. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Capacitance for parallel-plate, cylindrical, spherical capacitors (without dielectrics). Energy stored in Electrostatic field.	Foundations of Electricity & Magnetism by B. Ghosh	4		

Subject Name/Code: Physics Minor

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Atri Sarkar (AS),

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Paper Name & Code: Minor-2, Basic Physics-II

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Basic Electricity and Magnetism (GP)	Lorentz force: Force on a moving charge in simultaneous electric and magnetic fields, force on a current carrying conductor in a magnetic field. Trajectory of charged particles in uniform electric field, crossed uniform electric and magnetic fields. Basic principle of cyclotron.	Introduction to Electrodynamics by D.J. Griffiths Electricity and Magnetism by D. Chattopadhyay and P.C. Rakshit	3	Chalk and Talk	
	Magnetostatics: Concept of current density (linear, surface, volume). Equation of continuity. Biot and Savart's law, magnetic field due to a straight conductor, circular coil, Helmholtz coil, solenoid. Ampere's circuital law with applications (Infinite long wire, infinite solenoid, infinite current sheet). Magnetic field due to a small current loop - concept of magnetic dipole. Torque and force on magnetic dipole in a uniform magnetic field.	Foundations of Electricity & Magnetism by B. Ghosh	8		

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Paper Name & Code: Minor-2, Basic Physics-II

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Introduction to Thermodynamics (AS)	Kinetic theory: Macroscopic and microscopic description of matter, Postulates of molecular kinetic theory of an ideal gas, Relation between microscopic and macroscopic state variables, Maxwell's velocity distribution, Concept of pressure and temperature.	Thermal physics by A.B. Gupta and H.P. Roy	3	Chalk and Talk	
	Zeroth and First Law of Thermodynamics: Extensive and intensive thermodynamic variables. Thermodynamic equilibrium, zeroth law of Thermodynamics & concept of temperature. Concept of work & heat, State Functions, internal energy and first law of Thermodynamics, its differential form, first law & various processes. Applications of first law: General relation between CP and CV, work done during isothermal and adiabatic processes, compressibility and expansion coefficient.	Heat and Thermodynamics by M.W. Zemansky and Richard Dittman	9		

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Paper Name & Code: Minor-2, Basic Physics-II

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Introduction to Thermodynamics (AS)	Second Law of Thermodynamics: Reversible and irreversible process with examples. Inter-conversion of work and heat. Heat engines. Carnot's cycle, Carnot engine & efficiency. Refrigerator & coefficient of performance, Kelvin-Planck and Clausius statements for the second law and their equivalence. Carnot's Theorem. Applications of second law of Thermodynamics: Thermodynamic scale of temperature and its equivalence to perfect gas scale.	Thermal physics by A.B. Gupta and H.P. Roy	10	Chalk and Talk	
	Entropy: Concept of Entropy, Clausius theorem. Clausius inequality, Second law of Thermodynamics in terms of Entropy. Entropy of a perfect gas. Principle of increase of Entropy. Entropy changes in reversible and irreversible processes with examples. Entropy of the universe. Principle of increase of Entropy. Temperature- Entropy diagrams for different cycles. Third law of Thermodynamics. Un-attainability of absolute zero.	Heat and Thermodynamics by M.W. Zemansky and Richard Dittman	6		
Total			50		

Subject Name/Code: Physics Minor

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Atri Sarkar (AS), Dr. Kathakali Biswas (KB)

Paper Name & Code: Introduction to Computer Programming and Graph Plotting (Pr) SEC2 (MDC)

Planned				Content Delivery Technique	Remarks/ Comments
Unit/Group/Module/ Article	Topics	Reference Books	No of Lecture Planned		
1.Introduction to Graph Plotting (2D only, using GNUPLOT) (KB)	a)Plotting 2D graphs: both functions and Data files. Changing plot range and plot styles: the options-with points(w p),with dots(w d),with lines (w l), with Lines points (w lp), line type (lt),line width (lw). Using the set command for samples, xrange, yrange, xlabel ,ylabel, title etc. The using option	1) Gnuplot 5, Lee Phillips, Alogus Publishing, edition 2012 2) Gnuplot in Action understanding data and Graphs, Phillipp K. Janert	2	Computer Practical	
	b) User defined functions [Including the use of ternary operator for piece-wise defined functions.]		3		
	c)Fitting data files using gnuplot.		3		
	d)Polar and parametric plots		3		
	e)Conditional Plotting of data from file using \$,&&, operators.(Graphs to be saved without using GUI)		3		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Atri Sarkar (AS), Dr. Kathakali Biswas (KB)

Paper Name & Code: Introduction to Computer Programming and Graph Plotting (Pr) SEC2 (MDC)

Planned				Content Delivery Technique	Remarks/ Comments
Unit/Group/Module/ Article	Topics	Reference Books	No of Lecture Planned		
2. Introduction to programming in python (Version 3): (AS)	a)Introduction Using the python interpreter as a calculator Variable and data types (int, float, complex, list, tuple, set, string, the type () function) Basic mathematical operations Compound statements in python Conditionals (if, elif, else) Loops (for, while)	1) Scientific Computing in Python by Abhijit Kar Gupta	3	Computer Practical, Study material	
	b) User defined functions def: (return statement, default values for arguments, keyword arguments), lambda function. Importing modules with math and cmath as examples, Using help and dir command to use the inbuilt manual, Basic idea of namespaces- local and global Python scripts, I/O operations (including opening and writing to files)		3		

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Paper Name & Code: Introduction to Computer Programming and Graph Plotting(Pr) SEC2 (MDC)

Planned				Content Delivery Technique	Remarks/ Comments
Unit/Group/Module/ Article	Topics	Reference Books	No of Lecture Planned		
	b)The python data types List: defining lists, reading and changing elements from lists, slicing (with discussion on the difference between <code>ll=mm</code> and <code>ll=mm[:]</code> , concatenation, list comprehension. builtin functions involving lists: <code>range()</code> , <code>len()</code> , <code>sum()</code> , <code>min()</code> , <code>max()</code> –list methods: <code>append()</code> , <code>extend()</code> , <code>count()</code> , <code>index()</code> , <code>sort()</code> , <code>insert()</code> , <code>pop()</code> , <code>remove()</code> , <code>reverse()</code>		4	Computer Practical, Study material	
	Tuples: Contrast and compare with lists, packing/unpacking using tuples (including <code>a,b=b,a</code> to swap variables) • Sets : set methods: <code>update()</code> , <code>pop()</code> , <code>remove()</code> , Set Theoretic operations: union, intersection, difference and symmetric difference of two sets.		4		

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Paper Name & Code: Introduction to Computer Programming and Graph Plotting (Pr) SEC2 (MDC)

Planned				Content Delivery Technique	Remarks/ Comments
Unit/Group/Module/ Article	Topics	Reference Books	No of Lecture Planned		
	Strings: defining strings, the use of single, double or triple quotes as string delimiters, len(), indexing, slicing, string concatenation, some string methods: strip(), split(), join(), find(), count(), replace(), string formatting in python (using the % operator	1) Scientific Computing in Python by Abhijit Kar Gupta	2	Computer Practical	
3. Problems and Applications (AS)	Finding factors of an integer, Determining whether an integer is prime or not. Finding out prime number greater than or lesser than a given value. Finding out all prime numbers within a given range	1) Scientific Computing in Python by Abhijit Kar Gupta	10		
	Root finding for a single variable (basic theory and algorithm) using Newton-Raphson and Bisection method Sorting of lists (algorithm, flowchart and code) using Bubble or Selection sort Sum of series correct up to given decimal		8		

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Paper Name & Code: Introduction to Computer Programming and Graph Plotting (Pr) SEC2 (MDC)

Planned					
Unit/Group/Module/ Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks/ Comments
	Places (Sine, Cosine, Exponential etc.)				
	Simulation of motion of a particle in 1D under a given force $F(x, t, v)$ with given initial condition and plotting (x, t) , (x, v) , (t, v) . (Output to be saved in data files and Gnuplot to be used to plot graphs), using Euler's method only.		6	Computer Practical	
	Matrix Addition, Multiplication and Transpose using List Comprehension.		6		
		Total	60		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Atri Sarkar (AS)

Paper Name & Code: IDC (INTERDISCIPLINARY COURSE): FRONTIERS IN PHYSICS

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Nature of Science	Role of proper reasoning and experiments, with examples. Inductive and deductive logic.	1. Six Easy Pieces – Richard P. Feynman 2. The first three minutes – Steven Weinberg	2	Chalk and Talk	
	The character of physical laws, including universality.		2		
	Difference between science and pseudo science		1		
2. Universe	The Copernican revolution, Kepler's laws and the Solar system, Galileo and birth of Telescopic Astronomy,	1. Six Easy Pieces – Richard P. Feynman 2. The first three minutes – Steven Weinberg	4	Chalk and Talk	
	Modern observations: Stars and galaxies, Life cycle of stars. Birth of the Universe,		3		
	Big Bang and Hubble expansion, Dark matter and dark energy.		3		
3. Matter	Atoms and molecules: The physical basis of the Periodic Table	1. The character of physical laws –	2	Chalk and Talk	

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Atri Sarkar (AS)

Paper Name & Code: IDC (INTERDISCIPLINARY COURSE): FRONTIERS IN PHYSICS

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Heat and Thermodynamics: Basic idea about the kinetic theory of gases; Distinction between ideal and real gases; The three laws of thermodynamics. Concept of Entropy.	Richard P. Feynman 2. Introduction to Astronomy: From Darkness to Blazing Glory – J. W Scott, JAS Educational Publications	6	Chalk and Talk	
	Radioactivity: Alpha, beta & gamma decay; X-Rays – Properties		3		
	Structure of the atom: Electron, Nucleus: proton and neutron. Mention of the Standard Model of particles & interactions.		4		
4. Forces	Laws of falling bodies, Inertia, Gravitation, Electricity and Magnetism, Light and its dual property.	1. Six Easy Pieces – Richard P. Feynman 2. The first three minutes	5	Chalk and Talk	

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Atri Sarkar (AS)

Paper Name & Code: IDC (INTERDISCIPLINARY COURSE): FRONTIERS IN PHYSICS

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	The microscopic world of Quantum Mechanics.	– Steven Weinberg	5	Chalk and Talk	
	Special and General Theory of Relativity (brief and qualitative ideas only)		5		
	Total Lectures		45		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Subhendu Chandra (SC), Dr. Atri Sarkar (AS)

Paper Name & Code: Modern Physics , DSC-5 Sem -IV

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Radiation and its nature (AS)	Black body Radiation, Planck's quantum hypothesis, Planck's constant (derivation of Planck formula is not required).	1) Perspective of Quantum Mechanics by S.P. Kuila 2) Quantum Physics by Eisberg and Resnick 3) Introduction to Quantum Mechanics by David. J. Griffiths	3	Chalk and Talk, Assignment	
	Photoelectric effect and Compton scattering — light as a collection of photons. Davisson-Germer experiment.		2		
	Bohr-Sommerfeld quantization of the form $pdq=nh$. De Broglie wavelength and matter waves. Wave-particle duality.		2		
	Wave description of particles by wavepackets. Group and Phase velocities and relation between them.		2		
	Probability interpretation: Normalized wavefunctions as probability amplitudes. Two-slit experiment with photons and electrons. Linear superposition principle as a consequence.		3		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Subhendu Chandra (SC), Dr. Atri Sarkar (AS)

Paper Name & Code: Modern Physics , DSC-5

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Radiation and its nature(AS)	Position measurement, γ -ray microscope thought experiment. Heisenberg uncertainty principle (Statement with illustrations). Impossibility of a trajectory of a particle.		3		
2. Basics of Quantum Mechanics(SC)	Quantum measurements- Deterministic vs probabilistic view points. Description of a particle using wave packets. Spread of the Gaussian wave-packet for a free particle in one dimension. Fourier transforms and momentum space wavefunction. Position- Momentum uncertainty. Simultaneous measurements: Compatible and incompatible observables and their relation to commutativity	1) Elements Of Quantum Mechanics by Singh Kamal, Singh S.P	10	Chalk and Talk, Assignment	
3. Schrödinger Equation (SC)	Schrödinger equation as a first principle.Probabilistic interpretation of wave function and equation of continuity (in 1-dimension). Time evolution of wavefunction. Stationary states. Time independent Schrödinger equation as an eigenvalue equation.	1) Quantum Mechanics by A. N. KONAR	8	Chalk and Talk, Assignment	

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Subhendu Chandra (SC), Dr. Atri Sarkar (AS)

Paper Name & Code: Modern Physics , DSC-5

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
4. Application to one dimensional systems (SC)	General discussion of bound states in an arbitrary potential: continuity of wave function, boundary conditions on wave functions and emergence of discrete energy levels. Particle in an infinitely rigid box: energy eigenvalues and eigenfunctions ,normalization. Quantum mechanical tunnelling across a step potential and rectangular potential barrier, calculation of reflection and transmission probabilities. α -decay as an example.Application to one dimensional square well potential of finite depth (for bound states only).	1) Quantum Mechanics by A. N. Konar	12	Chalk and Talk, Assignment	
5. Quantum mechanics of simple harmonic oscillator (SC)	Setting up the eigenvalue equation for the Hamiltonian. Energy levels and energy eigenfunctions in terms of Hermite polynomials (Solution to Hermite differential equation may be assumed). Ground state, zero-point energy and uncertainty principle.	1) Quantum Mechanics by Aruldas G	5	Chalk and Talk, Assignment	
	Total		50		

LESSON PLAN

Department Name: Physics

Name of Faculty: Principal Madam (MRK) Dr. Gayatri Pal (GP), Ms . Kathakali Biswas (KB)

Paper Name & Code: Electromagnetism DSC-6 Sem - IV

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Alternating current (GP)	Mean and r.m.s. values of current and emf with sinusoidal wave form; LR, CR series and parallel LCR circuits, reactance, impedance, phase-angle, power dissipation in AC circuit- power factor	Fundamentals of Electricity and Magnetism by B. Ghosh	2	Chalk and Talk, Assignment	
	Resonance in a series and parallel LCR circuit, Q-factor.		1		
	Class test / Assignment		1		
2. Electrostatics (KB)	Gauss' theorem of electrostatics: differential form. Multipole expansion in electrostatics. Dipole and quadrupole moment.	1) Introduction to Electrodynamics by D.J. Griffiths	2	Chalk and Talk, Assignment	
	Problem solving	2) Fundamentals of Electricity and Magnetism by B. Ghosh	1		

LESSON PLAN

Department Name: Physics

Name of Faculty: Principal Madam (MRK) Dr. Gayatri Pal (GP), Ms . Kathakali Biswas (KB)

Paper Name & Code: Electromagnetism DSC-6

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
3. Dielectric properties of matter (KB)	Dielectric in an external electric field. Electric Fields inside matter, Electric Polarisation, bound charges, displacement density vector, relation between E , P and D. Gauss's theorem in dielectrics, linear Dielectric medium, electric susceptibility and permittivity.	1) Introduction to Electrodynamics by D.J. Griffiths 2) Fundamentals of Electricity and Magnetism by B. Ghosh	4	Chalk and Talk, Assignment	
	Electrostatic boundary conditions for E and D.		1		
	Problem solving		1		
4. Laplace's and Poisson equations (KB)	Laplace's and Poisson equations. Uniqueness Theorems. Earnshaw's theorem. Dirichlet Boundary value problems in electrostatics.	1) Introduction to Electrodynamics by D.J. Griffiths 2) Fundamentals of Electricity and Magnetism by B. Ghosh	2	Chalk and Talk, Assignment	
	Problem solving		1		

LESSON PLAN

Department Name: Physics

Name of Faculty: Principal Madam (MRK) Dr. Gayatri Pal (GP), Ms . Kathakali Biswas (KB)

Paper Name & Code: Electromagnetism DSC-6

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
4. Method of Images and its applications (KB)	Plane Infinite metal sheet, Semi-infinite dielectric medium and metal Sphere.	1)Introduction to Electrodynamics by D.J. Griffiths	3	Chalk and Talk, Assignment	
	Problem solving	2)Fundamentals of Electricity and Magnetism by B. Ghosh	1		
5.Magnetostatics (GP)	Derivation of $\nabla \cdot \mathbf{B} = 0$, $\nabla \times \mathbf{B} = \mu_0 \mathbf{J}$. Magnetic vector potential and magnetic dipole.	1)Introduction to Electrodynamics by D.J. Griffiths 2)Fundamentals of Electricity and Magnetism by B. Ghosh	1	Chalk and Talk, Assignment	
	Multipole expansion of vector potential for line currents. Magnetic field for magnetic dipole.		1		
	Calculation for vector potential in simple cases (i) infinite straight wire (ii) Infinite Solenoid . Magnetic dipole moment for rotating rod, sphere, ring. Gyromagnetic ratio		2		
	Problem solving		1		

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Department Name: Physics

Name of Faculty: Principal Madam (MRK) Dr. Gayatri Pal (GP), Ms . Kathakali Biswas (KB)

Paper Name & Code: Electromagnetism DSC-6

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
6. Magnetic properties of matter (GP)	(a) Potential and field due to a magnetic dipole. Magnetic dipole moment. Force and torque on a magnetic dipole in a uniform magnetic field.	1)Introduction to Electrodynamics by D.J. Griffiths	2	Chalk and Talk, Assignment	
	(b) Magnetization, bound currents. Magnetic intensity H. Relation between B , H and M. Linear media. Magnetic Susceptibility and Permeability. Boundary conditions for B and H.	2)Fundamentals of Electricity and Magnetism by B. Ghosh	2		
	Problem solving		1		
8.Electromagnetic induction (GP)	Non-conservative nature of electric field. Faraday's law of induction: simple examples (e.g.: Motional EMF, Faraday disc); Lenz's law. Self and mutual inductances in simple cases, energy stored in inductors.	1)Introduction to Electrodynamics by D.J. Griffiths 2)Fundamentals of Electricity and Magnetism by B. Ghosh	2	Chalk and Talk, Assignment	
	Problem solving		1		

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Name of Faculty: Principal Madam (MRK) Dr. Gayatri Pal (GP), Ms . Kathakali Biswas (KB)

Paper Name & Code: Electromagnetism DSC-6

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
9. Maxwell's equations (MRK)	Maxwell's equations. Gauge transformations: Lorenz and Coulomb Gauge.	1)Introduction to Electrodynamics by D.J. Griffiths	2	Chalk and Talk, Quiz, Problem solving	
	Wave equations. Poynting Theorem and Poynting vector. Electromagnetic (EM) Energy Density.	2)Fundamentals of Electricity and Magnetism by B. Ghosh	2		
10. EM Wave Propagation in unbounded media (MRK)	Plane EM waves through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant, wave impedance.	1)Introduction to Electrodynamics by D.J. Griffiths	2	Chalk and Talk, Quiz, Problem solving	
	Propagation through conducting media, relaxation time, skin depth.	2)Fundamentals of Electricity and Magnetism by B. Ghosh	2		

LESSON PLAN

Department Name: Physics

Name of Faculty: Principal Madam (MRK) Dr. Gayatri Pal (GP), Ms . Kathakali Biswas (KB)

Paper Name & Code: Electromagnetism DSC-6

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
11. EM Wave in Bounded Media (MRK)	Boundary conditions at a plane interface between two media. Reflection and Refraction of plane waves at plane interface between two dielectric media. Laws of reflection and refraction.	1)Introduction to Electrodynamics by D.J. Griffiths 2)Fundamentals of Electricity and Magnetism by B. Ghosh	3	Chalk and Talk, Quiz, Problem solving	
	Fresnel's formulae for perpendicular and parallel polarization cases, Reflection and transmission coefficients, Brewster's law. Total internal reflection, evanescent waves. Metallic reflection (normal incidence).	3) Electromagnetic Waves and Radiating Systems by E. C. Jordan and K. G. Balmain 4)Engineering Electromagnetics by W. H. Hayt, J. A. Buck and M. J. Akhtar	3		
	Assignment		1		
	Total		50		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Shinjinee Das Gupta (SDG), Dr. Kathakali Biswas (KB)

Paper Name & Code: Mathematical Physics II , DSC-7 Sem - IV

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Solution of 2nd order linear differential equations (SDG)	Second order inhomogeneous differential equation; Linear independence of solutions: Wronskian, second solution.	1) Mathematical Methods for Physics and Engineers by Riley, Hobson and Bence 2) Differential equation by Ross	3	Chalk and Talk, PPT, Class test, Assignmnet	
	Singularity analysis at finite points. Power series solution of 2nd order differential equation. Frobenius method and its applications to differential equations.		4		
	Legendre, Hermite Differential Equations. Properties of Legendre and Hermite Polynomials: Rodrigues Formula, Generating Function, Orthogonality and completeness relation (Statement only.)		3		
	Simple recurrence relations. Expansion of function in a series of Legendre Polynomials.		3		
	Class Test		2		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Shinjinee Das Gupta (SDG), Dr. Kathakali Biswas (KB)

Paper Name & Code: Mathematical Physics II , DSC-7

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
2. Linear Vector Space (LVS) (SDG)	Idea of LVS with 2-d and 3-d cartesian vectors. Introduction to bra and ket vectors.	1) Vector spaces and Matrices in Physics by M.C. Jain 2) Matrices and Tensors in Physics by A. W. Joshi	1	Chalk and Talk, PPT, Assignment, Quiz	
	Definition of LVS with examples: 2-d, 3-d vectors, complex numbers, sinusoidal waveforms. Dual space.		1		
	Inner product, Norm (defined in terms of inner product), Cauchy-Schwarz inequality, metric space.		1		
	Linear independence and dependence of vectors. Completeness of a set of vectors. Dimension and basis. Orthogonality. Gram-Schmidt method for orthogonalization.		1		
	Quiz and assignment		1		
3. Vectors (SDG)	Vectors and scalars under rotation.	1) Mathematical Methods for Physics and Engineers by Riley, Hobson and Bence	1	Chalk and Talk, Quiz, Assignment	

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Shinjinee Das Gupta (SDG), Dr. Kathakali Biswas (KB)

Paper Name & Code: Mathematical Physics II , DSC-7

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
3. Vectors (SDG)	Orthogonal curvilinear coordinates: Jacobian of transformation and its application to gradient, divergence, curl and Laplacian operators.	2) Mathematical Physics by H. K. Dass	3	Chalk and Talk, Quiz, PPT, Assignment	
	Class Test		1		
4. Introduction to Tensor analysis (SDG)	Definition of cartesian tensors in 3 dimensions. Transformation properties.	1) Matrices and Tensors in Physics by A. W. Joshi	2	Chalk and Talk, Quiz, Assignment	
	Contraction of tensors in 3 dimensions.		1		
	Peer teaching		1		
5. Matrices (SDG)	Representation of linear operator in terms of matrices. Addition and multiplication of matrices. Null matrices. Diagonal, scalar and unit matrices.	1) Matrices and Tensors in Physics by A. W. Joshi	2	Chalk and Talk, Quiz, PPT, Assignment	
	Transpose of a matrix. Symmetric and skew-symmetric matrices. Conjugate of a matrix. Hermitian and skew-hermitian matrices.	2) Mathematical Physics by H. K. Dass	2		
	Singular and non-singular matrices. Orthogonal and unitary matrices. Trace of a matrix. Similarity transformation.	3) Mathematical methods in the physical sciences by Boas	2		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Shinjinee Das Gupta (SDG), Dr. Kathakali Biswas (KB)

Paper Name & Code: Mathematical Physics II , DSC-7

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
5. Matrices (SDG)	Invariance of trace and determinant under similarity transformation. Transformation of basis. Eigenvalues and eigenvectors (degenerate and non-degenerate).	1) Matrices and Tensors in Physics by A. W. Joshi 2) Mathematical Physics by H. K. Dass 3) Mathematical methods in the physical sciences by Boas	2	Chalk and Talk, Quiz, PPT, Assignment	
	Commuting operators and simultaneous eigenvectors for non-degenerate and degenerate eigenvalues.		1		
	Cayley-Hamilton Theorem. Diagonalization of matrices.		2		
	Solutions of coupled linear ordinary differential equations.		1		
	Functions of a matrix, e.g., exponential and trigonometric functions.		1		
	Peer Teaching + Class test		2		
6. Numerical Analysis II (KB)	Partial differential equation: Finite difference approximations to partial derivatives ($O(h^2)$). Solution of one dimensional heat conduction equation by explicit method. Qualitative idea of explicit and implicit methods.	1) Mathematical Methods for Physicists by Arfken	2		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Shinjinee Das Gupta (SDG), Dr. Kathakali Biswas (KB)

Paper Name & Code: Mathematical Physics II , DSC-7

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
6. Numerical Analysis II (KB)	Laplace equation (2-d) using standard five point formula. Successive relaxation technique. Solution of 1-d Wave equation. Stability criterion-CFL condition (qualitative).	2) Numerical Methods for Engineers by D. V. Griffiths and I. M. Smith	3		
	Class Test		1		
	Total		50		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Atri Sarkar (AS), Dr. Kathakali Biswas (KB)

Paper Name & Code: Classical Mechanics and Special Theory of Relativity , DSC-8 Sem - IV

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Non-inertial Systems (GP)	Non-inertial frames and idea of fictitious forces.	Classical Mechanics by A. B. Gupta	1	Chalk and Talk, Assignment	
	Equation of motion (EOM) with respect to a uniformly accelerating frame. EOM with respect to a uniformly rotating frame:		3		
	Centrifugal and Coriolis forces.		1		
	Applications: Surface of rotating liquid, deflection of falling mass, cyclone.		2		
	Numerical Solving		1		
2. Rotational Dynamics (GP)	The rigid body: Constraints defining the rigid body. Degrees of freedom for a rigid body;		1		
	Relation between angular momentum and angular Velocity:		1		
	Moment of inertia tensor. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies.		2		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Atri Sarkar (AS), Dr. Kathakali Biswas (KB)

Paper Name & Code: Classical Mechanics and Special Theory of Relativity , DSC-8

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
2. Rotational Dynamics (GP)	Equation of motion for rotation about a fixed axis. Principal Axes transformation.	Classical Mechanics by A. B. Gupta	2		
	Transformation to a body fixed frame. EOM for the rigid body with one point fixed (Euler's equations of motion).		2		
	Torque-free motion. Kinetic energy of rotation.		1		
	Numericals Solving		1		
3. Variational calculus in Physics (KB)	Basic ideas of functionals. Extremization of action as a basic principle in mechanics. Generalized coordinates, Constraint. Lagrangian formulation.	Classical Mechanics by S. L. Gupta, V. Kumar, H.V. Sharma	3	Chalk and Talk, PPT, Assignment	
	Euler-Lagrange equations of motion for simple systems: harmonic oscillators, simple pendulum, spherical pendulum. Motion under Central force.		5		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Atri Sarkar (AS), Dr. Kathakali Biswas (KB)

Paper Name & Code: Classical Mechanics and Special Theory of Relativity , DSC-8

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
3. Variational calculus in Physics (KB)	Cyclic coordinates. Symmetries and conservation laws. Legendre transformations and the Hamiltonian formulation of mechanics. Canonical equations of motion.	Classical Mechanics by S. L. Gupta, V. Kumar, H.V. Sharma	6	Chalk and Talk, PPT, Assignment	
	Applications to simple systems.		4		
	Assignment		2		
4. Special theory of Relativity (AS)	Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity.	1) Introduction to Special Relativity by R. Resnick 2) The special theory of relativity by Banerjee and Banerjee	2	Chalk and Talk, Assignment	
	Invariance of space-time interval. Derivation of Lorentz transformation equations. Length contraction. Time dilation.		3		
	Simultaneity and order of events. Concept of causality.		2		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Atri Sarkar (AS), Dr. Kathakali Biswas (KB)

Paper Name & Code: Classical Mechanics and Special Theory of Relativity , DSC-8

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
4. Special theory of Relativity (AS)	Relativistic transformation of velocity. Velocity addition. Relativistic dynamics.	1) Introduction to Special Relativity by R. Resnick 2) The special theory of relativity by Banerjee and Banerjee	2	Chalk and Talk, Assignment	
	Energy-momentum dispersion relation. Mass less particles. Mass-energy equivalence. Transformation of energy and momentum.		2		
	Minkowski space-time $[(ct,x,y,z)$ or (x,y,z,ct)] diagram.		1		
	Total		50		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Atri Sarkar (AS), Dr. Kathakali Biswas (KB),

Paper Name & Code: Minor-2, Basic Physics II, Sem-IV

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Basic Electricity and Magnetism (KB)	Electrostatics: Coulomb's law, Electric field, Electric field lines. Superposition Principle. Electric flux. Idea of charge density (linear, surface, volume) and continuous charge distributions. Gauss' Law (in integral form) with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field.	Introduction to Electrodynamics by D.J. Griffiths	3	Chalk and Talk	
	Introduction to electrostatic potential, Equi-potential surfaces. Calculation of potential for linear, surface and volume charge distributions: simple cases (e.g.: uniform line charge, disc, spherical shell, sphere etc.). Potential and field due to a physical dipole; Torque, force and Potential Energy of an electric dipole in a uniform electric field.	Electricity and Magnetism by D. Chattopadhyay and P.C. Rakshit	4		
	Electrostatic energy of system of charges, a charged sphere. Conductors in an electrostatic Field. Mechanical force on the surface of a charged conductor. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Capacitance for parallel-plate, cylindrical, spherical capacitors (without dielectrics). Energy stored in Electrostatic field.	Foundations of Electricity & Magnetism by B. Ghosh	4		

Subject Name/Code: Physics Minor

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Atri Sarkar (AS), Dr. Kathakali Biswas (KB),

Paper Name & Code: Minor-2, Basic Physics II, Sem-IV

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Basic Electricity and Magnetism (GP)	Lorentz force: Force on a moving charge in simultaneous electric and magnetic fields, force on a current carrying conductor in a magnetic field. Trajectory of charged particles in uniform electric field, crossed uniform electric and magnetic fields. Basic principle of cyclotron.	Introduction to Electrodynamics by D.J. Griffiths Electricity and Magnetism by D. Chattopadhyay and P.C. Rakshit	3	Chalk and Talk	
	Magnetostatics: Concept of current density (linear, surface, volume). Equation of continuity. Biot and Savart's law, magnetic field due to a straight conductor, circular coil, Helmholtz coil, solenoid. Ampere's circuital law with applications (Infinite long wire, infinite solenoid, infinite current sheet). Magnetic field due to a small current loop - concept of magnetic dipole. Torque and force on magnetic dipole in a uniform magnetic field.	Foundations of Electricity & Magnetism by B. Ghosh	8		

Subject Name/Code: Physics Minor

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Atri Sarkar (AS), Dr. Kathakali Biswas (KB),

Paper Name & Code: Minor-2, Basic Physics II, Sem-IV

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Introduction to Thermodynamics (AS)	Kinetic theory: Macroscopic and microscopic description of matter, Postulates of molecular kinetic theory of an ideal gas, Relation between microscopic and macroscopic state variables, Maxwell's velocity distribution, Concept of pressure and temperature.	Thermal physics by A.B. Gupta and H.P. Roy	3	Chalk and Talk	
	Zeroth and First Law of Thermodynamics: Extensive and intensive thermodynamic variables. Thermodynamic equilibrium, zeroth law of Thermodynamics & concept of temperature. Concept of work & heat, State Functions, internal energy and first law of Thermodynamics, its differential form, first law & various processes. Applications of first law: General relation between CP and CV, work done during isothermal and adiabatic processes, compressibility and expansion coefficient.	Heat and Thermodynamics by M.W. Zemansky and Richard Dittman	9		

Subject Name/Code: Physics Minor

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Atri Sarkar (AS), Dr. Kathakali Biswas (KB),

Paper Name & Code: Minor-2, Basic Physics II, Sem-IV

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Introduction to Thermodynamics (AS)	Second Law of Thermodynamics: Reversible and irreversible process with examples. Inter-conversion of work and heat. Heat engines. Carnot's cycle, Carnot engine & efficiency. Refrigerator & coefficient of performance, Kelvin-Planck and Clausius statements for the second law and their equivalence. Carnot's Theorem. Applications of second law of Thermodynamics: Thermodynamic scale of temperature and its equivalence to perfect gas scale.	Thermal physics by A.B. Gupta and H.P. Roy	10	Chalk and Talk	
	Entropy: Concept of Entropy, Clausius theorem. Clausius inequality, Second law of Thermodynamics in terms of Entropy. Entropy of a perfect gas. Principle of increase of Entropy. Entropy changes in reversible and irreversible processes with examples. Entropy of the universe. Principle of increase of Entropy. Temperature- Entropy diagrams for different cycles. Third law of Thermodynamics. Un-attainability of absolute zero.	Heat and Thermodynamics by M.W. Zemansky and Richard Dittman	6		
Total			50		

Subject Name/Code: Physics Minor

LESSON PLAN
Even Semester, 2025-26

Department Name : Physics SEM VI (MAJOR)

Name of Faculty : Dr. Gayatri Pal (GP) , Dr. Subhendu Chandra (SC)

Paper Name & Code: Digital Electronics DSCC13(Th)

Planned					
Unit / Group / Module/Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks/ Comments
1.Number System (GP)	Binary Numbers. Decimal to Binary and Binary to Decimal Conversion. BCD, Octal and Hexadecimal numbers	Digital circuits Part I &II by D. Roychoudhury	2	Chalk and Talk	
	Singed & unsigned numbers, 1's & 2's complement, subtraction using 2's complement Binary addition and Subtraction		2	Chalk and Talk	
2.Digital Circuits (GP)	Difference between Analog and Digital Circuits. XOR and XNOR Gates and application as Parity Checkers. Different logic families DTL,TTL,	Digital Principles & Applications by A.P. Malvino ,D.P. Leach	4	Chalk and Talk	
	AND, OR and NOT Gates (realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra.		4	Chalk and Talk	
	Fundamental Products .Idea of Minterms and Maxterms. Conversion of a Truth table into Equivalent Logic Circuit by(1)Sum of Products Method and (2) Karnaugh Map (4 variables).		4		

LESSON PLAN
Even Semester, 2025-26

Department Name : Physics SEM VI (MAJOR)

Name of Faculty : Dr. Gayatri Pal (GP), Dr. Subhendu Chandra (SC)

Paper Name & Code: Digital Electronics DSCC13(Th)

Planned					
Unit / Group / Module/Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks/ Comments
3.Implementation of different circuits (GP)	Half and Full Adders. Half & Full Subtractors,4-bit binary Adder/ Subtractor. Use of IC 7483 as adder and Subtractor		4	Chalk and Talk	
5. Data processing Circuits (GP)	Basic idea of Multiplexers , De-multiplexers,		3	Chalk and Talk	
	Decoders, Encoders.		2	Chalk and Talk	
5.Sequential circuits (SC)	SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations.		Digital circuits Part I &II by D. Roychoudhury	4	Chalk and Talk

LESSON PLAN
Even Semester, 2025-26

Department Name : Physics SEM VI (MAJOR)

Name of Faculty : Dr. Gayatri Pal (GP), Dr. Subhendu Chandra (SC)

Paper Name & Code: Digital Electronics DSCC13(Th)

Planned					
Unit / Group / Module/Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks/ Comments
	Race-around conditions in JK Flip-Flop. M/SJK Flip-Flop. D-FF,T-FF	Digital Principles & Applications by A.P. Malvino ,D.P. Leach	4		
6.Register & Counters (SC)	Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).	Digital circuits Part &II by D. Roychoudhury	4	Chalk and Talk	
	Ring Counter. Asynchronous counters, Decade Counter .Synchronous Counter (4 bits)		4	Chalk and Talk	
7.Data Conversion (GP)	D/ A conversion : Resistive network (Weighted and R-2R Ladder).		2	PPT	
	A/D conversion circuits		2	PPT	
Problem solving			5		
		Total	50		

LESSON PLAN, AY 2025-2026

Department Name: Physics

Name of Faculty: Dr. Maitreyi Ray Kanjilal (MRK), Dr. Subhendu Chandra (SC) ,
Dr. Shinjinee Das Gupta (SDG), Dr. Atri Sarkar (AS)

Paper Name & Code: Solid State Physics, DSCC14, Semester - VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Crystal Structure (MRK)	Solids : Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis; Central and Non-Central Elements.	1) Introduction to Solid State Physics by C. Kittel, 2) Solid State Physics by R K Puri and V K Babbar	2	Chalk & talk, Assignment, PPT, Assignment	
	Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones.		2		
	Diffraction of X-rays by Crystals. Laue and Bragg's Laws and their equivalence.		1		
	Atomic and Geometrical Structure Factor.		2		
	Basic idea of crystal indexing: examples with SC, BCC, FCC structure.		2		
	Problems		1		

LESSON PLAN, AY 2025-2026

Department Name: Physics

**Name of Faculty: Dr. Maitreyi Ray Kanjilal (MRK), Dr. Subhendu Chandra (SC) ,
Dr. Shinjinee Das Gupta (SDG), Dr. Atri Sarkar (AS)**

Paper Name & Code: Solid State Physics, DSCC14, Semester - VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
2. Elementary Lattice Dynamics (AS)	Lattice Vibrations and Phonons : Linear Monatomic and Diatomic Chains.	1) Introduction to Solid State Physics by C. Kittel,	2	Chalk & talk, Assignment	
	Acoustical and Optical Phonons.		1		
	Qualitative Description of the Phonon Spectrum in Solids.		1		
	Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids, T^3 law.		2		
	Problems		1		
3. Drude's Theory (AS)	Free electron gas in metals, effective mass, drift current, mobility and conductivity, Hall effect in metals.	2) Solid State Physics by R K Puri and V K Babbar	2	Chalk & talk	
	Thermal conductivity. Lorentz number, limitation of Drude's theory.		1		

LESSON PLAN, AY 2025-2026

Department Name: Physics

Name of Faculty: Dr. Maitreyi Ray Kanjilal (MRK), Dr. Subhendu Chandra (SC) ,

Dr. Shinjinee Das Gupta (SDG), Dr. Atri Sarkar (AS)

Paper Name & Code: Solid State Physics, DSCC14, Semester - VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
4. Dielectric Properties of Material (AS)	Polarization .Local Electric Field at an Atom. Depolarization Field	1) Solid State Physics by Puri and Babbar	1	Chalk & talk, PPT	
	Electric Susceptibility. Polarizability. Clausius-Mosotti Equation.		2		
	Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion		3		
	Cauchy and Sellmeier relations. Langevin- Debye equation. Complex Dielectric Constant.		3		
	Problems		1		
5. Elementary Band Theory (SDG)	Kronig-Penney model. Band Gap. Effective mass and effective mass tensor.	1) Introduction to Solid State Physics by C. Kittel,	2	Chalk & talk, PPT	
	Conductor, Semiconductor (P and N type) and insulator. Conductivity of Semiconductor, mobility,	2) Solid State Physic sby Harald Ibach and Hans Lüth	2		
	Hall Effect. Measurement of conductivity (4 Probe method) & Hall coefficient.		2		
	Peer teaching		1		
	Numerical		1		

LESSON PLAN, AY 2025-2026

Department Name: Physics

Name of Faculty: Dr. Maitreyi Ray Kanjilal (MRK), Dr. Subhendu Chandra (SC) ,

Dr. Shinjinee Das Gupta (SDG), Dr. Atri Sarkar (AS)

Paper Name & Code: Solid State Physics, DSCC14, Semester - VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
6. Magnetic properties of material (SC)	Dia, Para, Ferri and Ferromagnetic Materials.	1) Introduction to Solid State Physics by C. Kittel, 2) Solid State Physics by R K Puri and V K Babbar	1	Chalk & talk, Assignment	
	Classical Langevin Theory of Dia and Paramagnetic Domains.		2		
	Quantum Mechanical Treatment of Para-magnetism (using partition function).		2		
	Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve and hysteresis. Calculation of energy loss in B-H loop.		2		
	Numerical		1		
7. Superconductivity (AS)	Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors,	1) Solid State Physics by R K Puri and V K Babbar	2	Chalk & talk, Assignment	
	London's Equation and Penetration depth. Isotope effect.		2		
		Total	50		

LESSON PLAN, AY 2025-2026

Department Name: Physics

Name of Faculty: Dr. Shinjinee Das Gupta (SDG), Dr. Kathakali Biswas (KB)

Paper Name & Code: Atomic, Molecular and Laser Physics, DSCC15, Semester - VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Generalized Angular momenta and spin (SDG)	Generalized angular momentum. Electron's magnetic moment and spin.	1) Physics of Atoms and Molecules by Bransden and Joachain,	2	Chalk & talk, Assignment, PPT, Assignment	
	Gyromagnetic ratio, Bohr Magneton, and the g-factor (derivation not required).		1		
	Energy associated with a magnetic dipole placed in magnetic field. Larmor's theorem. Stern-Gerlach experiment.		2		
	<i>L-S</i> and <i>j-j</i> couplings.		1		
	Numerical		1		
2. Atoms in external magnetic field (SDG)	Anomalous Zeeman effect. Splitting of spectral lines and selection rules (statement and application only, derivation of level splitting and selection rules not required).	2) Atomic and Molecular Physics by Raj Kumar	3	Chalk & talk, PPT, Assignment	
	Numerical		1		

LESSON PLAN, AY 2025-2026

Department Name: Physics

Name of Faculty: Dr. Shinjinee Das Gupta (SDG), Dr. Kathakali Biswas (KB)

Paper Name & Code: Atomic, Molecular and Laser Physics, DSCC15, Semester - VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
3. Many electron atoms (SDG)	Identical particles, Symmetric and anti-symmetric wavefunctions with Slater determinant, spin-singlet and spin-triplet states, ortho and para helium as an example	1) Physics of Atoms and Molecules by Bransden and Joachain, 2) Atomic and Molecular Physics by Raj Kumar	2	Chalk & talk, PPT, Assignment	
	Pauli's Exclusion Principle; Hund's Rule; Periodic table. Fine structure splitting.		1		
	<i>L-S</i> and <i>j-j</i> coupling for many-electron atoms. Spectral notations for atomic states and Term symbols for equivalent and in-equivalent electrons		2		
	Spectra of alkali atoms (Na etc.): difference between hydrogen spectra and alkali spectra.		2		
	Peer teaching		1		
4. Molecular Spectra (SDG)	Diatomic molecules — rotational and vibrational energy levels. Basic ideas about molecular spectra	1) Fundamental of Molecular Spectroscopy by Banwell 2) Atomic and Molecular Physics by Raj Kumar	2	Chalk & talk, PPT, Assignment	
	Raman effect and its application to molecular spectroscopy (qualitative discussion only).		1		
	Class Test + Quiz		2		

LESSON PLAN, AY 2025-2026

Department Name: Physics

Name of Faculty: Dr. Shinjinee Das Gupta (SDG), Dr. Kathakali Biswas (KB)

Paper Name & Code: Atomic, Molecular and Laser Physics, DSCC15, Semester - VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
5. Lasers (KB)	Radiative and non-radiative transitions. Absorption, spontaneous and stimulated emission, Einstein's A and B coefficients—their interrelation.	1.Lasers: Theory and Applications by A. Ghatak & K. Thyagarajan	4	Chalk & talk	
	Idea of metastable state, population inversion. Necessary condition for lasing, threshold population inversion. Two-level system: unattainability of population inversion. Three-level and four-level systems: rate equations and necessary condition for population inversion.		4		
	Basic components of a laser system — active medium, pumping system and optical resonator. Free spectral range.		3		
	Line broadening mechanism — natural broadening and pressure broadening (qualitative discussion), Doppler broadening.		3		
	Ruby laser, He-Ne laser and semiconductor laser working principle.		4		
6. Fiber optics (KB)	Optical fiber, coherent bundle, numerical aperture. Step index and graded index fibers. Attenuation of optical fibers.	1.Introduction to Fiber Optics by A. Ghatak	3	Chalk & talk	
	Modes of a planar waveguide: TE and TM modes. Physical understanding of modes, Optical fibers: Guided modes of step-index fibers.		5		
		Total	50		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Kathakali Biswas (KB)

Paper Name & Code: Electromagnetism, PHS-Minor3-6-2, Semester-VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1.Electrostatics (KB)	Electric polarisation, bound charges (no derivation required), displacement density vector, linear dielectric medium, electric susceptibility and permittivity.	1.Foundations of Electricity and Magnetism by B.Ghosh 2.Introduction to Electrodynamics by D. J. Griffiths	5	Chalk & Talk	
	Method of Images and its application to plane Infinite metal sheet. Electric fields inside matter		5		
2.Magnetostatics (GP)	Divergence and curl of magnetostatic field using Biot-Savart law	1.Foundations of Electricity and Magnetism by B.Ghosh 2.Introduction to Electrodynamics by D. J. Griffiths	3	Chalk & Talk	
	Magnetic vector potential for uniform magnetic field.		3		
	Magnetic fields inside matter, magnetization, bound currents (no derivation required). H and B field. Linear media.		5		
	Problem solving		1		
3.Electromagnetic induction (KB)	Non-conservative nature of electric field. Faraday's law of induction: simple examples (eg: motional emf, Faraday disc); Lenz's law	1.Foundations of Electricity and Magnetism by B.Ghosh 2.Introduction to Electrodynamics by D. J. Griffiths	5	Chalk & Talk	
	Self and mutual inductances in simple cases, L of single coil, M of two coils. Energy stored in inductors.		5		

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Kathakali Biswas (KB)

Paper Name & Code: Electromagnetism, PHS-Minor3-6-2, Semester-VI

Unit / Group / Module / Article	Planned				
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
4. Electrodynamics (KB)	Maxwell's equations and EM waves: Maxwell's equations, Equation of continuity of current, displacement current, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves	1.A Text Book on Light by B.Ghosh 2.Introduction to Electrodynamics by D. J. Griffiths	5	Chalk & Talk	
	Poynting vector, decay of charge in conducting medium.		2		
	Problem solving		1		
5.Varying currents (KB)	Growth and decay of currents in L-R circuit; charging and discharging of capacitor in C-R circuit.	1.Foundations of Electricity and Magnetism by B.Ghosh	4	Chalk & Talk	

LESSON PLAN

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP), Dr. Kathakali Biswas (KB)

Paper Name & Code: Electromagnetism, PHS-Minor3-6-2, Semester-VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
6.Alternating current (GP)	Mean and r.m.s. values of current and emf with sinusoidal wave form; LR, CR and series LCR circuits, reactance, impedance, power factor, vector diagram, resonance in a series LCR circuit, Q-factor	1.Foundations of Electricity and Magnetism by B.Ghosh	4	Chalk & Talk	
	Problem solving		2		
		Total	50		

LESSON PLAN, AY 2025-2026

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP) , Dr. Atri Sarkar (AS)

Paper Name & Code: Modern Physics, MPHS (MDC Minor), Semester - VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Special Theory of Relativity (AS)	Postulates of STR, Lorentz Transformation (Derivation not required). Derivation of i) length contraction, ii) time dilation, iii) velocity addition for velocities in same direction.	1) Special Theory of Relativity by Robert Resnick	5	Chalk & talk, Assignment	
	Energy-momentum dispersion relation. Mass-energy equivalence.		3		
2. Quantum theory of Radiation (AS)	Planck's concept, radiation formula (statement only).	1) Modern Physics by R. Murugesan	1	Chalk & talk, Assignment	
	Photoelectric effect. Bohr's theory. Effect of finite nuclear mass. Compton effect.		6		
	Numerical		1		
3. Basic Quantum Mechanics (AS)	Wave nature of material particle, wave-particle duality, wavelength of de-Broglie waves, Heisenberg Uncertainty principle.	1) Modern Physics by R. Murugesan	7	Chalk & talk	

LESSON PLAN, AY 2025-2026

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP) , Dr. Atri Sarkar (AS)

Paper Name & Code: Modern Physics, MPHS (MDC Minor), Semester - VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Schrodinger equation, time-dependent and time-independent Schrodinger wave-function and its probabilistic interpretation. Normalization.	1) Modern Physics by R. Murugesan	2	Chalk & talk	
	Introduction to linear operators. Calculation of various commutation relations.		1		
	Particle in a one dimensional infinite potential well: energy eigen values. Schrodinger equation for one dimensional harmonic oscillator. Energy eigenvalues and energy eigenfunctions. (only first three wavefunctions, no need to introduce Hermite polynomial).		5		
4. Crystal Structure (AS)	Crystalline structure of solid, Miller indices, lattice planes, simple cubic, FCC and BCC lattices.	1) Solid State Physics by Puri and Babbar	3	Chalk & talk, PPT	
	Diffraction of X-ray, Bragg's law, Moseley's Law: explanation from Bohr's theory. Continuous and characteristic X-ray.		3		
	Numerical problems		1		

LESSON PLAN, AY 2025-2026

Department Name: Physics

Name of Faculty: Dr. Gayatri Pal (GP) , Dr. Atri Sarkar (AS)

Paper Name & Code: Modern Physics, MPHS (MDC Minor), Semester - VI

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
5. Structure of Solids (GP)	Different types of bonding: ionic, covalent, metallic, Van der Waals and hydrogen.	1) Solid State Physics by Puri and Babbar	3	Chalk & talk	
	Elementary ideas about band structure in conductors, direct and indirect semiconductors and insulators (qualitative discussions).		3		
6. Magnetic properties of material (GP)	Dia, para and ferro-magnetic properties of solids. Origin of dia-magnetism.	1) Solid State Physics by Puri and Babbar	2	Chalk & talk	
	Langevin theory of paramagnetism and Curie's law.		2		
	Domain structure of ferromagnetic materials. B-H loop and hysteresis.		2		
		Total	50		