PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Physics

SYLLABUS FOR 2nd Sem PROGRAMME

Quantum Mechanics - II and Mathematical Physics – II (11204151)

Type of Course:

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/	Lab Hrs/		External		Internal			
				T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Unit I**: **Quantum dynamics, Atoms and Molecules**: The equations of motion, The Schödinger picture, The Heisenberg picture, Indistinguishable particles, Pauli principle, Inclusion of spin, Spin functions for two electrons, Spin functions for three electrons, The Helium Atom, Central field approximation, Thomas - Fermi Model of the atom, Hartree equation, Hartree Fock equations.	25%	15
2	**Unit II**: **Einstein's Quantum Theory of Radiation**: The interaction picture, Einstein co-efficents, Momentum transfer, Life time, Possibility of amplification. Time dependent perturbation theory, Electric dipole interaction, Quantum electrodynamics, Creation and annihilation operators, Fock states, Quantization of field, Zero point energy, Cohrent state, Description of the electromagnetic field, Interaction of radiation with matter.	25%	15
3	**Unit III**: **Complex Variable**: Introduction, Analytical Function, Theorems, Illustrative examples, Contour Integral Theorem, Cauchy's Integral Formula Theorem, Illustrative examples, Laurent Series Theorem, Method of finding residues. The Residue Theorem, Evaluation of Definite, Integrals by use of the residue theorem, Examples, Argument principle Example, Additional illustrative examples, The point at infinity, residue at infinity, Mapping Examples, Conformal mapping, Some Application of conformal Mapping examples, Additional illustrative examples. 1. FET	25%	15

4	**Unit IV**: **Integral equations and Green's functions :** Introduction, Conversion of differential equation into an integral equation, Linear Harmonic oscillator, Liouville - Neumann series, Separation methods.Non homogeneous boundary value problems and Green's functions, Green's functions for one - dimensional problems, Eigen function expansion of Green's function, Fourier transform method of constructing the Green's function, Green's functions in higher dimensions.	25%	15

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Physics

SYLLABUS FOR 2nd Sem PROGRAMME

Classical Mechanics – II, Electrodynamics and Plasma Physics (11204152)

Type of Course:

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/	Lab Hrs/		External		Internal			
				T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Unit I**: **Non Linear Oscillations and Chaos**: Introduction, Singular Points of Trajectories, Nonlinear Oscillations, Volter's Problem, Limit cycle, Chaos, Logistic Map, Poincare System, Strange attractors.	25%	15
2	**Unit II**: **Relativistic electrodynamics and classical field theory**: Relativistic Mechanics, Proper time and proper velocity, Relativistic energy and momentum, Relativistic kinematics, Relativistic dynamics, Relativistic electro dynamics, How field transform, The field tensor, Electro dynamics in tensor notation, Relativistic potentials.The transition from a discrete to a continuous system., The Lagrangian formulation for continuous system, Sound vibrations in gases as an example of Lagrangian formulation, The Hamiltonian formulation for continuous system, Description of fields by variational principles.	25%	15
3	**Unit III**: **Scattering and Dispersion**: Scattering of radiation by a free charge, Scattering of radiation by a bound charge, Radiation damping, Dispersion in dilute gases, Dispersion in liquids and solids. Frequency dependence of Є, μ, σ. Dispersion in non conductors, Free electrons in conductors and Plasma, Illustrative Examples.	25%	15

4	**Unit IV**: **Plasma Physics**: The moment equations, Derivation of the moment equations, Magnetohydrodynamic OR MHD, One fluid model, Two fluid model, Illustrative Examples. Collisions, Liouville equation, The system of B.B.G.K.Y. Equations, The B-V equation with self consistent field, Illustrative Examples.Controlled thermonuclear reaction, Lawson criterion, The Coulomb barrier, Heating and confinement of the plasma, Radiation loss of energy, Instability problem, Magnetohydrodynamic conversion of energy, Plasma propulsion, Other plasma devices, Illustrative Examples.	25%	15

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Physics

SYLLABUS FOR 2nd Sem PROGRAMME

Solid State Properties and Physics of Semiconductor (11204153)

Type of Course:

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/	Lab Hrs/		External		Internal			
				T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Unit I**: **Magnetism**: Diamagnetism, Paramagnetism, Electron Spin Resonance, Nuclear Magnetic Resonance, Spin Relaxation, Weiss theory of Ferro magnetism, the exchange interaction, The Heisenberg model, Ferromagnetic domains, The Bloch wall, Origin of domains, Neel model of Antiferromagnetism, Neel model of Ferrimagnetism, Spin waves, Magnons in Ferromagnets, The Bloch T3/2 law, Magnons in Antiferromagnets.	25%	15
2	**Unit II**: **Superconductivity**: Introduction, Meissner effect, Heat Capacity, Energy gap, Isotop effect, Thermodynamics of the superconducting transition, London equation, Coherence Length, BCS theory of superconductivity, BCS ground state, Flux quantization in a superconducting ring, Type - I and Type -II superconductors, Vortex state, Single particle tunneling, Josephson superconductor tunnelin, DC Josephson effect, AC Josephson effect, Macroscopic quantum interference.	25%	15
3	**Unit III**: **Electrical Conduction in Semiconductors**: Classification of solids: Insulations, Semiconductors, Conductors, Electrons and holes, Mobility, P and N - type semiconductors, Generation and recombination.The Density of States in an Energy band, Energy states densities in semiconductors, Fermi level and the effect of temperature, Intrinsic semiconductors, N - type semiconductors, P - type semiconductors, The law of mass action, The Hall effect.	25%	15

4	**Unit IV**: **Junction Between Materials**: Work function in metals, junction between metals, Semiconductor Junction with no applied voltage, semiconductor junction with applied voltage, Abrupt and Graded junction, Flow of Current across a PN junction, The rectifier equation, The break down of a P - N junction.	25%	15

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Physics

SYLLABUS FOR 2nd Sem PROGRAMME

Remote Sensing and Electronics - II (11204154)

Type of Course:

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/	Lab Hrs/		External		Internal			
				T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Unit I**: **Remote Sensing principles, platforms and sensors:** **Remote Sensing principles :** Electromagnetic remote sensing process, Radiation laws,Atmospheric interaction with electromagnetic radiation, Interaction with earth surface and spectral signatures. **Microwave remote sensing :**The Radar principle, Factors affecting microwave measurements, Side-looking airborne radar systems (SALR), Synthetic aperture radar (SAR), Interaction between microwaves and earth surface, Geometrical characteristics. **Remote Sensing platforms and Sensor :** Satellite system parameters – instrumental parameters, viewing parameters. Sensor parameters – spatial resolution, spectral resolution, radiometric resolution, Imaging sensor systems- multispectral, thermal and microwave imaging. Earth Resource and meteorological satellites.	25%	15
2	**Unit II**: **Image interpretation :** **Visual image interpretation :** Basic elements of image interpretation, Interpretation of aerial photo and satellite imagery, Application of aerial interpretation. **Digital image processing :** Basic character of digital image, Preprocessing – geometric correction, radiometric correction, atmospheric correction, Image enhancement techniques – contrast enhancement. Spatial filtering techniques – different filters, filtering for edge enhancement Image transformation – NDVI transformation, PCA transformation, Image classification – supervised and unsupervised classification	25%	15

3	**Unit III**: **Field Effect transistors (FET)**: Introduction, Advantages and Disadvantages of FET, Operation, Effect of VDS on Channel Conductivity, Channel Ohmic Region and Pinch-off Region, Characteristic Parameters of FET, Effect of Temperature on FET Parameters, Common source AC Amplifier, Common Drain Amplifier, Common Gate Amplifier, Frequency response of FET Amplifier. **MOSFET:** Depletion MOSFET, Enhancement MOSFET, Differences between JFET and MOSFET, Handling precaution for MOSFET, Dual-Gate MOSFET, Characteristics of dual-gate MOSFET.	25%	15
4	**Unit IV**: **Digital IC Logic Families:** Digital ICs, Level of Integration, Digital IC Families, Characteristics of Digital ICs, TTL Logic Family - NAND Gate with Totem-pole Output, Types of TTL, TTL parameters: floating inputs, worst-case input/output voltages, profile and windows, compactibility, sourcing and sinking, noise immunity, standard loading, loading rules. ECL Logic Family - OR/NOR Gates, I2L Logic Family - NOR Gate, MOS Logic Family - MOS Inverters,NMOS Logic Family - NAND & NOR Gates, CMOS Logic Family - NAND & NOR Gates, CMOS characteristics, TTL to CMOS and CMOS to TTL interface.Comparison of Logic Families.	25%	15

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Physics

SYLLABUS FOR 2nd Sem PROGRAMME

Lab-I (Electronics-II) (11204155)

Type of Course:

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
				External		Internal			
Lect Hrs/	Tut Hrs/	Lab Hrs/ Week		T	P	T	CE	P	
-	-	4	2	-	60	-	40	-	100

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

List of Practical:

1. Practical 1
2. Practical 2
3. Practical 3
4. Practical 4
5. Practical 5
6. Practical 6

PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Physics

SYLLABUS FOR 2nd Sem PROGRAMME

Lab-II (Optical Lab-II) (11204156)

Type of Course:

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
				External		Internal			
Lect Hrs/	Tut Hrs/	Lab Hrs/ Week		T	P	T	CE	P	
-	-	4	2	-	60	-	40	-	100

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

List of Practical:

1. Practical 1
2. Practical 2
3. Practical 3
4. Practical 4
5. Practical 5