Department of Physics

Syllabus distribution & Teaching Plan, Even Semesters, Session: 2022-23

(Term I: Commencement of classes to 1st internal; Term II: 1st internal to 2nd internal; Term III: 2 nd internal to ESE preparatory break)

Name of the Teacher: Dr. Jyotirmoy Pramanik

Semester II

Name	Syllabus Allotted	Teaching Plan
Dr. Jyotirmoy Pramanik	C3T: Electric field and Electric Potential; Dielectric properties of Matter (Two lectures per week)	**Term I (10 Lectures) :** **Electric Field and Electric Potential** Course, Program, Program Specific outcomes, Electric field: Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field. Electrostatic Potential. Laplace's and Poisson equations. The Uniqueness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole. **Term II (10 Lectures):** Electrostatic energy of system of charges. Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor. Uniqueness theorem (statement). Method of Images and its application to: (1) Plane Infinite Sheet and (2) Sphere. **Term III (10 Lectures):** **Dielectric Properties of Matter** Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with

		dielectric. Displacement vector D. Relations between E, P and D. Gauss' Law in dielectrics.

Semester IV

Name	Syllabus Allotted	Teaching Plan
Dr. Jyotirmoy Pramanik	SEC2T (2 Lectures per week): Renewable energy and Energy Harvesting SEC2P (2 hours per week): Renewable energy and Energy Harvesting Lab - **Demonstrations and Experiments** 1. Demonstration of Training modules on Solar energy, wind energy, etc. 2. Conversion of vibration to voltage using piezoelectric materials 3. Conversion of thermal energy into voltage using thermoelectric modules.	**Term I(10 Lectures) :** **Fossil fuels and Alternate Sources of energy** Fossil fuels and nuclear energy, their limitation, need of renewable energy, non-conventional energy sources. An over view of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity. **Solar energy** Solar energy, its importance, storage of solar energy, solar pond, non-convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems. **Wind Energy harvesting** Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies. **Term II (10 Lectures):** **Ocean Energy** Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass. **Geothermal Energy** Geothermal Resources, Geothermal Technologies

		Hydro Energy Hydropower resources, hydropower technologies, environmental impact of hydro power sources. **Term III (10 Lectures):** **Piezoelectric Energy harvesting** Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power

Semester VI

Name	Syllabus Allotted	
Dr. Jyotirmoy Pramanik	Experimental Techniques, DSE4T (4 lectures per week): Experimental Techniques Lab, DSE4P (4 hours per week): **List of Practical:** 1. Determine output characteristics of a LVDT & measure displacement using LVDT 2. Measurement of Strain using Strain Gauge. 3. Measurement of level using capacitive transducer. 4. To study the characteristics of a Thermostat and determine its parameters. 5. Study of distance measurement using ultrasonic transducer. 6. Calibrate Semiconductor type temperature sensor (AD590, LM35, or LM75) 7. To measure the change in temperature of ambient using Resistance Temperature Device (RTD). 8. Create vacuum in a small chamber using a mechanical (rotary) pump and measure the chamber pressure using a pressure gauge.	**Term I (20 Lectures):** **Measurements** Accuracy and precision. Significant figures. Error and uncertainty analysis. Types of errors: Gross error, systematic error, random error. Statistical analysis of data (Arithmetic mean, deviation from mean, average deviation, standard deviation, chi-square) and curve fitting. Guassian distribution. **Signals and Systems** Periodic and aperiodic signals. Impulse response, transfer function and frequency response of first and second order systems. Fluctuations and Noise in measurement system. S/N ratio and Noise figure. Noise in frequency domain. Sources of Noise: Inherent fluctuations, Thermal noise, Shot noise, 1/f noise. **Vacuum Systems** Characteristics of vacuum: Gas law, Mean free path. Application of vacuum. Vacuum system-Chamber, Mechanical pumps, Diffusion pump & Turbo Modular pump, Pumping speed, Pressure gauges (Pirani, Penning, ionization). **Shielding and Grounding** Methods of safety grounding. Energy coupling. Grounding. Shielding: Electrostatic shielding. Electromagnetic Interference. **Term II (20 Lectures):** **Transducers &industrial instrumentation (working principle, efficiency, applications)** Static and dynamic characteristics of measurement Systems. Generalized performance of systems, Zero order first order, second order and higher order systems. Electrical, Thermal and Mechanical systems. Calibration.

	9. To measure Q of a coil and influence of frequency, using a Q-meter.	Transducers and sensors. Characteristics of Transducers. Transducers as electrical element and their signal conditioning. Temperature transducers: RTD, Thermistor, Thermocouples, Semiconductor type temperature sensors (AD590, LM35, LM75) and signal conditioning. Linear Position transducer: Strain gauge, Piezoelectric. Inductance change transducer: Linear variable differential transformer (LVDT), Capacitance change transducers. Radiation Sensors: Principle of Gas filled detector, ionization chamber, scintillation detector. **Term III (20 Lectures):** **Digital Multimeter** Comparison of analog and digital instruments. Block diagram of digital multimeter, principle of measurement of I, V, C. Accuracy and resolution of measurement. **Impedance Bridges and Q-meter** Block diagram and working principles of RLC Bridge. Q - meter and its working operation. Digital LCR bridge.

Department of Physics

Teaching Plan

Name of the Teacher: Dr. Tanika Kar

Semester II	
Syllabus allotted	**C4T:** Wave Optics, Interference, Interferometer, Diffraction **C4P:** Wave and Optics Lab
No of Classes (Hour) per week	**C4T:** 2 **C4P:** 2
Teaching Plan	**Lecture 1:** A brief introduction to the portion to be taught. **Lecture 2:** Huygens' Principle **Lecture 3:** Interference – Spatial & Temporal Coherence, Young's double slit experiment. **Lecture 4:** Different classes of interference; Biprism; Lloyd's mirror; Determination of wavelength of monochromatic light, fringe width and thickness of thin film. **Lecture 5:** Phase change on reflection – Stoke's treatment; Difference between biprism and Lloyd's mirror fringe pattern; Thin film due to reflected light; Effect of monochromatic & white light, wedge angle on fringe pattern. **Lecture 6:** Thin film due to transmitted light; Effect of monochromatic & white light, wedge angle on fringe pattern; Fringe width – wedge angle relationship. **Lecture 7:** Fringes of equal width & Fringes of equal inclination. **Lecture 8:** Newton's rings with reflected and transmitted light. Determination of wavelength of monochromatic light, refractive index of liquid using Newton's rings. Difference between biprism and Newton's rings fringe pattern; **Lecture 9:** End - Semester questions & related mathematical problem discussion. **Lecture 10:** Short-test. **Lecture 11:** Michelson Interferometer. **Lecture 12:** Fabry-Perot Interferometer. **Lecture 13:** Diffraction – Introduction; Fresnel's half – period zones of a plane wavefront and their applications. **Lecture 14:** Zone Plate – Construction, area of half – period zones, multiple foci of a zone plate. **Lecture 15:** Comparison of zone plate with convex lens. End – Semester questions & related mathematical problem discussion. **Lecture 16:** Different classes of diffraction. Fraunhofer diffraction in a single slit – conditions for maxima and minima. **Lecture 17:** Fraunhofer diffraction in a double slit – conditions for maxima and minima. Missing order. Comparison of diffraction patterns of single slit & double slit. **Lecture 18:** End - Semester questions & related mathematical problem discussion.

	Lecture 19: Short-test. **Lecture 20:** Fraunhofer diffraction in a plane diffraction grating – construction, conditions for maxima and minima. Absent spectra, Ghost lines, overlapping of spectral lines. **Lecture 21:** Angular dispersive power of a grating. Determination of wavelength of monochromatic light using grating. Difference between prism and grating spectra. End - Semester questions & related mathematical problem discussion. **Lecture 22:** Fraunhofer diffraction at a circular aperture. **Lecture 23:** Resolving power, Rayleigh criterion of resolution. Resolving power of a telescope. **Lecture 24:** Resolving power of a grating. End - Semester questions & related mathematical problem discussion. **Lecture 25:** Fresnel's half – period elements of cylindrical wavefront. Fresnel's diffraction at a straight edge. **Lecture 26:** Kirchhoff's integral theorem, Fresnel's integral, Fresnel – Kirchhoff's integral formula. **Lecture 27:** Fresnel's diffraction by a narrow slit and a narrow wire. **Lecture 28:** End - Semester questions & related mathematical problem discussion. **Lecture 29:** Revision. **Lecture 30:** Class test.
Semester IV	
Syllabus allotted	**C9T:** Elements of Modern Physics **C9P:** Elements of Modern Physics Lab **C10P:** Analog systems and Applications Lab
No of Classes (Hour) per week	**C9T:** 2 **C9P & C10P:** 4
Teaching Plan	**Lecture 1:** A brief introduction to the portion to be taught. **Lecture 2:** Binding energy of an atom, semi- empirical mass formula. **Lecture 3:** Radioactivity – Laws of radioactive decay; Mean life, half life; Activity. Radioactive radiations – properties of alpha, beta and gamma rays. **Lecture 4:** Alpha decay, Range of alpha particles, Geiger law, Straggling of range, Geiger – Nuttall law, alpha disintegration energy, alpha ray spectra. **Lecture 5:** Beta decay – beta ray spectra, Its comparison with alpha ray spectra, Different types of beta decay. Difficulties in explaining beta ray spectra. Pauli's neutrino hypothesis, Properties of neutrino. **Lecture 6:** Gamma rays – its spectra, Internal conversion, passage of gamma rays through matter. **Lecture 7:** Short-test. **Lecture 8:** Nuclear Fission – types of fission, distribution of fission products. **Lecture 9:** Nuclear Fission – fissile and fertile material, spontaneous fission, explanation using liquid drop model. **Lecture 10:** Nuclear chain reaction. Nuclear reactor – basic components and

	types. **Lecture 11:** Nuclear Fusion – Thermonuclear reactions, Steller energy. **Lecture 12:** Short-test. **Lecture 13:** Size and structure of nucleus, nuclear force. **Lecture 14:** Nuclear models – Liquid drop model, Nuclear shell model. **Lecture 15:** Short-test. **Lecture 16:** LASER – Introduction – Absorption, Spontaneous & Stimulated emission of radiation. **Lecture 17:** Einstein's A, B coefficients. **Lecture 18:** Population inversion, Pumping, Three – level & Four – level lasers. **Lecture 19:** Basic components of laser. **Lecture 20:** Ruby laser, He – Ne laser. **Lecture 21:** Short-test. **Lecture 22:** End - Semester questions & related mathematical problem discussion. **Lecture 23:** Revision. **Lecture 24:** Revision. **Lecture 25:** Class-test.
Semester VI	
Syllabus allotted	**C13T**: Polarization of Electromagnetic Waves, Wave Guides, Optical Fibres. **C13P**: Electromagnetic Theory Lab.
No of Classes (Hour) per week	**C13T:** 2 **C13P:** 3
Teaching Plan	**Lecture 1:** A brief introduction to the portion to be taught. **Lecture 2:** Polarization – Introduction, Description of linear, circular and elliptical polarization. **Lecture 3:** Propagation of electromagnetic waves in anisotropic medium, symmetric nature of dielectric tensor, Fresnel's formula. **Lecture 4:** Polarization by reflection, Brewster's law, Production and detection of polarized light by transmission through piles of plates. Geometry of Calcite crystal, Meaning of optic axis and principal section. **Lecture 5:** Double refraction, Positive and negative crystals, Devices for production and detection of plane polarized light – Nicol prism. **Lecture 6:** Action of nicol as polariser and analyser, parallel and crossed nicol. **Lecture 7:** Quarter wave plate and its use to produce and detect elliptically and circularly polarized light. **Lecture 8:** Analysis of elliptically and circularly polarized light by using quarter wave plate. **Lecture 9:** Short-test. **Lecture 10:** Babinet's Compensator – construction and application. **Lecture 11:** Optical activity, Biot's laws – meaning of specific rotation, molecular rotation. **Lecture 12:** Polarimeters – Laurent half-shade polarimeter, Action of half-shade plate. **Lecture 13:** Rotatory dispersion, Bi – quartz polarimeter, Action of Bi –

	quartz **Lecture 14:** End - Semester questions & related mathematical problem discussion. **Lecture 15:** Planar optical wave guide, Planar dielectric wave guide. **Lecture 16:** Condition of continuity at interface, Phase shift on total reflection, Eigen value equation. **Lecture 17:** Phase and group velocity of guided waves, Field energy and power transmission. **Lecture 18:** Short-test. **Lecture 19:** Optical fibres – Introduction, construction and working of an optical fibre. **Lecture 20:** Optical fibre communication system, total internal reflection, step – and graded – index fibre. **Lecture 21:** Numerical aperture, Single and multimode fibres. End – Semester questions & related mathematical problem discussion. **Lecture 22:** Revision. **Lecture 23:** Revision. **Lecture 24:** Class Test.

Department of Physics

Teaching Plan

Name of the Teacher: Dr. Ritwik Saha

Semester II	
Syllabus allotted	C4T: Superposition of Two Harmonic Waves, Holography C3P: Electricity and Magnetism Lab
No of Classes (Hour) per week	C4T: 1 C3P: 2
Teaching Plan	**Lecture 1:** Holography: Principle of Holography. Recording and Reconstruction Method. **Lecture 2:** Theory of Holography as Interference between two Plane Waves. Point source holograms. **Lecture 3:** Standing (Stationary) Waves in a String: Fixed and Free Ends. Analytical Treatment. **Lecture 4:** Energy of Vibrating String. Transfer of Energy. Normal Modes **Lecture 5:** Phase and Group Velocities. Changes with respect to Position and Time. **Lecture 6:** Longitudinal Standing Waves and Normal Modes. Open and Closed Pipes **Lecture 7:** Transverse waves along Stretched Strings, Normal Modes **Lecture 8:** Introduction to Fourier Series **Lecture 9:** Fourier series, Examples. **Lecture 10:** Plucked String **Lecture 11:** Tutorial **Lecture 12:** Struck String **Lecture 13:** Tutorial. **Lecture 14:** Melde's Experiment **Lecture 15:** Superposition of N Harmonic Waves.
Semester IV	
Syllabus allotted	C8T: Complex Analysis, Integral Transforms C8P: Mathematical Physics III Lab C9P: Elements of Modern Physics Lab GE4P: Electricity and Magnetism Lab
No of Classes (Hour) per week	C8T: 2 C8P: 2 C9P: 3 GE4P: 2
Teaching Plan	**Lecture 1:** Brief Revision of Complex Numbers. **Lecture 2:** Euler's formula, De Moivre's theorem, Roots of Complex Numbers. **Lecture 3:** Graphical Representation of Complex Numbers, Regions, Neighbourhood, Stereographic projection. **Lecture 4:** Functions of Complex Variables, Mapping, Limit, Continuity. **Lecture 5:** Multivalued Complex functions, Limit, Continuity.

	Lecture 6: Analyticity and Cauchy-Riemann Conditions, Polar form of CR **Lecture 7:** Analytic function, Harmonic function, Singularity **Lecture 8:** Singular functions: poles and branch points, order of singularity, branch cuts. **Lecture 9:** Integration of a function of a complex variable: Process to calculate integration, Line integration. **Lecture 10:** Cauchy-Gaursat theorem, Cauchy's Inequality. **Lecture 11:** Cauchy's integral formula. **Lecture 12:** Simply and multiply connected region. **Lecture 13:** Taylor's expansion. **Lecture 14:** Laurent expansion. **Lecture 15:** Different types of Singularities from Laurent expansion. **Lecture 13:** Expansion of a given function in Laurent series **Lecture 14:** Residues **Lecture 15:** Residues **Lecture 16:** Cauchy's Residue theorem **Lecture 17:** Examples related to Cauchy's Residue theorem **Lecture 18:** Application in solving Definite Integrals, Type-I **Lecture 19:** Application in solving Definite Integrals, Type-II **Lecture 20:** Application in solving Definite Integrals, Type-III **Lecture 21:** Introduction to Integrals Transforms, Fourier Transform **Lecture 22:** Fourier Transform, Examples **Lecture 23:** Dirac delta function, in terms of rectangular function and Gaussian function, Integral representation of Dirac delta function. **Lecture 24:** Fourier Transform of Gaussian function, trigonometric functions. **Lecture 25:** Fourier Transform of finite wave train and some other functions, Fourier Transform in 3D. Examples. **Lecture 26:** Properties of Fourier Transform, Linear, Change of scale, Shifting, Conjugate, Modulation. **Lecture 27:** Convolution theorem, Fourier Transform of derivatives. **Lecture 28:** Fourier Sine and Cosine Transform of derivatives. **Lecture 29:** Parseval's identity, Parseval's theorem, Solution of definite integral using Parseval's identity. **Lecture 30:** Solution of PDE using Fourier Transform. **Lecture 31:** Solution of PDE using Fourier Transform, Examples **Lecture 32:** Tutorial (Discussion on questions of Assignment-1: Complex Analysis) **Lecture 33:** Tutorial (Discussion on questions of Assignment-2: Complex Analysis) **Lecture 34:** Tutorial (Discussion on questions of Assignment-3: Complex Analysis) **Lecture 35:** Tutorial (Discussion on questions of Assignment-4: Fourier Transform) **Lecture 36:** Tutorial (Discussion on questions of Assignment-4: Fourier Transform) **Lecture 37:** Tutorial (Discussion on VU previous year questions of C8T) **Lecture 38:** Tutorial (Discussion on VU previous year questions of C8T) **Lecture 39:** Tutorial (Discussion on VU previous year questions of C8T) **Lecture 40:** Tutorial (Discussion on VU previous year questions of C8T)
Semester VI	

Syllabus allotted	DSE3T: Nano Materials and Applications: Characterization, Optical Properties, Electron Transport, Applications. C14P: Statistical mechanics Lab
No of Classes (Hour) per week	DSE3T: 2 C14P: 3
Teaching Plan	**Lecture 1:** X-Ray Diffraction. **Lecture 2:** Optical Microscopy. **Lecture 3:** Scanning Electron Microscopy. **Lecture 4:** Transmission Electron Microscopy. **Lecture 5:** Atomic Force Microscopy. **Lecture 6:** Scanning Tunneling Microscopy **Lecture 7:** Coulomb interaction in nanostructures. Concept of dielectric constant for nanostructures and charging of nanostructure. **Lecture 8:** Quasi-particles and excitons. Excitons in direct and indirect band gap semiconductor nanocrystals **Lecture 9:** Quantitative treatment of quasi-particles and excitons, charging effects. **Lecture 10:** Radiative processes: General formalization-absorption, emission and luminescence. **Lecture 11:** Optical properties of heterostructures and nanostructures. **Lecture 12:** Carrier transport in nano-structures. Coulomb blockade effect, Single Electron Transistor. **Lecture 13:** Thermionic emission. **Lecture 14:** Thermionic emission. **Lecture 15:** Tunnelling and hoping conductivity. **Lecture 16:** Defects and impurities **Lecture 17:** Deep level and surface defects. **Lecture 18:** Applications of nanoparticles, quantum dots, nanowires and thin films for photonic devices (LED, solar cells) **Lecture 19:** CNT based transistors. **Lecture 20:** Nanomaterial Devices: Quantum dots heterostructure lasers, optical switching and optical data storage. **Lecture 21:** Magnetic quantum well; magnetic dots -magnetic data storage. **Lecture 22:** Micro Electromechanical Systems (MEMS) **Lecture 23:** Nano Electromechanical Systems (NEMS). **Lecture 24:** Tutorial **Lecture 25:** Tutorial **Lecture 26:** Tutorial **Lecture 27:** Tutorial

Department of Physics

Teaching Plan

Name of the Teacher: Rudra Narayan Mondal

<table>
<tr><th colspan="2">Semester II</th></tr>
<tr><td>Syllabus allotted</td><td>C4T: Superposition of Collinear Harmonic oscillations; Superposition of two perpendicular Harmonic Oscillations; Wave Motion; Velocity of Waves
C3P: Electricity and Magnetism Lab</td></tr>
<tr><td>No of Classes (Hour) per week</td><td>C4T: 1
C3P: 4</td></tr>
<tr><td>Teaching Plan</td><td>Lecture 1: Introduction to harmonic oscillations, Linearity and Superposition Principle.
Lecture 2: Superposition of two collinear oscillations having equal frequencies and different frequencies (Beats).
Lecture 3: Superposition of N collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences.
Lecture 4: Lissajous Figure: Superposition of two perpendicular Harmonic Oscillations with equal frequency
Lecture 5: Lissajous Figure: Superposition of two perpendicular Harmonic Oscillations with different frequency ratio.
Lecture 6: Graphical method to draw Lissajous figure. Uses of Lissajous figure
Lecture 7: Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves.
Lecture 8: Wave Equation. Particle and Wave Velocities. Differential Equation of wave
Lecture 9: Velocity of Longitudinal Waves in a Fluid in a Pipe.
Lecture 10: Field parameter: dilatation, condensation, acoustic pressure
Lecture 11: Water Waves: Ripple and Gravity Waves
Lecture 12: Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave: Bel, decibel, phon
Lecture 13: Velocity of Transverse Vibrations of Stretched Strings.
Lecture 14: Newton’s Formula for Velocity of Sound. Laplace’s Correction
Lecture 15: Tutorial</td></tr>
<tr><th colspan="2">Semester IV</th></tr>
<tr><td>Syllabus allotted</td><td>C8T: Matrices; Eigen values and eigen vectors
C10T: Bipolar junction transistor; Field effect transistor
C8P: Mathematical Physics III Lab
C10P: Analog systems and Applications Lab</td></tr>
<tr><td>No of Classes (Hour) per week</td><td>C8T: 1
C10T: 1
C8P: 2
C10P: 3</td></tr>
<tr><td>Teaching Plan</td><td>C8T: Matrices; Eigen values and eigen vectors
Lecture 1: Introduction to matrix</td></tr>
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	Lecture 2: Addition and Multiplication of Matrices. Null Matrices. **Lecture 3:** Diagonal, Scalar and Unit Matrices. **Lecture 4:** Upper-Triangular and Lower-Triangular Matrices. **Lecture 5:** Transpose of a Matrix. Symmetric and Skew-Symmetric Matrices. **Lecture 6:** Conjugate of a Matrix. Hermitian and Skew- Hermitian Matrices. **Lecture 7:** Singular and Non-Singular matrices. Orthogonal and Unitary Matrices. **Lecture 8:** Trace of a Matrix. **Lecture 9:** Inner Product **Lecture 10:** Eigen values and eigen vectors of a 2×2 matrix **Lecture 11:** Eigen values and eigen vectors of a 3×3 matrix **Lecture 12:** Cayley- Hamiliton Theorem and its application **Lecture 13:** Diagonalization of Matrices. **Lecture 14:** Solutions of Coupled Linear Ordinary Differential Equations. **Lecture 15:** Functions of a Matrix: exp(A), trigonometric function of a square matrix **C10T: Bipolar junction transistor; Field effect transistor** **Lecture 1:** Introduction to transistor: importance in modern civiliztion **Lecture 2:** Concept of emitter, base and collector of n-p-n and p-n-p Transistors: Band diagram **Lecture 3:** Principle of operation of a transistor: Current components through a transistor **Lecture 4:** Input and output Characteristics of CB, CE and CC Configurations. **Lecture 5:** Current gains α and β Relations between α and β. **Lecture 6:** Load Line analysis of Transistors. DC Load line and Q-point. AC load line **Lecture 7:** Active, Cutoff and Saturation Regions: operational condition **Lecture 8:** Solving problems related to transistor **Lecture 9:** Introduction to Field effect transistor: Advantages of FET over transistor **Lecture 10:** JFET: working principle, source, drain, Gate **Lecture 11:** Input and output characteristics of JFET **Lecture 12:** Introduction to MOSFET; Working principle **Lecture 13:** Tutorial **Lecture 14:** Tutorial **Lecture 15:** Tutorial
Semester VI	
Syllabus allotted	DSE3T: Nano Materials and Applications: Nanoscale Systems; Synthesis of Nanostructure Materials C14P: Statistical mechanics Lab
No of Classes (Hour) per week	DSE3T: 2 C14P: 3
Teaching Plan	**Lecture 1:** Feynman lecture: ‘There is plenty of room at bottom’, Introduction to nanoscience and nanotechnology. Examples of natural nanomaterials and manmade nanomaterials.

	Lecture 2: Length scales in physics, Comparison of different objects **Lecture 3:**1D, 2D and 3D nanostructures (nanodots, thin films, nanowires, nanorods): Examples and applications **Lecture 4:** Band structure and density of states of 1D, 2D and 3D nanomaterials. **Lecture 5:** Size Effects in nano systems, Quantum confinement **Lecture 6:** Applications of Schrodinger equation- Infinite potential well **Lecture 7:** Schrodinger equations for a particle is in a step potential and potential box **Lecture 8:** quantum confinement of carriers in 3D, 2D, 1D nanostructures and its consequences. **Lecture 9:** Different properties (Color, electrical, optical, magnetic etc) of materials at nanoscale. **Lecture 10:** Synthesis of nanomaterials: Physical, Chemical, Biological and hybrid method. Top down and Bottom up approach. **Lecture 11:** Photolithography. Ball milling technique **Lecture 12:** Gas phase condensation. Vacuum deposition. **Lecture 13:** Physical vapor deposition (PVD) **Lecture 14:** Thermal evaporation **Lecture 15:** E-beam evaporation **Lecture 16:** Pulsed Laser deposition **Lecture 17:** Chemical vapor deposition (CVD) **Lecture 18:** Sol-Gel method **Lecture 19:** Hydrothermal and solvothermal synthesis. **Lecture 20:** Preparation through colloidal methods. **Lecture 21:** Electro deposition. **Lecture 22:** Spray pyrolysis. Spin coating **Lecture 23:** MBE growth of quantum dots. **Lecture 24:** Tutorial **Lecture 25:** Tutorial **Lecture 26:** Tutorial **Lecture 27:** Tutorial

Department of Physics

Teaching Plan

Name of the Teacher: Dr. Samir Kumar Giri

<table>
<tr><th colspan="2">Semester II</th></tr>
<tr><td>Syllabus allotted</td><td>C3T: Electricity and Magnetism
C4P: Wave and Optics Lab
GE2T:Thermal Physics and Statistical Mechanics
GE2P:Thermal Physics and Statistical Lab</td></tr>
<tr><td>No of Classes (Hour) per week</td><td>C3T: 1
C4P: 4
GE2T:1
GE2P:2</td></tr>
<tr><td rowspan="2">Teaching Plan</td><td>Lecture 1: Introduction to course prospectus and course outcome
Lecture 2: AC Circuits: Kirchhoff's laws for AC circuits.
Lecture 3: Complex Reactance and Impedance
Lecture 4: Series LCR Circuit
Lecture 5: Parallel LCR Circuit.
Lecture 6: Ideal Constant-voltage and Constant-current Sources
Lecture 7: Thevenin theorem
Lecture 8: Norton theorem
Lecture 9: Tutorial
Lecture 10: Reciprocity theorem
Lecture 11: Superposition theorem
Lecture 12: Maximum Power Transfer theorem.
Lecture 13: Tutorial.
Lecture 14: Applications to dc circuits
Lecture 15: Tutorial.</td></tr>
<tr><td>Lecture 1: Introduction to course prospectus and course outcome
Lecture 2: Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature.
Lecture 3: First law and internal energy, conversion of heat into work.
Lecture 4: Various Thermodynamical Processes, Applications of First Law: General Relation between CP and CV
Lecture 5: Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient.
Lecture 6: Reversible and irreversible processes
Lecture 7: Second law and Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes
Lecture 8: Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.
Lecture 9: Enthalpy, Gibbs, Helmholtz and Internal Energy functions.
Lecture 10: Maxwell's relations and applications - Joule-Thompson Effect
Lecture 11: Clausius- Clapeyron Equation, Expression for (CP – CV), CP/CV, TdS equations
Lecture 12: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order)</td></tr>
</table>

	Lecture 13: Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case) **Lecture 14:**Law of equipartition of energy **Lecture 15:** its applications to specific heat of gases; mono-atomic and diatomic gases
Semester IV	
Syllabus allotted	C10T: Analog Systems and Applications C10P: Analog Systems and Applications Lab GE4T: Electricity and Magnetism
No of Classes (Hour) per week	C10T:01 C10P:03 GE4T: 2
Teaching Plan	**Lecture 1:** Introduction to course prospectus and course outcome. **Lecture 2:** P and N type semiconductors **Lecture 3:** Energy Level Diagram **Lecture 4:** Conductivity and Mobility, Concept of Drift velocity **Lecture 5:** PN Junction Fabrication. **Lecture 6:** Barrier Formation in PN Junction Diode **Lecture 7:** Static and Dynamic Resistance **Lecture 8:** Current Flow Mechanism in Forward and Reverse Biased Diode. **Lecture 9:** Drift Velocity. **Lecture 10:** Tutorial. **Lecture 11:** Derivation for Barrier Potential. **Lecture 12:** Barrier Width and Current for Step Junction. **Lecture 13:** Current Flow Mechanism in ForwardBiased Diode. **Lecture 14:** Tutorial. **Lecture 15:** Current Flow Mechanism in Reverse Biased diode.
	Lecture 1: Introduction to course prospectus and course outcome**.** **Lecture 2:** Biot-Savart's law **Lecture 3:** Biot-Savart's law applications- straight conductor **Lecture 4:** Biot-Savart's law applications-, circular coil, solenoid carrying current. **Lecture 5:** Divergence and curl of magnetic field**.** **Lecture 6:** Magnetic vector potential **Lecture 7:** Ampere's circuital law **Lecture 8:** Magnetic properties of materials. **Lecture 9:** Magnetic intensity, magnetic induction, permeability. **Lecture 10:** Magnetic susceptibility**.** **Lecture 11:** Brief introduction of dia-, paramagnetic materials**.** **Lecture 12:** Brief introduction of ferro- magnetic materials. **Lecture 13:** Faraday's laws of electromagnetic induction **Lecture 14:** Tutorial. **Lecture 15:** Lenz's law. **Lecture 16:** Self and mutual inductance **Lecture 17:** L of single coil. **Lecture 18:** M of two coils **Lecture 19:** Energy stored in magnetic field. **Lecture 20:** Equation of continuity of current. **Lecture 21:** Displacement current

	Lecture 22: Maxwell's equations **Lecture 23:** Poynting vector **Lecture 24:** Energy density in electromagnetic field **Lecture 25:** Electromagnetic wave propagation through vacuum and isotropic dielectric medium **Lecture 26:**Tutorial **Lecture 27:** Tutorial **Lecture 28:** Transverse nature of EM waves **Lecture 29:** Polarization **Lecture 30:** Tutorial. **Lecture 31:** Problem and Solution of Maxwell's equations **Lecture 32:**Tutorial (Discussion on questions of Assignment-1: Biot-Savart's law) **Lecture 33:** Tutorial (Discussion on questions of Assignment-2: Ampere's circuital law) **Lecture 34:** Tutorial (Discussion on questions of Assignment-3: Magnetic vector potential) **Lecture 35:** Tutorial (Discussion on questions of Assignment-4: Lenz's law) **Lecture 36:** Tutorial (Discussion on questions of Assignment-5: Self and mutual inductance) **Lecture 37:** Tutorial (Discussion on VU previous year questions of GE4T) **Lecture 38:** Tutorial (Discussion on VU previous year questions of GE4T) **Lecture 39:** Tutorial (Discussion on VU previous year questions of GE4T) **Lecture 40:** Tutorial (Discussion on VU previous year questions of GE4T)
Semester VI	
Syllabus allotted	C14T: Statistical Mechanics DSE3P: Nano Materials and Applications Lab.
No of Classes (Hour) per week	C14T: 2 DSE3P: 3
Teaching Plan	**Lecture 1:** Introduction to course prospectus and course outcome. **Lecture 2:** Macrostate& Microstate. **Lecture 3:** Elementary Concept of Ensemble. **Lecture 4:** Microcanonical ensemble. **Lecture 5:** Phase Space. **Lecture 6:** Entropy and Thermodynamic Probability **Lecture 7:** Canonical ensemble. **Lecture 8:** Partition Function **Lecture 9:** Thermodynamic Functions of an Ideal Gas. **Lecture 10:** Classical Entropy Expression. **Lecture 11:** Gibbs Paradox. **Lecture 12:** SackurTetrode equation. **Lecture 13:** Law of Equipartition of Energy. **Lecture 14:** Law of Equipartition of Energy– Applications to Specific Heat and its Limitations. **Lecture 15:** Tutorial. **Lecture 16:** Thermodynamic Functions of a Two-Energy Levels System **Lecture 17:** Negative Temperature. **Lecture 18:** Grand canonical ensemble and chemical potential

	Lecture 19: Properties of Thermal Radiation. **Lecture 20:** Blackbody Radiation. **Lecture 21:** Pure temperature dependence. **Lecture 22:** Kirchhoff's law **Lecture 23:** Stefan-Boltzmann law: Thermodynamic proof. **Lecture 24:** Radiation Pressure **Lecture 25:** Wien's Displacement law **Lecture 26:** Wien's Distribution Law **Lecture 27:** Tutorial **Lecture 28:** Saha's Ionization Formula **Lecture 29:** Rayleigh-Jean's Law. **Lecture 30:** Ultraviolet Catastrophe

Department of Physics

Teaching Plan

Name of the Teacher: Mihir Das

Semester II	
Syllabus allotted	**C2P: Mechanics Lab** **GE1T: Elements of Modern Physics** **GE1P: Elements of Modern Physics Lab**
No of Classes (Hour) per week	**C2P:- 2** **GE1T:- 1** **GE1P:- 2**
Teaching Plan	**GE1T: Size and structure of atomic nucleus and its relation with atomic weight, Radioactivity , Fission and fusion** **Lecture 1:** Constitutes of Nucei,Isotopes,Isobars,Isotones and Mirror Nucei. **Lecture 2:** Nuclear Mass and Binding Energy , Unit of Atomic Mass **Lecture 3:** Mass Defect and Packing Fraction,Stability of Nucleus. **Lecture 4:** Complementarity of Binding and Packing Fraction Curves. **Lecture 5:** Nature of Nuclear Force, NZ Graph **Lecture 6:** Semiempirical Mass Formula and Binding Energy **Lecture 7:** Law of Radioactive Decay,Mean Life and Half Life **Lecture 8:** Radioactive Radiations,General Properties of α,β,γ Rays **Lecture 9:** Decay: Decay-Energy Released **Lecture 10:** Energy Spectrum and Pauli's Prediction of Neutrino **Lecture 11:** Mass Deficit,Nuclear Fission **Lecture 12:** Energy Released in Fission of U-235 **Lecture 13:**Fusion and Thermonuclear Reactions. **Lecture 14:** Tutorial **Lecture 15:** Tutorial
Semester IV	
Syllabus allotted	**C9P: Elements of Modern Physics Lab** **C10T: Analog Systems and Applications** **C10P: Analog Systems and Applications Lab**
No of Classes (Hour) per week	**C9P: 2** **C10T: 2** **C10P: 2**
Teaching Plan	**C10T: Amplifiers,** **Lecture 1:** Introduction to D.C Biasing of a Transistor **Lecture 2:** Stability of Biasing ,Fixed Bias Arrangement **Lecture 3:** Voltage Divider Bias of Self Bias ,Emitter Feedback Bias Circuit **Lecture 4:** Collector-Base Feedback Bias, Bias Compensation,Graphical Analysis of Transistor Amplifier, AC Load Line **Lecture 5:**Transistor as 2-port Network. h-parameter Equivalent Circuit

	Lecture 6: Graphical Determination of CE h-parameters **Lecture 7:** Analysis of a CE Amplifier Using Hybride Model **Lecture 8:** The Emitter Follower (CC Amplifier),Simplified Hybrid Model **Lecture 9:** CE Amplifier With Emitter Resistance ,Darlington Pair **Lecture 10:** Introduction to BJT Amplifier, Classification of Amplifiers **Lecture 11:** Distortion and Noise in Amplifiers,Principles of Multistage Amplifiers **Lecture 12:** Two stage RC-coupled amplifier **Lecture 13:** Two stage RC-coupled amplifier **Lecture 14:** Introduction to Power Amplifiers,Series-fed Class A Power Amplifier With Resistive Load, Transistor Coupled Class A Power Amplifier **Lecture 15:** Class B Push Push Pull Amplifier,Advantages and Disadvantages **Lecture16:** Complementary Symmetry Push Pull Ampliofier. Tuned Class C Amplifier **Lecture 17:** Feedback in Amplifiers: Effects of Positive and Negative Feedback on Input Impedance, Output Impedance **Lecture 18:** Effects of Positive and Negative Feedback on Gain, Stability, Distortion and Noise. **Lecture 19:** Sinusoidal Oscillators: Barkhausen's Criterion for self-sustained oscillations. RC Phase shift oscillator, determination of Frequency **Lecture 20:** Hartley & Colpitts oscillators **Lecture 21:** Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical Op-Amp. (IC 741) **Lecture 22:** Open-loop and Closed-loop Gain. Frequency Response. CMRR. Slew Rate and concept of Virtual ground **Lecture 23:** Applications of Op-Amps: Linear - Inverting and non-inverting amplifiers, Adder and Subtractor **Lecture 24:** Differentiator, Integrator, Log amplifier, and Zero crossing detector **Lecture 25:** Wein bridge oscillator, Non-linear – inverting and non-inverting comparators **Lecture 26:** Schmidt triggers or Regenerative comparator **Lecture 27:** Frequency Response of OP-AMP,Input-Output Characteristics of OP-AMP **Lecture 28:** Conversion: Resistive network (Weighted and R-2R Ladder). Accuracy and Resolution **Lecture 29:** A/D Conversion(Successive Approximation) **Lecture 30:** Tutorial
Semester VI	
Syllabus allotted	**CC-14T: Statistical Mechanics** **DSE3P: Nano Materials and Applications Lab**
No of Classes (Hour) per week	**CC-14T: 2** **DSE3P: 3**

Teaching Plan	**CC-14T: Quantum Theory of Radiation, Bose-Einstein Statistics, Fermi-Dirac Statistics** **Lecture 1:** Introduction to Quantum Statistics, Failures of Classical Statistics **Lecture 2:** Spectral Distribution of Black Body Radiation. Planck's Quantum Postulates **Lecture 3:** Planck's Law of Blackbody Radiation: Experimental Verification **Lecture 4:** Deduction of (1) Wien's Distribution Law, (2) Rayleigh-Jeans Law, (3) Stefan-Boltzmann Law, (4) Wien's Displacement law from Planck's law **Lecture 5:** Previous Years Question Solving **Lecture 6:** Bose-Einstein Distribution Law,Energy and Pressure For a Perfect Bose-Einstein Gas **Lecture 7:** Gas Degeneracy **Lecture 8:** Bose Einstein Condensation **Lecture 9:** Thermal Properties of Bose-Einstein Gas **Lecture 10:** Properties of Liquid He **Lecture 11:** Radiation as a Phototn Gas and Thermodynamics Functions of Photon Gas, Bose Distribution of Planck's Law **Lecture 12:** Previous Years Question Solving **Lecture 13:** Fermi-Dirac Distribution Law **Lecture 14:** Energy and Pressure of the Gas **Lecture 15:** Case of Slightly Degeneracy **Lecture 16**: Case of Strongly Degeneracy **Lecture 17:** Expression of Energy and Pressure in terms of Fermi Energy **Lecture 18:** Thermodynamic Functions of Degenerate Fermi Gas **Lecture 19:** Electron Gas in a Metal, Specific Heat of Metals **Lecture 20:** Relativistic Fermi Gas, White Dwarf Stars **Lecture 21:** White Dwarf Stars, Chandrasekhar Mass Limit **Lecture 22:** Previous Years Question Solving **Lecture 23:** Tutorial **Lecture 24:** Tutorial **Lecture 25:**. Tutorial **Lecture 26:** Tutorial **Lecture 27:** Tutorial

Department of Physics

Teaching Plan

Name of the Teacher: Mr. Pankaj Patra

<table>
<tr><th colspan="2">Semester II</th></tr>
<tr><td>Syllabus allotted</td><td>DSC-1B(CC2): Electricity and Magnetism</td></tr>
<tr><td>No of Classes (Hour) per week</td><td>DSC-1B(CC2): 2</td></tr>
<tr><td>Teaching Plan</td><td>Lecture 1: Magnetostatics: Biot-Savart's law & its applications- straight conductor
Lecture 2: Circular coil, solenoid carrying current
Lecture 3: Divergence and curl of magnetic field.
Lecture 4: Magnetic vector potential. Ampere's circuital law.
Lecture 5: Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility.
Lecture 6: Brief introduction of dia, para and ferro-magnetic materials.
Lecture 7: Tutorial (Discussion on VU previous year questions)
Lecture 8: Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law
Lecture 9: Self and mutual inductance
Lecture 10: L of single coil
Lecture 11: M of two coils
Lecture 12: Energy stored in magnetic field.
Lecture 13: Tutorial (Discussion on VU previous year questions)
Lecture 14: Maxwell`s equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations
Lecture 15: Poynting vector, energy density in electromagnetic field
Lecture 16: Electromagnetic wave propagation through vacuum and isotropic electric medium
Lecture 17: Transverse nature of EM waves, polarization.
Lecture 18:Numericals on Magnetostatics
Lecture 19: Numericals on Magnetic properties of materials
Lecture 20: Numericals on Electromagnetic Induction
Lecture 21: Tutorial (Discussion on VU previous year questions)
Lecture 22:Discussions on short type questions and answers
Lecture 23:Group discussion
Lecture 24:Class test
Lecture 22:Tutorial
Lecture 23:Tutorial
Lecture 24:Tutorial
Lecture 25:Tutorial
Lecture 26:Tutorial
Lecture 27:Tutorial
Lecture 28:Tutorial
Lecture 29:Tutorial</td></tr>
</table>

	Lecture 30: Tutorial
Semester IV	
Syllabus allotted	DSC1DT: Waves and Optics DSC1DP: Waves and Optics (lab)
No of Classes (Hour) per week	DSC1DT: 2 DSC1DP: 2
Teaching Plan	**Lecture 1: Superposition of Two Collinear Harmonic oscillations**: Linearity and Superposition Principle. **Lecture 2:** Oscillations having equal frequencies **Lecture 3:** Oscillations having different frequencies (Beats). **Lecture 4: Superposition of Two Perpendicular Harmonic Oscillations**: Graphical and Analytical Methods **Lecture 5:** . Lissajous Figures with equal frequency **Lecture 6:** . Lissajous Figures with unequal frequency **Lecture 7:** Uses of Lissajous Figures and numericals **Lecture 8: Waves Motion- General**: Transverse waves on a string **Lecture 9:**Travelling and standing waves on a string. Normal Modes of a string. **Lecture 10:** Group velocity, Phase velocity **Lecture 11:** Plane waves, Spherical waves, Wave intensity. **Lecture 12: Fluids: Surface Tension**: Synclastic and anticlastic surface - Excess of pressure. **Lecture 13:** Application to spherical and cylindrical drops and bubbles. **Lecture 14:** variation of surface tension with temperature - Jaegar's method.. **Lecture 15:** Viscosity – Rate of flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid. **Lecture 16:** Variations of viscosity of a liquid with temperature lubrication and numericals **Lecture 17:** Physics of low pressure - production and measurement of low pressure **Lecture 18:** Rotary pump , Diffusion pump, Molecular pump **Lecture 19:** Knudsen absolute gauge , penning and pirani gauge ,Detection of leakage. **Lecture 20:** Numericals **Lecture 21:** Sound: Simple harmonic motion **Lecture 22:** - Forced vibrations and resonance **Lecture 23:** - Fourier's Theorem **Lecture 24:** Application to saw tooth wave and square wave **Lecture 25:** Intensity and loudness of sound - Decibels - Intensity levels **Lecture 26:** musical notes - musical scale **Lecture 27:** Acoustics of buildings: Reverberation and time of reverberation. **Lecture 28:** Absorption coefficient - Sabine's formula - measurement of reverberation time - Acoustic aspects of halls and auditoriam. **Lecture 29:** Tutorial (Discussion on VU previous year questions) **Lecture 30:** Tutorial
Semester VI	
Syllabus allotted	DSE2T: Solid State Physics SEC4T: Weather Forecasting SEC-4P: Practical

No of Classes (Hour) per week	DSE2T: 2 SEC4T: 1 SEC-4P: 2
Teaching Plan (DSE2T)	**Lecture 1:** Crystal Structure: Solids: Introduction,Amorphous and Crystalline Materials. **Lecture 2:** Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. **Lecture 3:** Unit Cell. Miller Indices. **Lecture 4:** Reciprocal Lattice. **Lecture 5:** Types of Lattices. **Lecture 6:** Brillouin Zones. **Lecture 7:** Diffraction of X-rays by Crystals Bragg's Law. **Lecture 8:** Atomic and Geometrical Factor **Lecture 9:** Elementary Lattice Dynamics: Lattice Vibrations and Phonons. **Lecture10:** Linear Monoatomic Chain **Lecture 11:** Linear Diatomic Chain **Lecture 12:** Acoustical and Optical Phonons **Lecture 13:** Qualitative Description of the Phonon Spectrum in Solids. **Lecture 14:** Dulong and Petit's Law. **Lecture 15:** Einstein and Debye theories of specific heat of solids. T3 law **Lecture 16:** Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. **Lecture 17:** Classical Langevin Theory of diamagnetic materials. **Lecture 18:** Classical Langevin Theory of Paramagnetic Domains. **Lecture 19:** Quantum Mechanical Treatment of Paramagnetism. **Lecture 20:** Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. **Lecture 21:** Discussion of B-H Curve. Hysteresis and Energy Loss. **Lecture 22:**Numericals. **Lecture 23:**Previous years VU question papers solve. **Lecture 24:**Class test **Lecture 25:** Group discussion **Lecture 26:** Questions answers **Lecture 27:** Tutorial **Lecture 28:** Tutorial **Lecture 29:** Tutorial
Teaching plan(SEC4T)	**Lecture 1:** Introduction to atmosphere: Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere **Lecture 2:** Variation of pressure and temperature with height; air temperature; requirements to measure air temperature; temperature sensors **Lecture3:** Atmospheric pressure: its measurement; cyclones and anticyclones: its characteristics **Lecture 4:** Measuring the weather: Wind; forces acting to produce wind; wind speed direction: units, its direction; measuring wind speed and direction; humidity, clouds and rainfall **Lecture 5:** radiation: absorption, emission and scattering in atmosphere; radiation laws **Lecture 6:** Weather systems: Global wind systems; air masses and fronts: classifications; jet streams; local thunderstorms; tropical cyclones: classification;

	tornadoes; hurricanes **Lecture 7:** Climate and Climate Change: Climate: its classification; causes of climate change; global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate. **Lecture 8:** Basics of weather forecasting: Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods **Lecture 9:** Criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting **Lecture 10:** Weather maps; uncertainty and predictability; probability forecasts. **Lecture 11:**Tutorial