Teaching Plan
for the Academic Session 2021-2022
Department of Physics
Mathabhanga College

Course Instructors :

- *Dr.* **Sulagna** DUTTA
- *Mr.* **Anirban** SARKAR
- *Ms.* **Neelam** ROY
- *Mr.* **Samser Doha** AHMED
- *Dr.* **Rashidul** ISLAM
- *Mr.* **Eya** HANNAN

Mode of Lectures : Online

Platform : WhatsApp / Google Meet

Duration of each lecture : 1 Hour

Semester duration : September 01 — December 31, 2021

TEACHING PLAN FOR THE ACADEMIC SESSION 2021-2022

Department of Physics

1st Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
		October	
Sulagna Dutta	C-1 (T)	• **Calculus :** Recapitulation: Limits, continuity, average and instantaneous quantities, differentiation. Plotting functions. Intuitive ideas of continuous, differentiable, etc. functions and plotting of curves. Approximation: Taylor and binomial series (statements only). • **First Order and Second Order Differential equations :** First Order Differential Equations and Integrating Factor. Homogeneous Equations with constant coefficients. Wronskian and general solution. Statement of existence and Uniqueness Theorem for Initial Value Problems. Particular Integral. • **Calculus of functions of more than one variable :** Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration. Constrained Maximization using Lagrange Multipliers.	24
Rashidul Islam	C-1 (P)	• **Introduction and Overview :** Computer architecture and organization, memory and Input/output devices • **Basics of scientific computing :** Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow & overflow-emphasize the importance of making equations in terms of dimensionless variables, Iterative methods. • **Errors and error Analysis :** Truncation and round off errors, Absolute and relative errors, Floating point computations.	24
Samser Doha Ahmed	C-2 (T)	• **Fundamentals of Dynamics :** Inertial frames; Review of Newton's Laws of Motion. Galilean transformations. Motion of rocket. Motion of a projectile in Uniform gravitational field Dynamics of a system of particles. Centre of Mass. • **Work and Energy :** Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Potential Energy.. Force as gradient of potential energy. Work & Potential energy. Law of Conservation of Energy. • **Rotational Dynamics :** Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum.. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation. • **Elasticity :** Relation between Elastic constants. Twisting torque on a Cylinder or Wire.	20
	C-2 (P)	• Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope. • To determine the height of a building using a Sextant / free fall method. • To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity. • To determine the Moment of Inertia of a Flywheel/ metallic bar about an axis passing through its centre of gravity	10
	GE-1 (T)	• **Vectors :** Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. • **Ordinary Differential Equations :** 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients. • **Laws of Motion :** Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. • **Momentum and Energy :** Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.	20
	GE-1 (P)	• Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope. • To determine the Moment of Inertia of a Flywheel/ metallic bar axis passing through the centre of gravity. • To determine the Young's Modulus of a Wire by Optical Lever Method/flexure method. • To determine the Modulus of Rigidity of a Wire by Maxwell's needle method.	10

(To be continued)

1st Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
	DSC-1 (T)	• **Vectors :** Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. • **Ordinary Differential Equations :** 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients. • **Laws of Motion :** Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. • **Momentum and Energy :** Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.	20
	DSC-1 (P)	• Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope. • To determine the Moment of Inertia of a Flywheel/ metallic bar axis passing through the centre of gravity. • To determine the Young's Modulus of a Wire by Optical Lever Method/flexure method. • To determine the Modulus of Rigidity of a Wire by Maxwell's needle method.	10
		November	
Sulagna Dutta	C-1 (T)	• **Vector Calculus :** Recapitulation of vectors: Properties of vectors under rotations. Scalar product and its invariance under rotations. Vector product, Scalar triple product and their interpretation in terms of area and volume respectively. Scalar and Vector fields. • **Vector Differentiation :** Directional derivatives and normal derivative. Gradient of a scalar field and its geometrical interpretation. Divergence and curl of a vector field. Del and Laplacian operators. Vector identities. • **Vector Integration :** Ordinary Integrals of Vectors. Multiple integrals, Jacobian. Notion of infinitesimal line, surface and volume elements. Line, surface and volume integrals of Vector fields. Flux of a vector field. Gauss' divergence theorem, Green's and Stokes Theorems and their applications (no rigorous proofs).	24
Rashidul Islam	C-1 (P)	• **Review of C & C++ fundamentals Programming :** Introduction to Programming, constants, variables and data types, operators and Expressions, I/O statements, scanf and printf, c in and c out, Manipulators for data formatting, Control statements (decision making and looping statements) (If statement. If else Statement. Nested if Structure. Else if Statement. Ternary Operator. Goto Statement. Switch Statement. Unconditional and Conditional Looping. While Loop. Do-While Loop. FOR Loop. Break and Continue Statements. Nested Loops), Arrays (1D & 2D) and strings, user defined functions, Structures and Unions, Idea of classes and objects. • **Programs :** Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending descending order, Binary search. • **Random number generation :** Area of circle, area of square, volume of sphere, value of pi (π).	24
Samser Doha Ahmed	C-2 (T)	• **Fluid Motion :** Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube. • **Gravitation :** Law of gravitation. Gravitational potential energy. Gravitational mass. Potential and field due to spherical shell and solid sphere. • **Central Force Motion :** Motion of a particle under a central force field. Two-body problem and its reduction to one body problem and its solution. The energy equation and energy diagram. Kepler's Laws. Satellite in circular orbit and applications. Basic idea of global positioning system.	11
	C-2 (P)	• To determine g and velocity for a freely falling body using Digital Timing Technique/ free fall method. • To determine Coefficient of Viscosity of given liquid by Stoke's method/Capillary Flow Method (Poiseuille's method).	4
	GE-1 (T)	• **Rotational Motion :** Angular velocity and angular momentum. Torque. Conservation Of angular momentum. • **Gravitation :** Newton's Law of Gravitation. Motion of a particle in a central force field. Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Basic idea of global positioning system (GPS). Physiological effects on astronauts.	10

(To be continued)

1st Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
	GE-1 (P)	• To determine the Modulus of Rigidity of a Wire by Maxwell's needle/dynamical/statistical. • To determine the Elastic Constant young's modulus of a Wire by Searle's method/flexure method.	5
	DSC-1 (T)	• **Rotational Motion :** Angular velocity and angular momentum. Torque. Conservation Of angular momentum. • **Gravitation :** Newton's Law of Gravitation. Motion of a particle in a central force field. Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Basic idea of global positioning system (GPS). Physiological effects on astronauts.	10
	DSC-1 (P)	• To determine the Elastic Constant/ Young's modulus of a Wire by Searle's method. • To determine g by Bar Pendulum.	5
		December	
Sulagna Dutta	C-1 (T)	• **Orthogonal Curvilinear Coordinates :** Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems. • **Introduction to probability :** Dirac Delta function and its properties: Definition of Dirac delta function. Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function.	24
Rashidul Islam	C-1 (P)	• **Solution of Algebraic and Transcendental equations by Bisection, Newton Raphson and Secant methods :** Solution of linear and quadratic equation, solving $\alpha = \tan\alpha$; $I = I_0\left(\frac{\sin\alpha}{\alpha}\right)^2$ in optics. • **Interpolation by Newton Gregory Forward and Backward difference formula, Error estimation of linear interpolation :** Evaluation of trigonometric functions e.g. $\sin\theta$, $\cos\theta$, $\tan\theta$, etc. • **Numerical differentiation (Forward and Backward difference formula) and Integration (Trapezoidal and Simpson rules), Monte Carlo method :** Given Position with equidistant time data to calculate velocity and acceleration and vice versa. Find the area of B-H Hysteresis loop.	24
Samser Doha Ahmed	C-2 (T)	• **Oscillations :** Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor. • **Non-Inertial Systems :** Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems.	11
	C-2 (P)	• To determine the Modulus of Rigidity of a Wire by Maxwell's needle/dynamical methods/statistical method. • To determine the value of g using Bar Pendulum.	4
	GE-1 (T)	• **Oscillations :** Simple harmonic motion. Differential equation of SHM and its solutions. Damped oscillations. • **Elasticity :** Hooke's law, Relation between elastic constants, Poisson's Ratio, Expression for Poisson's ratio in terms of elastic constants, Work done in stretching and twisting a wire, Determination of Rigidity modulus by static torsion, Determination of Rigidity modulus, Moment of inertia by Searle's method.	10
	GE-1 (P)	• To determine g by Bar Pendulum. • To study the Motion of a Spring and calculate (a) Spring Constant, (b) g.	5
	DSC-1 (T)	• **Oscillations :** Simple harmonic motion. Differential equation of SHM and its solutions. Damped oscillations. • **Elasticity :** Hooke's law, Relation between elastic constants, Poisson's Ratio, Expression for Poisson's ratio in terms of elastic constants, Work done in stretching and twisting a wire, Determination of Rigidity modulus by static torsion, Determination of Rigidity modulus, Moment of inertia by Searle's method.	10
	DSC-1 (P)	• To determine g by Bar Pendulum. • To study the Motion of a Spring and calculate (a) Spring Constant, (b) g.	5

3rd Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
		September	
Sulagna Dutta	C-5 (T)	• **Fourier Series :** Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients. Complex representation of Fourier series. Expansion of functions with arbitrary period. Expansion of non-periodic functions over an interval. Even and odd functions and their Fourier expansions. Application. Summing of Infinite Series. Term-by-Term differentiation and integration of Fourier Series. Parseval Identity.	20 + 18 (Tut)
	C-6 (P)	• To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method. • To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.	6
Rashidul Islam	C-5 (P)	• **Introduction to Numerical computation software Scilab :** Introduction to Scilab, Advantages and disadvantages, Scilab environment, Command window, Figure window, Edit window, Variables and arrays, Initialising variables in Scilab, Multidimensional arrays, Subarray, Special values, Displaying output data, data file, Scalar and array operations, Hierarchy of operations, Built in Scilab functions, Introduction to plotting, 2D and 3D plotting (2), Branching Statements and program design, Relational & logical operators, the while loop, for loop, details of loop operations, break & continue statements, nested loops, logical arrays and vectorization (2) User defined functions, Introduction to Scilab functions, Variable passing in Scilab, optional arguments, preserving data between calls to a function, Complex and Character data, string function, Multidimensional arrays (2) an introduction to Scilab file processing, file opening and closing, Binary I/o functions, comparing binary and formatted functions, Numerical methods and developing the skills of writing a program (2).	16
	C-6 (T)	**Kinetic Theory of Gases** • **Distribution of Velocities :** Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification. Doppler Broadening of Spectral Lines and Stern's Experiment. Mean, RMS and Most Probable Speeds.	4
Neelam Roy	C-7 (T)	• **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. • **Integrated Circuits (Qualitative treatment only) :** Active & Passive components.Discrete components. Wafer. Chip. Advantages and drawbacks of ICs. Scale of integration: SSI, MSI, LSI and VLSI (basic idea and definitions only). Classification of ICs. Examples of Linear and Digital ICs. • **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 application as Parity Checkers.	16
	C-7 (P)	• To measure (a) Voltage, and (b) Time period and Frequency of a periodic waveform using CRO. • To test a Diode and Transistor using a Multimeter. • To design a switch (NOT gate) using a transistor (Discrete components). • To verify and design AND, OR, NOT and XOR gates using NAND/NOR gates. • To design a combinational logic system for a specified Truth Table.	5
Anirban Sarkar	C-6 (T)	• **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, First Law of Thermodynamics and its differential form, Internal Energy, First Law & various processes, Applications of First Law: General Relation between CP and CV, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Co-efficient.	20

(To be continued)

3rd Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
	DSC-3 (T)	• **Laws of Thermodynamics :** Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_P & C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient, Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.	16
	DSC-3 (P)	• To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.	4
Eya Hannan	SEC-1 (Hons)	• **Basic Electricity Principles :** Voltage, Current, Resistance and Power. Ohm's law, series, parallel and series-parallel combination. AC electricity and DC electricity. Familiarization with multimeter, voltmeter and ammeter. • **Understanding Electrical circuits :** Main electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and Three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. real, imaginary, complex power components of AC source. Power factor, saving energy and Money.	20
	SEC-1 (Prog)	• **Introduction :** Measuring units. Conversion to SI and CGS unit. Familiarization with meter scale. Vernier caliper, Screw gauge and their utility. Measure the dimension of a solid block. volume of cylindrical beaker/glass, Diameter of a thin wire, thickness of metal sheet, use of sextant to measure height of buildings, mountains etc.	20
Samser Doha Ahmed	GE-3 (T)	• **Vectors :** Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. • **Ordinary Differential Equations :** 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.	10
	GE-3 (P)	• Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope. • To determine the Moment of Inertia of a Flywheel/ metallic bar axis passing through the centre of gravity.	5
		October	
Sulagna Dutta	C-5 (T)	• **Frobenius Method and Special Functions :** Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations. Legendre, Bessel, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Generating Function, Orthogonality. Simple recurrence relations.	16 + 6 (Tut)
	C-6 (P)	• To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. Or Determination of thermal conductivity of glass in form of a tube. • To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method.	6
Rashidul Islam	C-5 (P)	• **Curve fitting, Least square fit, Goodness of fit, standard deviation :** Ohms law to calculate R, Hooke's law to calculate spring Constant. • **Solution of Linear system of equations by Gauss elimination method and Gauss Seidal method. Diagonalization of matrices, Inverse of a matrix, Eigen vectors, eigen values problems :** Solution of mesh equations of electric circuits. Solution of coupled spring mass systems. • **Generation of Special functions using User defined functions in Scilab :** Generating and plotting Legendre Polynomials Generating and plotting Bessel function.	16
	C-6 (T)	**Kinetic Theory of Gases** • **Distribution of Velocities :** Degrees of Freedom. Law of Equipartition of Energy (No proof required). Specific heats of Gases.	4

(To be continued)

3rd Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
Neelam Roy	C-7 (T)	• **Boolean algebra :** De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. 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. • **Data processing circuits :** Basic idea of Multiplexers, De-multiplexers, Decoders,Encoders. • **Arithmetic Circuits :** Binary Addition. Binary Subtraction using 2's Complement. Half and Full Adders. Half & Full Subtractors, 4-bit binary Adder/Subtractor.	16
	C-7 (P)	• To convert a Boolean expression into logic circuit and design it using logic gate ICs. • To minimize a given logic circuit. • Half Adder, Full Adder / 4-bit binary Adder. • Half Subtractor/Full Subtractor/ Adder-Subtractor using Full Adder I.C. • To build Flip-Flop (RS/Clocked RS/D-type / JK) circuits using NAND gates.	5
Anirban Sarkar	C-6 (T)	• **Second Law of Thermodynamics :** Reversible and Irreversible process with examples.Conversion of Work into Heat and Heat into Work. Heat Engines. Carnot's Cycle, Carnot engine & efficiency. Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale.	20
	DSC-3 (T)	• **Thermodynamic Potentials :** Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for $(C_P - C_V)$, C_P/C_V and TdS equations.	16
	DSC-3 (P)	• To determine the temperature co-efficient of resistance by Platinum resistance thermometer.	4
Eya Hannan	SEC-1 (Hons)	• **Electrical Drawing and symbols :** Drawing symbols, blueprints. Reading schematics. Ladder diagrams. Electrical schematics, power circuits control circuits. Reading of circuit schematics. Tracking the connection of elements and identify current flow and voltage drop. • **Generators and Transformers :** DC power sources. AC/DC generators. Inductance, capacitance and impedance. Operation of Transformer.	20
	SEC-1 (Prog)	• **Mechanical skill :** Concept of workshop practice. Casting, Foundry, Machining, forming and welding. Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets ,composites and alloy, wood. Concept of machine processing. Introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools, lubricant oils. Cutting of a metal sheet using blade.	20
Samser Doha Ahmed	GE-3 (T)	• **Laws of Motion :** Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. • **Momentum and Energy :** Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.	10
	GE-3 (P)	• To determine the Young's Modulus of a Wire by Optical Lever Method/flexure method. • To determine the Young's Modulus of a Wire by Optical Lever/ flexure Method.	5
		November	
Sulagna Dutta	C-5 (T)	• **Frobenius Method and Special Functions :** Expansion of function in a series of Legendre Polynomials. Bessel Functions of the First Kind: Generating Function, simple recurrence relations. Zeros of Bessel Functions ($J_0(x)$ and $J_1(x)$) and Orthogonality. • **Some Special Integrals :** Beta and Gamma Functions and Relation between them. Expression of Integrals in terms of Gamma Functions. Error Function (Probability Integral).	20
	C-6 (P)	• To determine the Temperature Coefficient Resistance by Platinum Resistance Thermometer (PRT). • To study the variation of Thermo-EMF of a Thermocouple with Difference of Temperature of its Two Junctions.	6

(To be continued)

3rd Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
Rashidul Islam	C-5 (P)	• **Solution of ODE, First order Differential equation Euler, modified Euler and Runge-Kutta second order methods, Second order differential equation Fixed difference method :** First order differential equation : • Radioactive decay, • Current in RC, LC circuits with DC source, • Newton's law of cooling, • Classical equations of motion. Second order Differential Equation : • Harmonic oscillator (no friction), • Damped Harmonic oscillator, • Over damped, • Critical damped, • Oscillatory, • Forced Harmonic oscillator, • Transient and • Steady state solution, • Apply above to LCR circuits also.	16
	C-6 (T)	**Kinetic Theory of Gases** • **Molecular Collisions :** Mean Free Path. Collision Probability. Estimates of Mean Free Path. Transport Phenomenon in Ideal Gases: (1) Viscosity, (2) Thermal Conductivity and (3) Diffusion. Brownian Motion and its Significance.	4
Neelam Roy	C-7 (T)	• **Sequential Circuits :** SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered)Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. M/S JK Flip-Flop. • **Timers :** IC 555: block diagram and applications: Astable multivibrator and Monostable multivibrator. • **Shift registers :** Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).	16
	C-7 (P)	• To build JK Master-slave flip-flop using Flip-Flop ICs. • To build a 3 bit/ 4-bit Counter using D-type/JK Flip-Flop ICs and study timing diagram. • To make a 3 bit/4-bit Shift Register (serial and parallel) using D-type/JK Flip-Flop ICs. • To design an astable multivibrator of given specifications using 555 Timer. • To design a monostable multivibrator of given specifications using 555 Timer.	5
Anirban Sarkar	C-6 (T)	• **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. Entropy Changes in Reversible and Irreversible Processes. Principle of Increase of Entropy. Temperature–Entropy diagrams for Carnot's Cycle. Third Law of Thermodynamics. Unattainability of Absolute Zero.	20
	DSC-3 (T)	• **Kinetic Theory of Gases :** Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases.	16
	DSC-3 (P)	• Determination of thermal conductivity of glass in the form of tube.	4
Eya Hannan	SEC-1 (Hons)	• **Electric Motors :** Single-phase, three-phase and DC motors. Basic design. Interfacing DC or AC sources to control heaters and motors. Speed and Power of AC motor. • **Solid state Devices :** Resistors, inductors and capacitors. Diode and rectifiers. Components in series or in shunt. Response of inductors and capacitors with DC or AC sources.	20
	SEC-1 (Prog)	• Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet. • **Electrical and Electronic skill :** Use of Multimeter. Soldering of electrical circuits having discrete components(R, L, C, diode) and IC's on PCB.	20
Samser Doha Ahmed	GE-3 (T)	• **Rotational Motion :** Angular velocity and angular momentum. Torque. Conservation Of angular momentum. • **Gravitation :** Newton's Law of Gravitation. Motion of a particle in a central force field. Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Basic idea of global positioning system (GPS). Physiological effects on astronauts.	10
	GE-3 (P)	• To determine the Modulus of Rigidity of a Wire by Maxwell's needle/dynamical/statistical. • To determine the Elastic Constant young's modulus of a Wire by Searle's method/flexure method.	5

(To be continued)

3rd Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
		December	
Sulagna Dutta	C-5 (T)	• **Theory of Errors :** Systematic and Random Errors. Propagation of Errors. Normal Law of Errors. Standard and Probable Error. Least-squares fit. Error on the slope and intercept of a fitted line. • **Partial Differential Equations :** Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular, cylindrical and 17 spherical symmetry. Wave equation and its solution for vibrational modes of a stretched string, rectangular and circular membranes. Diffusion Equation.	20
	C-6 (P)	• To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method, (2) Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature.	6
Rashidul Islam	C-5 (P)	• **Partial differential equations :** • Wave equation, • Heat equation, • Poisson equation, • Laplace equation. • **Using Scicos / xcos :** • Generating square wave, sine wave, saw tooth wave, • Solution to harmonic oscillator, • Study of beat phenomenon, • Phase space plots.	16
	C-6 (T)	**Kinetic Theory of Gases** • **Real Gases :** Behavior of Real Gases: Deviations from the Ideal Gas Equation. The Virial Equation. Andrew's Experiments on CO_2 Gas. Critical Constants. Continuity of Liquid and Gaseous State. Vapour and Gas. Boyle Temperature. Van der Waal's Equation of State for Real Gases. Values of Critical Constants. Law of Corresponding States. Comparison with Experimental Curves. P-V Diagrams. Joule's Experiment. Free Adiabatic Expansion of a Perfect Gas. Joule-Thomson Porous Plug Experiment. Joule-Thomson Effect for Real and Van der Waal Gases. Temperature of Inversion. Joule-Thomson Cooling.	4
Neelam Roy	C-7 (T)	• **Counters (4 bits) :** Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter. • **Computer Organization :** Input/Output Devices. Data storage (idea of RAM and ROM).Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map. • **Intel 8085 Microprocessor Architecture :** Main features of 8085. Block diagram.Components. Pin-out diagram. Buses. Registers. ALU. Memory. Stack memory. Timing & Control circuitry. Timing states. Instruction cycle, Timing diagram of MOV and MVI. • **Introduction to Assembly Language :** 1 byte, 2 byte & 3 byte instructions.	16
	C-7 (P)	**Write the following programs using 8085 Microprocessor** • Addition and subtraction of numbers using direct addressing mode. or • Addition and subtraction of numbers using indirect addressing mode. or • Multiplication by repeated addition. or • Division by repeated subtraction. or • Handling of 16-bit Numbers. or • Use of CALL and RETURN Instruction. or • Block data handling. or • Other programs (e.g. Parity Check, using interrupts, etc.).	5
Anirban Sarkar	C-6 (T)	• **Thermodynamic Potentials :** Thermodynamic Potentials: Internal Energy, Enthalpy,Helmholtz Free Energy, Gibb's Free Energy. Their Definitions, Properties and Applications. Surface Films and Variation of Surface Tension with Temperature. Magnetic Work, Cooling due to adiabatic demagnetization, First and second order Phase Transitions with examples, Clausius Clapeyron Equation and Ehrenfest equations. • **Maxwell's Thermodynamic Relations :** Derivations and applications of Maxwell's Relations, Maxwell's Relations: (1) Clausius Clapeyron equation, (2) Values of $C_P - C_V$, (3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process.	20

(To be continued)

3rd Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
	DSC-3 (T)	• **Theory of Radiation :** Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law. • **Statistical Mechanics :** Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - distribution of velocity - Quantum statistics - Fermi-Dirac distribution law - electron gas - Bose-Einstein distribution law - photon gas - comparison of three statistics.	16
	DSC-3 (P)	• To determine the value of Stefan's Constant.	4
Eya Hannan	SEC-1 (Hons)	• **Electrical protection :** Relays, Fuses and disconnect switches. Circuit breaker. Overload devices. Ground – fault protection. Grounding and isolating. Phase reversal. Surge protection. Interfacing DC or AC sources to control elements. • **Electrical wiring :** Different types of conductors and cables. Basics of wiring- star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays .splices: wirenuts, crimps, terminal blocks, split bolts and solder. Preparation of extension board.	20
	SEC-1 (Prog)	• Operation of oscilloscope. Making regulated power supply. Timer circuit, electronic switch using transistor and relay. • **Introduction to prime movers :** Mechanism, gear system, wheel, fixing of gears with motor axel. Lever mechanism, Lifting of heavy weight using lever. Braking systems. Pulleys, working principle of power generation systems. Demonstration of pulley experiment.	20
Samser Doha Ahmed	GE-3 (T)	• **Oscillations :** Simple harmonic motion. Differential equation of SHM and its solutions. Damped oscillations. • **Elasticity :** Hooke's law, Relation between elastic constants, Poisson's Ratio, Expression for Poisson's ratio in terms of elastic constants, Work done in stretching and twisting a wire, Determination of Rigidity modulus by static torsion, Determination of Rigidity modulus, Moment of inertia by Searle's method.	10
	GE-3 (P)	• To determine g by Bar Pendulum. • To study the Motion of a Spring and calculate (a) Spring Constant, (b) g.	5

5th Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
		September	
Rashidul Islam	C-11 (T)	• **Time dependent Schrodinger equation :** Time dependent Schrodinger equation and dynamical evolution of a quantum state; Properties of Wave Function. Interpretation of Wave Function Probability and probability current densities in three dimensions; Conditions for Physical Acceptability of Wave Functions. Normalization. Linearity and Superposition Principles. Eigenvalues and Eigenfunctions. Position, momentum and Energy operators; commutator of position and momentum operators; Expectation values of position and momentum. Wave Function of a Free Particle. • **Time independent Schrodinger equation :** Hamiltonian, stationary states and energy eigenvalues; expansion of an arbitrary wavefunction as a linear combination of energy eigenfunctions; General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states; Application to spread of Gaussian wave-packet for a free particle in one dimension; wave packets, Fourier transforms and momentum space wavefunction; Position-momentum uncertainty principle.	12
	C-11 (P)	**Use C/C++/Scilab for solving the following problems based on Quantum Mechanics like** • Solve the s-wave Schrodinger equation for the ground state and the first excited state of the hydrogen atom. Obtain the energy eigenvalues and plot the corresponding wavefunctions.	4

(To be continued)

5th Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
Anirban Sarkar	C-12 (T)	• **Crystal Structure :** Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals. Bragg's Law. Atomic and Geometrical Factor.	16
	C-12 (P)	• To determine the Hall coefficient of a semiconductor sample.	4
Neelam Roy	DSE-1 (T) (Hons)	• **Electronic communication :** Introduction to communication – means and modes. Need for modulation. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in India (TRAI). Electromagnetic communication spectrum, band designations and usage. Channels and base-band signals. Concept of Noise, signal-to-noise (S/N) ratio. • **Analog Modulation :** Amplitude Modulation, modulation index and frequency spectrum.Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector), Concept of Single side band generation and detection.	16
	DSE-1 (P) (Hons)	• To design an Amplitude Modulator using Transistor. • To study envelope detector for demodulation of AM signal. • To study FM - Generator and Detector circuit.	3
Sulagna Dutta	DSE-2 (T) (Hons)	• **Special Theory of Relativity :** Postulates of Special Theory of Relativity. Lorentz Transformations. Minkowski space. The invariant interval, light cone and world lines. Space-time diagrams. Time -dilation, length contraction and twin paradox.	12 + 8 (Tut)
Eya Hannan	DSE-2 (T) (Hons)	• **Classical mechanics of point particles :** Review of Newtonian mechanics, Application to the motion of a charge particle in external electric and magnetic field. Motion in uniform electric field. Gyro radius and gyro frequency. Motion in cross electric and magnetic field. Generalised coordinates and velocities, Hamilton's principle, lagrangian and Euler-Lagrange equations. one dimensional examples of the Euler-Lagrange equations . one dimensional SHO and falling body in uniform gravity, application to simple systems such as coupled oscillator, canonical momenta and Hamiltonian. Hamilton's equation of motion.	20
	SEC-3 (Prog)	• **Basic of Measurement :** Instruments accuracy, precision, sensitivity, resolution range . Errors in measurements and loading effects. • **Multimeter :** Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. • **Electronic voltmeter :** Advantage over convensional multimeter for voltage measurement with respect to input impedance and sensitivity.Principles of voltage, Specification of an electronic voltmeter/ Multimeter and their significance. AC multivoltmeter.	20
Neelam Roy	DSE-1 (T) (Prog)	• **Digital Circuits :** Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. • De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map. • Binary Addition. Binary Subtraction using 2's Complement Method).Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor.	16
	DSE-1 (P) (Prog)	• To measure (a) Voltage, and (b) Frequency of a periodic waveform using a CRO. • To verify and design AND, OR, NOT and XOR gates using NAND gates. • To minimize a given logic circuit. • Half adder, Full adder / 4-bit Binary Adder.	4
		October	
Rashidul Islam	C-11 (T)	• **General discussion of bound states in an arbitrary potential :** Continuity of wavefunction, boundary condition and emergence of discrete energy levels; application to one-dimensional problem-square well potential; Quantum mechanics of simple harmonic oscillator-energy levels and energy eigenfunctions using Frobenius method; Hermite polynomials; ground state, zero point energy & uncertainty principle.	12

(To be continued)

5^{th} Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
	C-11 (P)	**Use C/C++/Scilab for solving the following problems based on Quantum Mechanics like** • Solve the s-wave radial Schrodinger equation for an atom. Find the energy (in eV) of the ground state of the atom to an accuracy of three significant digits. Also, plot the corresponding wavefunction.	4
Anirban Sarkar	C-12 (T)	• **Elementary Lattice Dynamics :** Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T_3 law. • **Magnetic Properties of Matter :** Dia-, Para-, Ferri- and Ferromagnetic Materials.Classical Langevin Theory of dia– and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss.	16
	C-12 (P)	• To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150° C) and to determine its band gap.	4
Neelam Roy	DSE-1 (T) (Hons)	• **Analog Modulation :** Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector), Qualitative idea of Super heterodyne receiver. • **Analog Pulse Modulation :** Channel capacity, Sampling theorem, Basic Principles-PAM, PWM, PPM, modulation and detection technique for PAM only, Multiplexing.	16
	DSE-1 (P) (Hons)	• To study AM Transmitter and Receiver. • To study FM Transmitter and Receiver. • To study Time Division Multiplexing (TDM).	3
Sulagna Dutta	DSE-2 (T) (Hons)	• **Special Theory of Relativity :** Four-vectors: space-like, time-like and light-like. Four-velocity and acceleration. Metric and alternating tensors. Four momentum and energy-momentum relation.	14
Eya Hannan	DSE-2 (T) (Hons)	• **Application :** Hamiltonian for a harmonic oscillator, solution of Hamilton's equation for SHO, particle in a central force field – conservation of angular momentum and energy. • **Small Amplitude Oscillations :** Minima of potential energy and points of stable equilibrium, expansion of the potential energy around a minimum, small amplitude oscillations about the minimum, normal modes of oscillations example of N identical masses connected in a linear fashion to $(N-1)$ identical springs.	20
	SEC-3 (Prog)	• **Cathode Ray Oscilloscope :** Block diagram of basic CRO. Construction of CRT, Electron Gun. Electrostatic focusing and acceleration, brief discussion on screen phosphor, visual persistence and chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac frequency, time period, special features of dual trace, introduction of digital oscilloscope, probes, Digital storage Oscilloscope: Block diagram and principle of working.	20
Neelam Roy	DSE-1 (T) (Prog)	• **Semiconductor Devices and Amplifiers :** Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static and Dynamic Resistance. Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell. • Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Active, Cutoff, and Saturation Regions. Current gains α and β. Relations between α and β. Load Line analysis of Transistors. DC Load line and Q-point. Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Class A, B, and C Amplifiers.	16
	DSE-1 (P) (Prog)	• Adder-Subtractor using Full Adder I.C. • To design an astable multivibrator of given specifications using 555 Timer. • To design a monostable multivibrator of given specifications using 555 Timer. • To study IV characteristics of PN diode, Zener / Light emitting diode.	4

November

(To be continued)

5^{th} Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
Rashidul Islam	C-11 (T)	• **Quantum theory of hydrogen-like atoms :** time independent Schrodinger equation in-spherical polar coordinates; separation of variables for second order partial differential equation; angular momentum operator & quantum numbers; Radial wavefunctions from Frobenius method; shapes of the probability densities for ground & first excited states; Orbital angular momentum quantum numbers l and m; $s, p, d, \cdots$ shells. • **Atoms in Electric & Magnetic Fields :** Electron angular momentum. Space quantization. Electron Spin and Spin Angular Momentum. Larmor's Theorem. Spin Magnetic Moment. Stern-Gerlach Experiment. Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magneton.	12
	C-11 (P)	**Use C/C++/Scilab for solving the following problems based on Quantum Mechanics like** • Solve the s-wave radial Schrodinger equation for a particle of mass m. For the anharmonic oscillator potential for the ground state energy (in MeV) of particle to an accuracy of three significant digits. Also, plot the corresponding wavefunction.	4
Anirban Sarkar	C-12 (T)	• **Dielectric Properties of Materials :** Polarization. Local Electric Field at an Atom.Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons. • **Ferroelectric Properties of Materials :** Structural phase transition, Classification of crystals, Piezoelectric effect, Pyroelectric effect, Ferroelectric effect, Electrostrictive effect, Curie-Weiss Law, Ferroelectric domains, PE hysteresis loop.	16
	C-12 (P)	• To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis.	4
Neelam Roy	DSE-1 (T) (Hons)	• **Digital Pulse Modulation :** Need for digital transmission, Pulse Code Modulation,Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), and Binary Phase Shift Keying (BPSK). • **Satellite Communication :** Introduction, need, Geosynchronous satellite orbits, geostationary satellite advantages of geostationary satellites. Satellite visibility, transponders (C - Band), path loss, ground station, simplified block diagram of earth station. Uplink and downlink.	16
	DSE-1 (P) (Hons)	• To study Pulse Amplitude Modulation (PAM). • To study Pulse Width Modulation (PWM).	2
Sulagna Dutta	DSE-2 (T) (Hons)	• **Special Theory of Relativity :** Doppler effect from a four-vector perspective. Concept of four-force. Conservation of four-momentum.	14
Eya Hannan	DSE-2 (T) (Hons)	• **Fluid Dynamics :** Density and pressure in a fluid, an element of fluid and its velocity, continuity equation and mass conservation.	20
	SEC-3 (Prog)	• **Signal Generators and Analysis Instruments** • **Impedance Bridges and Q-meters :** Block diagram, explanation and specifications of low frequency signal generators. Pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis. Block diagram of bridge, working principle of basic(balancing type) RLC bridge. Specifications of RLC bridge. Block diagram and working principles of a Q- meter. Digital LCR bridges.	20
Neelam Roy	DSE-1 (T) (Prog)	• **Operational Amplifiers (Black Box approach) :** Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop & Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Zero Crossing Detector. • **Sinusoidal Oscillators :** Barkhausen's Criterion for Self-sustained Oscillations. Determination of Frequency of RC Oscillator.	16

(To be continued)

5^{th} Semester[September to December]			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
	DSE-1 (P) (Prog)	• To study the characteristics of a Transistor in CE configuration. • To design a CE amplifier of a given gain (mid-gain) using voltage divider bias. • To design an inverting amplifier using Op-amp 741 or study its frequency response. • To design a non-inverting amplifier using Op-amp 741or study its Frequency Response.	4
		December	
Rashidul Islam	C-11 (T)	• **Atoms in External Magnetic Fields :** Normal and Anomalous Zeeman Effect. PaschenBack and Stark Effect (Qualitative Discussion only). • **Many electron atoms :** Pauli's Exclusion Principle. Symmetric & Antisymmetric WaveFunctions. Periodic table. Fine structure. Spin orbit coupling. Spectral Notations for Atomic States. Total angular momentum. Vector Model. Spin-orbit coupling in atoms-L-S and J-J couplings. Hund's Rule. Term symbols. Spectra of Hydrogen and Alkali Atoms (Na etc.).	12
	C-11 (P)	**Use C/C++/Scilab for solving the following problems based on Quantum Mechanics like** • Solve the s-wave radial Schrodinger equation for the vibrations of hydrogen molecule. Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of three significant digits. Also, plot the corresponding wavefunction.	4
Anirban Sarkar	C-12 (T)	• **Elementary band theory :** Kronig Penny model. Band Gap. Conductor, Semiconductor(P & N type) and insulator. Conductivity of Semiconductor, mobility, Hall Effect. Measurement of conductivity (04 probe method) & Hall coefficient. • **Superconductivity :** Experimental Results. Critical Temperature. Critical magnetic field.Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect. Idea of BCS theory (No derivation).	16
	C-12 (P)	• To study the PE Hysteresis loop of a Ferroelectric Crystal.	4
Neelam Roy	DSE-1 (T) (Hons)	• **Mobile Telephony System :** Basic concept of mobile communication, frequency bands used in mobile communication, concept of cell sectoring and cell splitting, SIM number, IMEI number, need for data encryption, architecture (block diagram) of mobile communication network, idea of GSM, CDMA, TDMA and FDMA technologies, simplified block diagram of mobile phone handset, 2G, 3G and 4G concepts (qualitative only). • GPS navigation system (qualitative idea only).	16
	DSE-1 (P) (Hons)	• To study Pulse Position Modulation (PPM). • To study ASK, PSK and FSK modulators.	2
Sulagna Dutta	DSE-2 (T) (Hons)	• **Special Theory of Relativity :** Relativistic kinematics. Application to two-body decay of an unstable particle	14
Eya Hannan	DSE-2 (T) (Hons)	• **Fluid Dynamics :** Stream lined motion, laminar flow, poiseuille's equation for flow of a liquid through a pipe, Navier- stokes equation, qualitative description of turbulence, Reynolds number.	20
	SEC-3 (Prog)	• **Digital Instruments :** Principle and working of digital meters. Comparison of analog and digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter. • **Digital Multimeter :** Block diagram and working of digital meters. Comparison of analog and digital interval, frequency and period measurement using universal counter/ frequency counter, time-base stability, accuracy and resolution.	20
Neelam Roy	DSE-1 (T) (Prog)	• **Instrumentations :** Introduction to CRO: Block Diagram of CRO. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference. • Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, Zener Diode and Voltage Regulation. • Timer IC: IC 555 Pin diagram and its application as Astable & Monostable Multivibrator.	16

(To be continued)

5^{th} **Semester[September to December]**			
The Name of the Teacher	Paper	Month	Total Number of Classes(Hours)
	DSE-1 (P) (Prog)	• To study a precision Differential Amplifier using Op-amp. • To investigate the use of an op-amp as a Differentiator. • To design a Wien Bridge Oscillator using an op-amp.	4