REVISED SYLLABI FOR
FIRST DEGREE PROGRAMME IN PHYSICS
UNDER CBCSS
LEARNING OUTCOME-BASED CURRICULUM (LOC) FOR UNDERGRADUATE PROGRAMME
(2018 admission onwards)

DEPARTMENT OF PHYSICS

BISHOP MOORE COLLEGE MAVELIKARA

VISION AND MISSION OF THE COLLEGE

VISION

To be a centre of excellence and a catalyst in facilitating a holistic development of youth with international standards, edified with the sanctity of truth, equipped to serve, grounded on Christian ideals.

MISSION

To nurture the enquiring mind to be liberated by truth, empowered by knowledge, committed to service and communal harmony, championing the cause of women and the marginalized and to create a sustainable environment.

PROGRAMME LEARNING OBJECTIVES (PLOs)

PLO1	**Professional Skill Development**

	To develop skills for independent and life-long learning, making use of the latest resources including e-resources To be able to apply the advanced knowledge acquired for the solution of complex problems in professional, social and personal life To acquire communication and presentation skills and become employable in the job market
PLO2	**Core Competency Development** To nurture the enquiring mind with profound and extensive knowledge To develop a multidisciplinary perspective and contribute to the knowledge capital of the world in general and the country in particular
PLO3	**Innovative Curriculum of Global Relevance** To develop in depth understanding and global competency in the subject of study To acquire global competency in the area of research and create new knowledge in the domain
PLO4	**Environmental Sensitivity and Sustainability** To apply the acquired knowledge towards creating a sustainable environment To engage in socially relevant research towards creating a sustainable environment To be shaped into proactive citizens sensitive to environmental and social issues
PLO5	**Ethical Principles and Holistic Development** To become competent and responsible citizens, committed to service and communal harmony, steadfast to the cause of women and the marginalized To nurture the enquiring mind to be liberated by truth, reflected in research devoid of plagiarism and truthful publication of results To create new knowledge as well as affordable methods and systems towards championing the cause of the marginalized To evolve as socially responsible individuals committed to service and communal harmony To be moulded into holistically developed individuals with international standards
PLO6	**Accessibility and Academic Excellence**

	To be able to apply the scientific knowledge, aesthetics of art and commercial acumen acquired from the programme in real-life situations, work environments and in entrepreneurial endeavours To develop a global perspective and engage in collaborative research with institutes of international eminence

PROGRAMME OUTCOMES (POs)

PO1	**Core Competency and Multidisciplinary Knowledge** Graduate students will be able to acquire a comprehensive knowledge of the core subject and a basic understanding of related disciplines to aid them in pursuing careers in multi and interdisciplinary fields
PO2	**Communication Skills** Graduate students will develop language competence and be proficient in oral and written communication
PO3	**Critical Thinking and Problem Solving Skills** Graduate students will develop critical thinking and apply the acquired knowledge to solve problems in the core subject and allied fields, as well as find solutions to societal problems
PO4	**Life Skills, Employability Skills and Entrepreneurial Skills** Graduate students will acquire life and employability skills to place themselves in esteemed positions and employments and entrepreneurial skills to emerge as young entrepreneurs
PO5	**Environment and Sustainability** Graduate students will count themselves accountable to protecting the environment and contributing to sustainable development
PO6	**Responsible Citizens for Nation Building** Graduate students will become competent and responsible citizens, committed to service and communal harmony, contributing to nation building

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1	Understand the fundamental concepts of Physics and the significance of physical phenomena
PSO 2	Develop problem solving skills and apply them to problems relating to physical phenomena
PSO 3	Imbibe experimental skills to carry out experiments to understand and explore the laws and concepts of Physics
PSO 4	Analyse the learnt concepts for applying in real life situations and for entrepreneurial endeavours
PSO 5	Acquire scientific temper and critical thinking leading to motivation for progression in Physics

COGNITIVE LEVELS (CLs)

CL1	**Remember**

CL2	**Understand**
CL3	**Apply**
CL4	**Analyse**
CL5	**Evaluate**
CL6	**Create**

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COURSE DESCRIPTIONS

Course Code	PY1141
Course Title	Basic Mechanics & Properties of Matter
Credits	02
Hours/week	02
Category	Core Course(CC)-Theory
Semester	I
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Dynamics of Rigid Bodies** Equations of motion for rotating rigid bodies- angular momentum and Moment of Inertia (MI)- Theorems on MI- calculation of MI of bodies of regular shapes- uniform rod, ring, disc, annular ring, solid cylinder, hollow cylinder and solid sphere- KE of rotating and rolling bodies- torque- Determination of MI of a flywheel (theory, experiment and applications).	07	CO1	CL1; CL2; CL3
II	**Conservation of energy** Energy Conservation law- Work – power- Kinetic Energy – Work Energy theorem- Conservative Forces - potential energy- Conservation of energy for a particle– energy function- .	03	CO1	CL1; CL2; CL3
III	**Oscillations** Simple harmonic motion – Energy of harmonic oscillators-simple pendulum- mass on a spring-oscillation of two particles connected by a spring- compound bar pendulum - interchange ability of suspension and oscillation-four points	12	CO2	CL3; CL4

	collinear with C.G about which the time period is the same-conditions for maximum and minimum periods - Determination of g using symmetric bar pendulum. Mechanical and electromagnetic wave motion- General equation of a wave motion-expression for a plane progressive harmonic wave-energy density for a plane progressive wave			
IV	**Elasticity** Modulus of elasticity (revision)Relations connecting the three elastic moduli-Poisson's ratio- bending of beams-bending moment-cantilever-centrally loaded beams and uniformly bent beams-I section girders-torsion of a cylinder-expression for torsional couple -work done in twisting a wire-torsion pendulum.	08	CO3	CL4; CL5
V	**Surface Tension** Surface tension-molecular explanation of ST.-angle of contact(revision)shapes of drops -expression for excess of pressure on a curved liquid surface -variation of ST. with temperature	03	CO4	CL1; CL5; CL6
VI	**Fluid Dynamics** Streamline and turbulent flow-equation of continuity-Bernoulli's theorem - venturi meter-viscosity-Newton's law- Stoke's formula	03	CO4	CL1; CL5; CL6

Topics for assignments /discussion in the tutorial session (sample)

1. Physics-The fundamental science-historical development of mechanics-some implications of the principle of mechanics-The scope of mechanics.
2. Life of eminent physicists- Newton, Einstein, C.V.Raman, Edison.
3. Study of Young's modulus for different types of wood.
4. Study of variation of surface tension for different detergents.
5. Study of viscosity of different types of ink and to arrive at knowledge of its fluidity.
6. Wide applications of Bernoulli's equation.
7. Variation of surface tension with temperature by Jaeger's method

Books for Study:

1. Mechanics:H. S.Hans and S. P PuriTMH, 2nd Edn.
2. Mechanics:J.C.Upadhyaya andS.Ram Prasad Chand Publications, 2017
3. Elements of Properties of Matter: D.S. Mathur, S. Chand Publications,2008
4. Fundamentals of Physics: Halliday and Resnick, Wiley India Pvt. Ltd.,2006

Books for Reference:

1. Properties of matter: Brijlal and Subramaniam, S.Chand & Co.,2004
2. Principles of Physics: P.V.Naik, PHI,2010

Web Resources

Course Outcome (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSO Addressed
CO1	Differentiate the rigid bodies, interpret the conservation laws and apply the concepts in analysing their advantages in day to day life situations	CL1;CL2; CL3	PSO1; PSO2
CO2	Interpret different oscillatory systems and apply the knowledge in practical systems	CL2; CL4	PSO1; PSO2
CO3	Apply the knowledge of elasticity and related mathematical formulation to elucidate the principles behind physical processes	CL4; CL5	PSO2; PSO4
CO4	Recollect the concepts of flow of fluids and surface tension and use them to solve everyday problems	CL1;CL5; CL6	PSO1; PSO4

Course Code	PY1241
Course Title	Heat & Thermodynamics

Credits	02
Hours/week	02
Category	Core Course(CC)-Theory
Semester	II
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Transference of heat** Thermal conductivity - determination by Lee's Disc method for bad conductor radial flow of heat, cylindrical flow, thermal conductivity of rubber, Weidman-Franz law-Radiation of heat, Stefan's law, determination of Stefan's constant, solar constant, determination of solar temperature	08	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
II	**Thermodynamics** Zeroth Law & First law of Thermodynamics, differential form-Thermodynamic Processes-Expression for work done in isothermal and adiabatic processes. Application of first law to specific heat and latent heat Reversible and irreversible process Second law of thermodynamics-Clausius and Kelvin statements-Carnot engine- Principle of refrigerator-working and efficiency, Otto engine and Diesel engine – working and efficiency.	18	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
III	**Entropy** Definition of entropy, change of entropy in reversible and irreversible cycle, Clausius inequality and second law of thermodynamics, entropy and available energy, Entropy, probability and disorder Nernst theorem and third law of thermodynamics phase transition, phase diagram, first order and second order phase transition	10	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

	(qualitative idea) Clausius-Clepeyron Equation			

Topics for assignments /discussion in the tutorial session (sample)

Books for Study:

1. Thermal and Statistical Mechanics: S.K. Roy, New Age International
2. Heat and Thermodynamics: D. S. Mathur, S. Chand &Co
3. Heat Thermodynamics and Statistical Physics: Brijlal & Subramaniam, S. Chand &Co
4. Thermal Physics, Statistical Physics and Solid-State Physics: C. J. Babu, Calicut University Press
5. Engineering Thermodynamics: P. K. Nag, McGraw-Hill, 5th Edn.

Books for Reference:

1. Heat and Thermodynamics: Zemansky, McGraw-Hill

2 Heat and Thermodynamics: Rose C McCarthy, The Rosen Publishing Group, Inc.NY,2005

3 Thermodynamics, Kinetic Theory and Statistical Thermodynamics: F. W. Sears and G. L. Salinger, Addison-Wesley Publishing Company, 3rdEdn.

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSO Addressed
CO1	Develop knowledge of the laws of thermal conductivity and thermodynamics, and understand its implications.	CL1; CL2; CL3	
CO2	Understand different thermodynamic processes and analyze and evaluate efficiency of different heat engines	CL2; CL4; CL5	
CO3	Develop appreciation of the concepts of order, disorder, entropy for different thermodynamic processes	CL1; CL2; CL3; CL4	
CO4			
CO5			
CO6			
CO7			

Course Code	PY 1341
Course Title	Electrodynamics
Credits	03
Hours/week	03
Category	Core Course(CC)-Theory
Semester	III
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Electrostatic Field** Electric field: introduction, Coulomb's law, Electric field, continuous distribution (Revision) , Divergence and curl of electrostatic fields; Field lines, flux applications of gauss's law, Curl of E, Electric potential: Introduction to potential, Comments on potential, Poisson's and Laplace's equations, potential of a localized charge distribution, Electrostatic boundary , Work and Energy in Electrostatics: The work done to move a	**10**	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

	charge, the energy of a point charge distribution, The energy of a continuous charge distribution.			
II	**Electrostatic fields in matter** Polarization: Dielectrics, induced dipoles, Polarization, The field of a polarized object: Bound charges, physical interpretation of bound charges and the field inside a dielectric Electric displacement: Gauss's law in the presence dielectrics, Boundary conditions.	10	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
III	**Magnetostatics** Introduction- The Biot- Savart law, Ampere's force law (revision), Magnetic torque, Magnetic flux and gauss's law for magnetic fields, magnetic vector potential, Magnetic intensity and Ampere's circuital law, magnetic materials.	07	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
IV	**Electromagnetic Induction** Electromotive force: Ohm's law Electromagnetic Induction Faraday's law, the induced electric field, Maxwell's equations, Magnetic charge.	07	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
V	**Electromagnetic waves (6hrs)** Waves in one dimension: The wave equation Electromagnetic waves in vacuum: The wave equation for E and B, Monochromatic plane waves, Energy and momentum in electromagnetic waves.	06	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
VI	**Transient currents** Growth and decay of current in LR and CR Circuits-Measurement of high resistance by leakage-Charging and discharging of a capacitor through LCR circuit.	07	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
VII	**Alternating current** AC through series LCR (acceptor circuit) and parallel LCR circuit (rejecter circuit)-Q- factor, Power in AC-power factor.	07	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

Topics for assignments /discussion in the tutorial session (sample)

1. Comment on how electrostatic energy is stored in a field
2. Discuss the electrostatic properties of conductors
3. What is meant by electrostatic shielding? In what way it helps us?
4. Discuss the peculiarities of electric displacement D and electric field E. How they are incorporated in Maxwell's Equation

5. Discuss the properties of linear dielectrics. What differentiates a dielectric to be linear or not?
6. Discuss applications of Ampere's circuital law
7. Compare electrostatics and magnetostatics
8. Why magnetic forces cannot do work
9. Discuss about cyclotron motion & cycloid motion
10. Discuss whether there exists any stand-off between ohm's law and Newton's second law

11. A battery has an *emf*. Can this *emf*. be a 'force'? How will you interpret electromotive force?
12. Discuss the role of motional *emf* in power generation
13. Discuss the orthogonality of E, B and propagation vector k
14. A wave function can have a sinusoidal representation. Solve the wave equation for this function and discuss the various terms related to a wave such as amplitude, frequency, phase, wave number.
15. Complex representation of wave function has good advantage. Why? Discuss the linearity of wave function. (use complex notation)
16. Discuss AC through LC, LR and CR circuits
17. Show that sharpness of resonance is equal to Q- factor
18. What is a choke coil? Discuss the advantage of using a choke coil instead of a resistor

Books for Study:

1. Electrodynamics: David J Griffith, PHI, 3rd Edn.
2. Electricity and Magnetism: Murugesan, S. Chand & Co.
3. Electricity and Magnetism: K. K. Tiwari, S. Chand & Co.
4. Principles of electromagnetics: N.O. Matthew Sadiku and S. V. Kulkarni Oxford University Press, 6th Edn.

Books for Reference:

1. Electricity and Magnetism: Muneer H. Nayfeh & Norton K. Bressel, John Wiley & Sons
2. Electricity and Magnetism: E. M. Purcell, Berkley Physics course, Vol.2, MGH
3. Electricity and Magnetism: J. H. Fewkes & John Yarwood, University Tutorial Press
4. Classical Electrodynamics: Walter Greiner, Springer International Edn.
5. Electromagnetic waves and radiating systems: Jordan & Balmain, PHI
6. Electromagnetics: B. B. Laud, Wiley Eastern Ltd., 2nd Edn.
7. Introduction to electrodynamics: Reitz & Milford, Addison Wesley
8. Electromagnetic theory fundamentals: Bhag Guru and Huseyin Hizirogulu, Cambridge University Press, 2nd Edn.
9. Electricity and Magnetism: D. C. Tayal, Himalaya Publishing Co.

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1		
CO2		
CO3		
CO4		
CO5		
CO6		
CO7		

Course Code	PY1441
Course Title	**Classical and Relativistic Mechanics**
Credits	03
Hours/week	03
Category	Core Course(CC)-Theory
Semester	IV
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Particle Dynamics** Mechanics of a particle – equation of motion of a particle – Motion of a charged particle in electromagnetic field – mechanics of a system of particles.	**05**	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
	Conservation laws (6 hrs)		CO1;	CL1;

II	linear uniformities of space and conservation of linear momentum – rotational invariance of space and law of conservation of angular momentum – homogeneity of flow of time and conservation of energy.	06	CO2; CO3; CO4; CO5; CO6	CL2; CL3; CL4; CL5; CL6
III	**Motion in central force field** Equivalent one body problem – motion in central force field – general features of motion – motion in an inverse square law force field – equation of the orbit – Kepler's laws of planetary motion and their deduction.	10	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
IV	**Collisions** Conservation laws- Conservation of momentum- laboratory and centre of mass systems- kinetic energies in the lab and CM systems-Cross-section of elastic scattering.	06	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
V	**Lagrangian Dynamics** Constraints-generalized coordinates-principle of virtual work-D' Alembert's principle, Lagrange's equation from D'Alembert's principle-applications of Lagrange's equation in simple pendulum, Atwood's machine and compound pendulum, Comparison of Lagrangian approach with Newtonian approach.	09	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
VI	**Hamiltonian Dynamics** Generalized momentum and cyclic coordinates- Hamiltonian function H-conservation of energy- Hamilton's equation - examples of Hamiltonian dynamics- one dimensional harmonic oscillator.	05	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
VII	**Frames of Reference, Galilean transformation and Special theory of relativity** Inertial frames of reference- Galilean transformation- non- inertial frames Origin and significance of special theory of relativity-search for universal frame of reference-Michelson-Morley experiment- postulates of special theory of relativity- consequences-Lorentz transformation equations-kinematical consequences of Lorentz transformations-length contraction-time	13	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

	dilation-twin paradox-transformation of velocity- variation of mass with velocity- mass energy equivalence.			

Topics for assignments /discussion in the tutorial session (sample)

Books for Study:

1. Classical Mechanics: J. C. Upadhyaya, Himalaya Publishing
2. Mechanics: H. S. Hans and S. P. Puri, Tata-McGraw Hill
3. Classical Mechanics: G. Aruldhas, PHI Learning Pvt Ltd., 2008
4. Introduction to classical mechanics: R. G. Thakwale and P. S. Puranik, Tata-McGraw Hill.
5. Classical Mechanics: Vimal Kumar Jain, Ane Books Pvt. Ltd., 2009

Books for Reference:

1. Classical Mechanics: Goldstein.
2. Modern Physics: Ronald Gautreau, Shaum's outlines series,1999
3. Classical Mechanics-Systems of Particles & Hamiltonian Dynamics: Walter Greiner, Springer,2nd Edn.
4. Classical Mechanics: N.C Rana and P. S. Joag, TMH Education Pvt. Ltd., 2015
5. Modern Physics: R. Murugersan, S. Chand &Co., Reprint, 2008.

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1		
CO2		
CO3		
CO4		
CO5		
CO6		
CO7		

Course Code	PY1442
Course Title	**Basic Physics Lab 1**
Credits	03
Hours/week	02
Category	Core Course (CC)-Practical
Semester	I,II,IV & IV
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

Sl.No	CONTENT	HOURS	COs	COGNITIVE LEVEL
01.	Fly Wheel - Moment of Inertia			
02.	Compound Bar Pendulum – Symmetric			
03.	Compound Bar Pendulum – Asymmetric			
04.	Uniform Bending---Y---Pin and			

	Microscope	02	CO1; CO2; CO3; CO4; CO5	CL1; CL2; CL3; CL4; CL5; CL6
05.	Uniform bending—Y- optic lever method			
06.	Non-uniform bending-Y-Optic lever& telescope			
07.	Rigidity modulus –Static torsion			
08.	Torsion pendulum I- By Torsional oscillations			
09.	Torsion pendulum I- By Equal masses			
10.	Kater's pendulum-Acceleration due to gravity			
11.	Melde's string-----Frequency of fork			
12.	Phase transition-determination of M.P of wax.			
13.	Determination of thermal conductivity of rubber			
14.	Lee's disc-determination of thermal conductivity of a bad conductor			
15.	Viscosity-Continuous flow method using constant pressure head.			
16.	Viscosity-Variable pressure head arrangement			
17.	Surface tension-Capillary rise			
18.	Sonometer-frequency of A.C			
19.	Kundt's tube-determination of velocity of sound.			
20.	Determination of m and Bh using deflection and vibration magnetomers.			
21.	Potentiometer-Resistivity.			
22.	Comparison of least counts of measuring instruments.			
23.	Evaluation of errors in simple experiments.			

References

1.Yarwood and Wittle; Experimental Physics for Students, Chapman &Hall Publishers.
2. An advanced course in practical physics, Chathopadhyaya, Rakshit and Saha, New central agency, Kolkata.
3. A text book of practical physics, S. Viswanathan& Co., Chennai.
4. Advanced Practical Physics, B. L. Worsnop and H. T. Flint, Khosla Publishers, Delhi.

Books for Reference:

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level

CO1	Apply the experimental methods to correlate with the Physics theory.	CL1;CL2;CL3
CO2	Apply the various procedures and techniques for the experiments.	CL3
CO3	Use the different measuring devices and meters to record the data with precision	CL4;CL5
CO4	Apply the mathematical concepts/equations to obtain quantitative results	CL5
CO5	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results	CL6

Course Code	**PY1541**
Course Title	**Quantum Mechanics**
Credits	04
Hours/week	04
Category	Core Course(CC)-Theory
Semester	V
Regulation	2018

Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**The Emergence of Quantum Mechanics** Limitations of classical physics, Black body radiation curve-Optical spectra –- photoelectric effect -specific heat of solids -Plank's quantum hypothesis, Einstein's theory of photoelectric effect -Compton effect- Quantum theory of specific heat of solids, -Bohr model- hydrogen atom-Bohr postulates-The correspondence principle.	18	CO1	CL1; CL2; CL6
II	**Wave Mechanics (22 hrs)** Wave nature of particles-electron diffraction- standing wave of electron in the orbit uncertainty principle -uncertainty relation among canonically conjugate pairs-application- non-existence of electrons in the nucleus-ground state energy of hydrogen atom- width of spectral lines-Properties of wave function-Conditions for Physical Acceptability of Wave Function, Normalization and orthogonality condition. Superposition Principle-wave packets, relation between - Particle velocity- group velocity and phase velocity- Probability Interpretation of Wave Function -Statistical Interpretation of Wave function - probability current density in one dimension-Expectation value- Time dependent Schrodinger equation,-Time independent Schrodinger equation - stationary states.	22	CO2	CL5; CL6
III	**One Dimensional Energy Eigen Value Problems** Free particle Schrodinger equation– square-well potential with infinite walls-Square well potential with finite walls, square potential barrier– The Harmonic oscillator- (Schrodinger method).	14	CO3	CL3; CL4
	General Formalism of Quantum Mechanics Linear vector space, Linear operator,		CO4	CL2; CL4

IV	Eigen values and Eigen functions-, Hermitian operator, Postulates of Quantum Mechanics-Equation of motion-Schrodinger representation- Momentum representation.	18		

Topics for assignments /discussion in the tutorial session (sample)

Books for Study:

1. Quantum Mechanics: G. Aruldhas, PHI, 2nd Edn., 2002
2. A Text book of Quantum Mechanics: P.M. Mathews & K. Venkatesan- McGraw Hill, 2nd Edn., 2010
3. Quantum Mechanics: Robert Eisberg and Robert Resnick, Wiley, 2nd Edn. 2002
4. Quantum Mechanics: Leonard I. Schiff, TMH, 3rd Edn., 2010
5. Concepts of Modern Physics: Arthur Beiser, TMH, 6th Edn.

Books for Reference:

1. Quantum Mechanics: Eugen Merzbacher, John Wiley and Sons Inc.,2004
2. Introduction to Quantum Mechanics: David J. Griffith, Pearson Education, 2nd Ed. 2005
3. Quantum Mechanics: Walter Greiner, Springer,4thEdn., 2001
4. Quantum Mechanics: Bruce Cameron Reed, Jones and Bartlett, 2008.
5. Quantum Mechanics for Scientists & Engineers: D.A. B. Miller, Cambridge University Press, 2008
6. Shaum's outline series

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1	To understand the limitations of classical physics and to implement the principles of Quantum Mechanics for the explanation of various physical phenomena.	CL1, CL2, CL5
CO2	To perform quantitative calculations based on the relationship between wavefunction and the system properties to evaluate systems using Schrodinger equation	CL3,CL5
CO3	To apply Schrodinger wave equation to solve quantum mechanical problems such as free particle, square well potential, square potential barrier and harmonic oscillator	CL3, CL4
CO4	To understand the methodologies and mathematical expressions used in Quantum Mechanics and to represent various systems using different representations	CL2, CL4

COs	CO Description	Cognitive Level
CO1	To understand the limitations of classical physics and to implement the principles of Quantum Mechanics for the explanation of various physical phenomena.	CL1, CL2, CL5
CO2	To perform quantitative calculations based on the relationship between wavefunction and the system properties to evaluate systems using Schrodinger equation	CL3,CL5
CO3	To apply Schrodinger wave equation to solve quantum mechanical problems such as free particle, square well potential, square potential barrier and harmonic oscillator	CL3, CL4
CO4	To understand the methodologies and mathematical expressions used in Quantum Mechanics and to represent various systems using different representations	CL2, CL4

Course Code	PY1542
Course Title	**Statistical Physics, Research Methodology and Disaster Management**
Credits	04
Hours/week	04
Category	Core Course(CC)-Theory
Semester	V
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Statistics and probability, possible disasters

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Statistical Physics** Statistical probability, Macro and Micro states, Phase space, Statistical ensemble, Postulate of equal probability, Maxwell Boltzmann distribution, Velocity distribution. Indistinguishability of identical particles, Bose Einstein and Fermi Dirac distribution function, comparison of three statistics.	**18**	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
II	**Research Methodology** Research - Objectives and motivation in research – different types of research- research approaches- Significance of research- Research methods and		CO1; CO2; CO3; CO4; CO5;	CL1; CL2; CL3; CL4; CL5;

	methodology – Research and scientific method- Various steps in a research process- importance of literature survey- criteria of good research. Thesis/ Report writing - preliminary section (Title page, declaration of author, certificate of supervisor, table of contents, list of tables and figures, preface acknowledgement), Main Text (abstract, introduction, experimental section, results and discussion), Conclusions, references, scope for future study.	18	CO6	CL6
III	**Error Analysis** Significant figures- Basic ideas of error measurement, uncertainties of measurement, importance of estimating errors, dominant errors, random errors, systematic errors, rejection of spurious measurements. Estimating and reporting of errors, errors with reading scales, absolute and relative errors, and standard deviation, Variance in measurements, error bars and graphical representation.	12	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

IV	**Disaster Management (24hrs)** Global natural disasters: Natural hazards and natural disasters, Recent major disasters and their relief efforts, Impact of global climate change and major natural disasters, Human adaptability of natural disasters, Fragile natural eco-environment, Disaster reduction activity, achievements, challenges and future development Earth quake disaster and their and their effects, Advancement in research of earthquake disaster, earthquake and tsunami warnings, earthquake disaster prevention, earthquake disaster mitigation Health emergencies and diseases: environmental health and diseases, disasters and emergencies, steps in disaster management, pre-disaster activity, role of water supply, need for protecting large scale water supply schemes, assessment of damaged and available and water resources, water quality testing- Personal hygiene, control of communicable diseases and prevention of epidemics, measures for controlling communicable diseases and epidemics. Radiation emergencies, health consequence of radiation, measures to prevent sudden health emergencies due to radiation.	24	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

Topics for assignments /discussion in the tutorial session (sample)

Books for Study:

1. Thermal and Statistical Mechanics: S. K. Roy –New Age International-2001
2. Elements of Statistical Mechanics: Kamal Singh and S. P. Singh- S. Chand & Co,1999
3. Thermal Physics, Statistical Physics and Solid-State Physics: C. J. Babu, Calicut University Press
4. Introduction to Statistical Mechanics: S. K. Sinha, Alpha Science International Ltd. 2005
5. Statistical Mechanics: B. K. Agarwal- New Age International 2007
6. Research Methodology: C. R. Kothari, New Age International Publishers.
7. Natural disaster mitigation – a scientific and practical approach: Science Press, Beijing, 2009
8. Environmental health in emergencies and disasters: A practical guide, B.Wisner & J.Adams (Eds.), WHO, Geneva, 2002 ISBN 92-4 154541-0.
9. Introduction to Disaster Management: Satish Modh, Macmillan, 2010

Books for Reference:

1. Statistical Mechanics: S. Rajagopal
2. Introduction to Statistical Physics: Kerson Huang -CRC Press, 2001
3. Statistical Mechanics: Norman Davison, Courier Corporation, 2013
4. Disaster Management: Harsh K Gupta, Universities Press, 2003

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSO Addressed
CO1	Differentiate between MB , BE and FD statistics and the conditions under which BE and FD distributions behave as MB distributions Learn to construct illustrative examples of MB, BE and FD distributions	CL2; CL6	PSO1; PSO2
CO2	Acquire the ability to choose methods appropriate to their research aims and objectives	CL3; CL4	PSO4; PSO5
CO3	Analyse and explain errors in measurements and experiments	CL4; CL5	PSO1; PSO2
CO4	Compare hazards, disasters and associated natural phenomena and their interrelationships, causes and their effects - developing humanitarian Assistance before and after disaster, Apply knowledge about existing global frameworks and existing agreements and role of community in successful Disaster Risk Reduction	CL2;CL3;CL4	PSO1; PSO2; PSO4

Course Code	PY1543

Course Title	**Electronics**
Credits	04
Hours/week	04
Category	Core Course(CC)-Theory
Semester	V
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Circuit Theory** Kirchhoff's law- Ideal voltage and current sources- Thevenin's and Norton's theorem, Maximum power transfer theorem	**04**	CO1;	CL1; CL2; CL3; CL4
II	**Diode Circuits** Extrinsic semiconductors-n- type and – p-type semiconductors-PN junction-PN junction under forward and reverse biased conditions-r m s value and peak inverse voltage- diode characteristics-ac and dc resistances- half wave and full wave rectifiers- (average dc value of current, ripple factor and efficiency)- different types of filters(shunt capacitor, LC and RC)- break down mechanism in diodes-Zener diode- voltage regulator.	14	CO2; CO3;	CL1; CL2; CL3; CL4;
III	**Transistors** Theory of BJT operation- CB,CE and CC characteristics-alpha, beta and gamma – relation between transistor currents-biasing circuits(CE configuration)-stability factors-selection of operating point-ac and dc load lines-Q point-collector feedback; base resistor and potential divider methods- BJT amplifiers-input and output impedances-graphical analysis of CE amplifier(frequency response, band width and gain in dB)-emitter follower.	16	CO4;	CL1; CL2; CL3; CL4; CL5; CL6

IV	**Power amplifiers: (5 hours)** Amplifier classes and efficiency - class A operation - transformer coupled class A amplifier - class B amplifier - push pull amplifier - basic ideas of class C operation - distortion in amplifiers.	24	CO4;	CL1; CL2; CL3; CL4; CL5; CL6
V	**Feedback & Oscillator circuits** Feedback principles – negative feedback - advantages of negative feedback - positive feedback - principle of sinusoidal feedback- oscillation - Barkhausen criterion for oscillations - RC phase shift, Hartley Oscillator, Colpitts Oscillator (derivations not required).	08	CO4;	CL1; CL2; CL3; CL4; CL5; CL6
VI	**Modulation** Fundamentals of modulation - AM, FM - frequency spectrum of AM - power in AM - demodulation of AM signal - frequency spectrum for FM	05	CO5;	CL1; CL2;
VI	**Special devices** JFET- Basic construction - Theory of operation - Static characteristics - Drain characteristics- Advantages - MOSFET – Depletion enhancement MOSFET – Construction – Static characteristics. Uni-junction Transistor - Construction-operation.	08	CO6	CL1; CL2;
VII	**Operational amplifiers (IC741)** Introduction – Schematic symbol and pin configuration - circuit configuration and block diagram representation – differential amplifier-ideal OP amp. - CMRR – differential mode and common mode – virtual ground principle – parameters of OP amp. - inverting amplifier – non-inverting amplifier –summing-differentiator- integrator amplifiers.	12	CO4;	CL1; CL2; CL3; CL4; CL5; CL6

Topics for assignments /discussion in the tutorial session (sample)

Electronic projects using flip flops.

2. Electronic projects using logic gates.
3. Electronic projects using IC 741 OP amp.
4. Electronic projects using timer 555.
5. Electronic projects using IC 311.
6. Constant voltage power supplies.
7. Constant current sources.
8. Oscillators of different frequencies.
9. Low range frequency generators.

10. High range frequency generators.
11. Voltage regulated dc power supplies with variable output.
12. Voltage regulated dual power supplies with variable output.
13. Instrument for the measurement of capacitance.
14. Instrument for the measurement of dielectric constant of a liquid/ solid.
15. Effect of temperature on electronic components.

Books for Study:

Basic electronics: Devices, circuits and IT fundamentals: Santiram Kal, PHI, 2009
2. Basic Electronics-Solid State: B. L. Theraja, S. Chand Ltd., 2005
3. Principles of Electronics: V. K. Mehta, S. Chand Ltd.,2005
4. A first course in Electronics: Anwar A. Khan, Kanchan K. Dey,PHI, 2006
5. Communication Electronics:Jose Robin and Ubald Raj, Indira Publications, 2002

Books for Reference:

Electronic Devices and Circuits: Theodore F. Bogart Jr., Universal book stall
2. Electronic devices and Circuit theory: Robert Boylestad & Louis Nashelski,PHI,5th Edn.
3. Electronic fundamentals & applications: John D Ryder, PHI, 4thEdn.
4. Electronic Communications: Dennis Roddy, John Coolen, Pearson, 4thEdn.
5. The art of electronics: Paul Horowitz and Winfield Hill 2nd Edn. Cambridge University Press, 2006.

Web Resources

1) **http://vlabs.iitkgp.ernet.in/be/#**
2) **https://nptel.ac.in/courses/122106025**

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1	Will be able to recognize the network theorems and analyse the current, voltage and power across various components of a circuit	CL1, CL2, CL3, CL4
CO2	Will be able to describe diode characteristics and compare the performance of different types of rectifier circuit	CL1, CL2
CO3	Will be able to design power supply circuits by applying junction diodes	CL1, CL2, CL3, CL4, CL5, CL6
CO4	Will be able to design single stage transistor amplifiers, oscillators and operational amplifiers, power amplifiers	CL1, CL2, CL3, CL4, CL5, CL6

CO5	Will be able to explain the concept of modulation	CL1, CL2
CO6	Will be able to explain the working of special devices, FET, MOSFET, UJT	CL1, CL2

Course Code	PY1544
Course Title	**Atomic & Molecular Physics**
Credits	04
Hours/week	04
Category	Core Course(CC)-Theory
Semester	V
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Vector Atom Model** Bohr's theory, correspondence principle Somerfield's atom model and explanation of fine structure of H line in Balmer series of hydrogen atom.Limitation of Sommerfeld atom model Vector atom model-Various quantum numbers associated with vector atom model-, L.S and j.j couplings – application of spatial quantization- Pauli's exclusion principle - magnetic dipole moment of electron due to orbital and spin motion - Spin-Orbit coupling.	**10**	CO1;	CL1; CL2; CL4;

II	**Atomic Spectra** Optical spectra-Spectral terms and notations - selection rules - intensity rule and interval rule - fine structure of sodium D lines – hyperfine structure-alkali spectra - Zeeman effect - Larmor's theorem – quantum mechanical explanation of normal Zeeman effect. Anomalous Zeeman effect –Paschen-Back effect-Stark effect.	14	CO1; CO2;	CL1, CL2; CL4
III	**X-ray Diffraction** X-rays- Discovery- properties -scattering - Measurement of X-ray wavelengths by ruled gratings-X-ray Spectra- continuous and characteristics X- ray spectrum-Origin of continuous Spectrum -Origin of characteristic X-rays-X-ray energy level diagram. -Absorption of X-rays-Applications of X-rays.	08	CO3;	CL2; CL3;
IV	**Molecular Spectra** Electromagnetic spectra-molecular energies-classification of molecules-rotational spectra of diatomic molecules-rotational energy levels-selection rules-rotational spectrum-isotope effect- bond length and atomic mass Diatomic vibrational spectra-vibrational energy levels-selection rule-vibrational transitions-Rotation-Vibration transitions-IR spectrometer Raman scattering- classical description of Raman scattering, quantum theory of Raman scattering- -vibrational Raman spectra-diatomic molecules-polyatomic molecules-rotational Raman spectra Raman spectrometer Electronic spectra sequences and progressions-Frank-Condon principle.	28	CO2;	CL2;
V	**Resonance Spectroscopy** NMR principle-Resonance condition-NMR spectrometer-chemical shift-indirect spin-spin Interaction- applications of NMR spectroscopy- ESR principle- Resonance condition –ESR spectrometer- hyperfine interaction – applications of ESR spectroscopy Mossbauer spectroscopy- principle - isomer shift	12	CO4;	CL2; CL5;
Topics for assignments /discussion in the tutorial session (sample)				

Books for Study:

1. Modern Physics: G. Aruldhas and P. Rajagopal, PHI, New Delhi, 2005
2. Modern Physics: R. Murugesan, S. Chand& Co., Reprint, 2008
3. Atomic and Nuclear Physics: N. Subramaniam & Brijlal, S. Chand& Co.
4. Atomic Physics: J. B. Rajam, S. Chand&Co.
5. Concepts of Modern Physics: A. Beiser, TMH, New Delhi, 6thEdn.

Books for Reference:

1. Fundamentals of Molecular Spectroscopy: Banwell, TMH
2. Spectroscopy: Walker & Straw, Chapman & Hill.
3. Molecular Spectroscopy: G. Aruldhas, PHI, 2004
4. Atomic and Nuclear Physics: Dr.V. W. Kulkarni-Himalaya Publishing House.

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSOs addressed
CO1	To learn and analyse about different atomic models, understand their significances and know about its merits and demerits.	CL1, CL2,CL4	PSO1, PSO3
CO2	To understand the concepts of atomic and molecular spectroscopy.	CL2	PSO1
CO3	To have basic knowledge about origin of X-rays and its applications	CL2, CL3	PSO2
CO4	To learn about different kinds of resonance spectroscopies	CL2,CL5	PSO1,PSO4
CO5	To know about the various spectroscopic techniques, instrumentation, and its applications.	CL3,CL6	PSO5

Course Code	PY1641
Course Title	**SOLID STATE PHYSICS**
Credits	04
Hours/week	04
Category	Core Course (CC)-Theory
Semester	VI
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Crystal Structure** Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors Lattice with a Basis – Unit Cell-Elements of symmetry-Types of Lattices -two and three dimensional- Miller Indices-Reciprocal Lattice.-.Brillouin Zones Diffraction of X-rays by Crystals. Bragg's	**18**	CO1; CO2;	CL1; CL2; CL3;

	Law X- ray diffraction techniques-Inter atomic forces. Types of bonding			
II	**Conduction in Metals- Free electron model** Introduction-conduction electrons-free electron gas-electrical conductivity-electrical resistivity versus temperature-heat capacity of conduction electrons - Fermi surface -electrical conductivity-effects of the Fermi surface-thermal conductivity in metals-Hall effect and magneto resistance -AC conductivity and optical properties-failure of free electron model.	12	CO3	CL1;CL2; CL4
III	**Band theory** Bloch theorem- Kronig Penny model-Band Gaps- Conductors-Semiconductors and insulators- P and N type Semiconductors- Conductivity of Semiconductors- mobility- Hall Effect-Hall coefficient.	10	CO3	CL1; CL4;
IV	**Dielectric Properties of Materials (12 hrs)** 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	12	CO4	CL1; CL2;CL5;
V	**Magnetic Properties of Matter** Dia, Para, Ferri and Ferromagnetic Materials- Classical Langevin Theory of Dia and Paramagnetic Domains- Quantum Mechanical Treatment of Para magnetism-Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains- Discussion of B-H Curve. Hysteresis and Energy Loss	12	CO5	CL1; CL2; CL4
VI	**Superconductivity** Critical Temperature-Critical magnetic field-Meissner effect- Type I and type II Superconductors- London's Equation and Penetration Depth- Isotope effect-.BCS theory- Tunnelling and Josephson Effect (Qualitative study)	08	CO5; CO6	CL1; CL2; CL3;CL4; CL6

Topics for assignments /discussion in the tutorial session (sample)

Books for Study:

1. Elements of Solid-State Physics: J. P. Srivastava, 2nd Edn., 2006, Prentice-Hall of India
2. Elementary Solid-State Physics: M. Ali Omar, Pearson India, 1999
3. Solid State Physics: M. A. Wahab, Narosa Publication, 2011
4. Elements of Solid-State Physics: J.P. Srivastava, 2nd Edn., Prentice-Hall of India, 2006.

Books for Reference:

1. Introduction to Solid State Physics: Charles Kittel, 8th Edn., Wiley India Pvt. Ltd., 2004
2. Introduction to Solids: Leonid V. Azaroff, Tata Mc-Graw Hill, 2004
3. Solid State Physics: Neil W. Ashcroft and N. David Mermin, Cengage Learning, 1976
4. Solid State Physics: Rita John, McGraw Hill, 2014
5. Solid-State Physics: H. Ibach and H Luth, Springer, 2009

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSO Addressed
CO1	Understanding the various types of crystal structure and their properties	CL1;CL2;	PSO1
CO2	Apply the concept of X-ray diffraction to interpret crystalline structure	CL1;CL2; CL3	PSO1;PSO2; PSO5
CO3	Summarize the details of band theory and the developments of semiconductor physics	CL1;CL2; CL4	PSO1;PSO4
CO4	Learn to discuss and evaluate dielectric properties of materials	CL1;CL2; CL5;	PSO1
CO5	Able to discuss types of magnetic properties of materials and learn the fundamentals of superconductivity	CL1;CL2; CL4	PSO1;PSO3
CO6	Able to illustrate theoretical formulation of superconductors	CL1;CL2; CL3;CL4; CL6	PSO1;PSO4

Course Code	PY1642
Course Title	**Nuclear and Particle Physics**
Credits	04
Hours/week	04
Category	Core Course(CC)-Theory
Semester	I
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**General Properties of Nuclei** Constituents of nucleus and their Intrinsic properties-quantitative facts about size-mass- charge density (matter energy), binding energy- average binding energy and its variation with mass number- main features of binding energy versus mass number curve- nuclear stability- angular momentum- parity- magnetic moment-electric quadrupole moments- Nuclear forces-meson theory.	**14**	CO1;	CL1; CL2;
II	**Nuclear Models** Liquid drop model -semi empirical mass formula and significance of various terms, condition of nuclear stability. Shell model-evidence for nuclear shell structure, nuclear magic numbers, basic assumptions of shell model, Collective model.	11	CO2;	CL4; CL5;
III	**Radioactivity** Alpha decay-basics of α-decay processes, theory of α-emission, Gamow's theory, Geiger Nuttal law, α -decay- energy kinematics for α- decay, positron emission, electron capture, neutrino hypothesis, Gamma decay: Gamma ray emission & kinematics, internal conversion.	12	CO3	CL2; CL3;
IV	**Nuclear Reactions** Types of Reactions, Conservation Laws, kinematics of reactions, Q-value- reaction rate- reaction cross section- reaction mechanism-Concept of compound nucleus	09	CO6	CL2; CL3;
V	**Particle Detectors & Accelerators** GM counter-scintillation counter- Linear accelerator- Cyclotron- Synchrotron-betatron	06	CO6	CL2; CL3;
VI	**Nuclear Fission and Fusion (12 hrs)** Nuclear fission-energy released in fission-Bohr and Wheeler's theory-chain reaction -multiplication factor-critical size-atom bomb-nuclear reactors-breeder reactors-uses of nuclear reactors. Nuclear fusion-sources of stellar energy-thermonuclear reactions-hydrogen bomb-controlled thermo-nuclear reactions-magnetic bottle-Tokamak- inertial confinement-nuclear	12	CO6	CL2; CL3;

	power in India			
VII	**Particle Physics** Particle interactions- basic features- types of particles and its families Symmetries and Conservation Laws-baryon number- Lepton number- Isospin- Strangeness and charm- concept of quark model- Cerenkov radiation	08	CO6	CL1; CL2; CL4;

Topics for assignments /discussion in the tutorial session (sample)

Books for Study:

1. Modern Physics: R. Murugesan, S. Chand & Co., Reprint, 2008
2. Modern Physics: G. Aruldhas and P. Rajagopal, PHI, New Delhi, 2005.
3. Nuclear Physics: D. C. Tayal, Himalaya Publishing House, 4th Edn.
4. Concepts of Modern Physics: A. Beiser, Tata McGraw-Hill, New Delhi, 6th Edn.
5. Atomic and Nuclear Physics: N. Subramaniam and Brijlal, S.Chand & Co.
6. Atomic Physics: J. B. Rajam, S.Chand & Co.
7. Introduction to Elementary Particles: D. Griffith, John Wiley & Sons
8. Nuclear Physics: S. N. Ghoshal, S. Chand & Co.

Books for Reference:

1. Concepts of nuclear physics: Bernard L. Cohen, Tata Mcgraw Hill, 1998
2. Nuclear Physics: Kaplan, Narosa publications
3. Introductory nuclear Physics: Kenneth S. Krane, Wiley India Pvt. Ltd., 2008
4. Introduction to the physics of nuclei & particles: R. A. Dunlap, Thomson Asia, 2004
5. Quarks and Leptons: F. Halzen and A. D. Martin, Wiley India, New Delhi
6. Basic ideas and concepts in Nuclear Physics- An Introductory Approach: K. Heyde, Institute of Physics Publishing, 2004
7. Radiation detection and measurement: G. F. Knoll, John Wiley & Sons, 2000
8. Theoretical Nuclear Physics: J. M. Blatt & V. F. Weisskopf, Dover Pub. Inc., 1991

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSOs addressed
CO1	Understand the general properties of nucleus and nuclear forces	CL1, CL2	PSO 1
CO2	Understand the different nuclear models and know about their differences	CL4, CL5	PSO1
CO3	Attain knowledge about the phenomena of radioactivity & radiation hazards	CL2,CL3	PSO2,PSO4
CO4	Understand different particle detectors and	CL1,CL2,CL	PSO4, PSO5

	accelerators	6	
CO5	Learn the elementary particles, analyse its groups and know about their properties	CL1,CL2,CL4	PSO1, PSO3
CO6	Know about the fission and fusion reactions and its applications	CL2,CL3	PSO4,PSO5

Course Code	PY1643
Course Title	**Classical and Modern Optics**

Credits	04
Hours/week	04
Category	Core Course(CC)-Theory
Semester	VI
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Interference of light** The principle of superposition - coherent sources – Double slit interference (theory of interference fringes and band width) - Interference by division of wave front and amplitude –Fresnel's biprism-interference in thin films-classification of fringes-wedge shaped films-testing of optical flatness-Newton's rings(reflected system)-refractive index of a liquid- Michelson interferometer – determination of wavelength	**14**	CO1, CO2	CL1, CL2, CL4
II	**Diffraction** Fresnel diffraction: - Half-period zones - explanation of rectilinear propagation of light– diffraction at a straight edge-zone plate. Fraunhofer diffraction: - Diffraction at a single slit, double slits – plane transmission grating - Rayleigh's criterion for resolution -resolving power of diffraction grating.	14	CO2	CL3, CL5
III	**Polarisation** Plane polarized light -polarization by reflection – Brewster's law - pile of plates - Malus law - Double refraction - Huygens explanation for double refraction in uniaxial Crystals - Nicol prism - Nicol prism as a polarizer and analyzer – Theory-production and analysis of plane, circularly and elliptically polarized light - quarter and half wave plates.	12	CO2;	CL3, CL5

IV	**Laser** Basic principle of laser operation Einstein coefficient, light propagation through medium and condition for light amplification population inversion by pumping and cavity threshold condition, line shape function- optical resonators (qualitative) Q factor various laser systems – Ruby laser - He-NE laser, Dye laser, semiconductor laser, (working principle only) Application of lasers- characteristics of laser beams -spatial coherence - Temporal coherence and spectral energy density Nonlinear optics : Nonlinear Polarization – second harmonic generation – phase matching	14	CO3;	CL1, CL4
V	**Fibre Optics** Introduction, optical fibre, the numerical aperture, coherent bundle, pulse dispersion in step index fibre, graded index fibre, single mode fibre, multimode fibre, Fibre optic sensors (Qualitative), fibre optic communication (qualitative), Advantages of fibre optic communication system.	10	CO4;	CL2, CL6
VI	**Holography: (8 hrs)** Principle of holography, recording of holograms, reconstruction of images (Theory not needed), application of holography, different types of holograms, transmission and reflection types.	08	CO4;	CL2, CL6

Topics for assignments /discussion in the tutorial session (sample)

1. Michelson's interferometer-Standardization of metre.
2. Diffraction at a rectangular aperture and circular aperture
3. Optical activity-Fresnel's theory of optical rotation.
4. Resolving power of prism and telescope
5. Constant deviation spectrometer.
6. Laurent's half shade polarimeter.
7. Laser applications.
8. Study of Fraunhofer lines using spectrometer. .
9. Determination of refractive index of liquid by Newton's rings method.
10. Comparison of radii of curvature by Newton's rings method.

Books for Study:

1. Text Book of Optics: Subramaniam & Brijlal, .Avadhanulu, 23rd Edn., 2006
2. Optics: Ajoy Ghatak, TMH, 2005
3. Optics and spectroscopy: R. Murugesan and K Sivaprasad, S. Chand & Co., 2010
4. Lasers Principles, Types and applications: K. R. Nambiar, New Age International Pvt.

Ltd. 2006
5. Optics: Eugene Hecht, Addison-Wesley 2002

Books for Reference:

1. Fundamentals of Optics: Jenkins and White, MCH
2. Modern Classical Optics: Geoffrey Brooker, Oxford University Press, 2003
3. Fundamentals of Optics-Geometrical Physical and Quantum:D. R. Khanna and H. R.Gulati, R. Chand,1984
4. Lasers &Non-Linear Optics: B. B. Laud, New Age International Pvt. Ltd., 2011
5. Electronic Communications: Dennis Roddy & John Coolen, Pearson, 1995

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1	To know the principles of interference and to analyse different phenomena observed	CL1, CL2, CL4
CO2	To analyze the basic properties of light and to evaluate the principles of optical instruments.	CL3, CL5
CO3	To know the principles of LASER and to use it for the construction of various lasers.	CL1, CL4, CL6
CO4	To understand the advanced applications of light in communication system and industry	CL2, CL6

Course Code	PY1644
Course Title	**Digital Electronics and Computer Science**
Credits	04
Hours/week	04
Category	Core Course(CC)-Theory
Semester	VI
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Number systems** Decimal number system-binary number system-conversion 2of binary number to decimal and decimal number to binary-binary addition and subtraction-21's complement-2's complement-binary subtraction using 2's complement-signed arithmetic operation-conversion of real numbers-conversion of decimal fraction to binary fraction-binary coded decimal - hexadecimal number system-conversion of hexadecimal number to decimal, decimal to hexadecimal, binary to hexadecimal and hexadecimal to binary-real or floating point representation of numbers-ASCII code. **Boolean algebra and logic gates** Logic gates AND, OR, NOT, NAND, NOR And Ex-OR gate-realization of other logic functions using NAND / NOR gates-tri state logic gate-Boolean laws-Demorgan's theorem-Simplification of Boolean equations using Boolean laws. Karnaugh map **Arithmetic circuits** Half adder-full adder-controlled inverter-binary adder- subtractor. **Sequential circuits** Flip-Flop, S-R Flip Flop, J-K Flip-flop, Master slave JK Flip- Flop	**22**	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

II	**Basics of computers** Hardware- input and output units-memory unit-ALU-control unit–basic operational concepts-Software – operating systems The memory systems:- Basic concepts-semiconductor RAM- internal organization memory chips- static memories-asynchronous and synchronous DRAM-structure of large memories–ROM,PROM,EPROM, EEPROM–flash memory-speed size and cost-Basic concepts of cache memory and virtual memories. Secondary storage-magnetic hard disks-optical disks-magnetic tape systems	11	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
III	**Programming in C++** Features of c++ - basic structure of c++ program – library files-header files – preprocessor directives- inbuilt functions-output using cout- input with cin - constants and variables – data types – declaration of variables – integer variables, character variables, floating point types, type bool - assigning values to variables–manipulators-operators and expressions–arithmetic operators, relational operators, logical operators, short hand operators-control statements-for loops , while loop, do…while loop- if statement, if……else, else….if constructions, switch statement- break, continue, go to statements-user defined functions-function definition, function declaration, function header and body, function call and execution, passing arguments to functions, returning values from functions, overloaded functions, inline functions, default arguments, scope rule for functions- storage classes-Arrays-array elements, array initialization, multidimensional arrays, passing arrays to functions-strings-basics of structures and pointers in c++, classes and objects (introduction only)-basic file operations-serial and sequential files, reading and writing -simple examples of c++ programs for solving problems in physics-compilation and execution of data.	25	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

IV	**Introduction to microprocessors** Microprocessors and microcontrollers (definition only)-intel 8085-8 bit microprocessor-pin disruption - 8085 instructions - addressing modes(definition only)- interrupts (definition only) - assembly language - simple programs-addition, subtraction.	14	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

Topics for assignments /discussion in the tutorial session (sample)

Books for Study:

1. Fundamentals of Microprocessors and Microcomputers: B. Ram,Dhanpat Rai Publications
2. Digital principles and Applications: Malvino and Leach.TMH, New Delhi, 4th Edn.
3. Fundamentals of Computers: V. Rajaram, PHI, New Delhi, 4th Edn.
4. A first course in Computers: S. Saxena, Vikas Publishing House Pvt. Ltd.,
5. Programming in C++: D. Ravichandran, Tata Mc Graw Hill, 2011
6. Object oriented programming in C++:Robert Lfore, Galgotia publications Pvt Ltd., 3rd Edn., 2004
7. The C++ programming language: Bjome Stroustrup, 4th Edn. Addison Wesley
8. Object oriented programming with C++: E. Balaguruswami, 5th Edn., Tata Mc Graw Hill
9. Programming in C++: M.T. Somasekharan, PHI Pvt. Publishing,2005
10. Numerical Methods with computer programs in C++:P. Ghosh, PHI Learning Pvt. Ltd.
11. The 8085 microprocessors:K. Udayakumar and B. S. Umasankar, Dorling Kindersley (India) Pvt. Ltd.,2008
12. Microprocessor 8085,8086:Abhishek Yadav, University Science Press, New Delhi 2008
13. Microprocessor-Architecture, Programming and applications with 8085:R. S. Gaonkar

Books for Reference:

1. Introduction to digital electronics: NIIT, PHI.
2. A first course in Computers: Sanjay Saxena, Vikas publishing house Pvt. Ltd.

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1	Understand, differentiate different number systems and interpret the relationships among them	CL1; CL2; CL3; CL4; CL5
CO2	Outline, Analyse and design different logic gate circuits and	CL1; CL2; CL3;

	categorize different boolean expressions	CL4; CL5
CO3	Explain principle of operations for various arithmetic and sequential electronic circuits	CL1; CL2
CO4	Understand the basic components and operational concepts of computers and microprocessors	CL1; CL2; CL3
CO5	Develop programming skills for solving problems in Physics using C++	CL1; CL2; CL3; CL6

Course Code	PY1661.4
Course Title	**Nano Science and Technology**
Credits	02
Hours/week	02
Category	Elective Courses (EC)-Theory
Semester	VI
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction** Length scales in Physics- nanometer- Nanostructures: Zero, One Two- and Three-dimensional nanostructures Band Structure and Density of State at nanoscale: Energy Bands, Density of States at low dimensional structures.	**06**	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
II	**Electrical Transport in Nanostructure** Electrical conduction in metals, The free electron model. Conduction in insulators/ionic crystals - Electron transport in semiconductors - Various conduction mechanisms in 3D (bulk), 2D(thin film) and low dimensional systems: Thermionic emission, field enhanced thermionic emission (Schottky	15	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

	effect).			
III	**Introductory Quantum Mechanics for Nanoscience** Size effects in small systems, Quantum behaviour of nanometric world: Applications of Schrödinger equation – infinite potential well, potential step, potential box; trapped particle in 3D (nanodot), electron trapped in 2D plane (nanosheet), electrons moving in 1D (nanowire, nanorod, nanobelt), Excitons, Quantum confinement effect in nanomaterials.	08	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
IV	**Growth Techniques of Nanomaterials (Elementary ideas only)** Top-down vs bottom-up techniques, Lithographic process, non-Lithographic techniques: Plasma arc discharge, sputtering Evaporation: Thermal evaporation, Electron beam evaporation. Chemical Vapor Deposition (CVD). Pulsed Laser Deposition, Molecular Beam Epitaxy, Sol-Gel Technique, Electro-deposition., Ball-milling	09	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
V	**Characterization tools of nanomaterials: (Qualitative ideas only)** Atomic Structures -Grain size determination – XRD (Debye Scherrer equation), Microscopy – Scanning Electron Microscope (SEM), Tunnelling Electron Microscope (TEM), Scanning Probe Microscope (SPM), Scanning Tunnelling Microscope (STM), Atomic Force Microscope (AFM). (Text -1).	10	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
VI	**Applications of nanotechnology: (Elementary ideas only)** Buckminster fullerene, Carbon nanotube, nano diamond, BN Nanotube, Nanoelectronics - single electron transistor (no derivation), Molecular machine, Nanobiometrics. **Applications of nanotechnology:** (Elementary ideas only) Potential applications, expected benefits from nanotechnologies, can nanotechnology helps in addressing various challenges? Energy and Energy Efficiency, new energy producers, Medicine, security, Other Applications .	06	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
Topics for assignments /discussion in the tutorial session (sample)				

Books for Study:

1. Introduction to Nanoscience & Nanotechnology by K. K. Chattopadhyay and A. N. Banerjee, PHI Learning and Private Limited
2. Nanotechnology, Rakesh Rathi, S Chand & Company, New Delhi
3. NANO: The Essentials, T .Pradeep, McGraw Hill Education (India) Private Limited

Books for Reference:

1. Nanoparticle Technology Handbook – M. Hosokawa, K. Nogi, M. Naita, T. Yokoyama (Eds.), Elsevier 2007
2. Encyclopaedia of Materials Characterization, Surfaces, Interfaces, Thin Films, Eds. Brundle, Evans and Wilson, Butterworth – Heinemann, 1992
3. Springer Handbook of nanotechnology, Bharat Bhushan (Edn.), Springer-Verlag, Berlin, 2004
4. Nano Science and Technology, VS Muraleedharan and A Subramania, Ane Books Pvt. Ltd, New Delhi
5. A Handbook on Nanophysics, John D, Miller, Dominant Publishers and Distributors, Delhi-51
6. Introduction to Nanotechnology, Charles P Poole Jr. and Frank J Owens, Wiley Students Edn.
7. Nano-and micro materials, K Ohno et. al, Springer International Edition 2009, New Delhi.

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1	To understand basic classification and density of states of various nanostructures.	CL1 & CL2
CO2	To evaluate the modifications of electrical transports in nanostructures.	CL2 & CL4
CO3	To understand the quantum mechanical behavior of nanostructures. Evaluation of energy and density of states of nanostructures with the aid of quantum mechanics	CL3 & CL5
CO4	To familiarize the experimental realization of nanostructures. A qualitative analysis of various growth techniques	CL2 &CL3
CO5	Analysis of nanostructures using sophisticated tools.	CL4 & CL6
CO6	Application of nanoscience in day to day life	CL5
CO7	Elementary ideas on various challenges and future perspectives of nanoscience.	CL5 & CL6

Course Code	PY1645
Course Title	**Advanced Physics Lab 2**
Credits	03
Hours/week	02
Category	Core Course (CC)-Practical
Semester	V & VI
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

Sl.No	CONTENT	HOURS	COs	COGNITIVE LEVEL
01.	Spectrometer-A, D and n of a solid prism.			
02.	Spectrometer –Dispersive power and Cauchy's constants.			
03.	Spectrometer Grating—Normal incidence-N & wavelength			
04.	Spectrometer-i-d curve			
05.	Spectrometer- Hollow prism			
06.	Liquid lens-refractive index of liquid and lens.			
07.	Newton's Rings—Reflected system			

08.	Air wedge-diameter of a wire.	02	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
09.	Potentiometer-Resistivity.			
10.	Potentiometer-Calibration of ammeter			
11.	Potentiometer –Reduction factor of T.G.			
12.	Potentiometer –Calibration of low range voltmeter.			
13.	Potentiometer – Calibration of high range voltmeter.			
14.	Thermo emf-measurement of emf using digital multimeter.			
15.	Carey Foster's bridge-Resistivity			
16.	Carey Foster's bridge-Temperature coefficient of resistance.			
17.	Mirror galvanometer-figure of merit.			
18.	BG- Absolute capacity of a condenser			
19.	Conversion of galvanometer into ammeter and calibration using digital Multimeter.			
20.	Conversion of galvanometer into voltmeter and calibration using digital Voltmeter.			
21.	Circular coil-Calibration of ammeter.			
22.	Study of network theorems-Thevenin's & Norton's theorems and maximum power transfer theorem.			
23.	Circular coil-Study of earth's magnetic field using compass box.			
24.	Absolute determination of m and Bh using box type and Searle's type vibration magnetometers.			
25.	Searle's vibration magnetometer-comparison of magnetic moments.			

References

1. Yarwood and Wittle; Experimental Physics for Students, Chapman &Hall Publishers.
2. An advanced course in practical physics, Chathopadhyaya, Rakshit and Saha, New central agency, Kolkata.
3. A text book of practical physics, S. Viswanathan& Co., Chennai.
4. Advanced Practical Physics, B. L. Worsnop and H. T. Flint, Khosla Publishers, Delhi.

Books for Reference:

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSOs addressed

CO1	Hand on experience on various light sources and spectrometer, learn to arrange optics related experimental set-up.	CL6	PSO2
CO2	Understand the different phenomenon of optics through though laboratory experiments	CL1, CL2	PSO1
CO3	Gain practical knowledge about electricity and magnetism and measurements such as: Resistance, Voltage, current etc.	CL3	PSO3
CO4	Apply the theories learnt and the skills acquired to solve real time problems	CL4	PSO5
CO5	Data analysis, error calculation and laboratory report preparation	CL5, CL4	PSO4

Course Code	PY1646
Course Title	**Advanced Physics Lab 3**
Credits	03
Hours/week	02
Category	Core Course (CC)-Practical
Semester	V & VI
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

Sl.No	Content	Hours	COs	Cognitive Level
01.	PN junction Diode (Ge & Si) characteristics-To draw the characteristic curves of a PN junction diode and to determine its ac and dc forward			

	resistances.	02	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
02.	Full wave (centre tapped) rectifier-To construct a full wave rectifier using junction diode and to calculate the ripple factor with and without shunt filter (10 readings for R_L 100 to 5000).			
03.	Full wave (centre tapped) rectifier-To construct a full wave rectifier using junction diode and to study effect of L,C, and LC filters on the ripple factor (for different R_L).			
04.	Bridge rectifier-To construct a bridge rectifier using junction diodes and to calculate the ripple factor with and without shunt filter (10 readings for R_L 100 to 5000).			
05.	Bridge rectifier- Dual power supply-To construct a dual power supply using bridge rectifier and measure the output voltages for different pair of identical load resistors.			
06.	Zener diode characteristics-To draw the I-V characteristic of a Zener diode and to find the break down voltage and the dynamic resistance of the diode.			
07.	Zener diode as a voltage regulator-To construct a voltage regulator using Zener diode and to study the output voltage variation (i) for different RL and (ii) for different input voltage with same R_L.			
08.	Transistor characteristics-CE-To draw the characteristic curves of a transistor in the CE configuration and determine the current gain, input impedance and output impedance.			
09.	Transistor characteristics-CB-To draw the characteristic curves of a transistor in the CB configuration and determine the current gain, input impedance and output impedance.			
10.	Single stage CE amplifier-To construct a single stage CE transistor amplifier and study its frequency response.			
11.	OP amp. IC741- Inverting amplifier-To construct an inverting amplifier using IC741 and determine its voltage gain.			
12.	OP amp. IC741- Non-inverting amplifier- To construct a non-inverting amplifier using IC741 and determine its voltage gain			

13.	OP amp. IC741- Differentiator-To construct an OP amp. Differentiator, determine its voltage gain and study the output response to pulse and square wave.			
14.	OP amp. IC741- Integrator-To construct an OP amp. Integrator, determine its voltage gain and study the output response to pulse and square wave.			
15.	Phase shift oscillator-To construct a phase shift oscillator using transistor and measure the frequency of the output waveform.			
16.	Logic gates- OR and AND-To verify the truth tables of OR and AND gates using diodes.			
17.	Network theorems (Superposition, Thevenin's & Norton's theorems) -To verify the (i) Superposition, (ii) Thevenin's & (iii) Norton's theorems.			
18.	RC-Filter circuits (Low pass)-To construct an RC –low pass filter circuit and to find the upper cut off frequency.			
19.	RC Filter circuits (High pass)-To construct an RC –high pass filter circuit and to find the lower cut off frequency.			
20.	Program to find the roots of a quadratic equation (both real and imaginary root)			
21.	Program to find the dot product and cross product of vectors.			
22.	Program to plot the functions Sin x, Tan x and e^x			
23.	Program to find the matrix addition, multiplication, trace, transpose and inverse.			
24.	Program to convert hexadecimal to decimal number, decimal to hexadecimal number, binary to hexadecimal numbers and hexadecimal to binary numbers.			
25.	Program to find the result of binary addition and subtraction.			
26.	Program to find the moment of inertia of regular bodies about various axes of rotation.			
27.	Program to find the velocity of a rolling body (without sliding) at any point in an inclined plane.			
28.	Program to study the motion of a spherical body in a viscous fluid.			

29	Program to study the motion of projectile in central force field.			
30.	Program to study the planetary motion and Kepler's law.			
31.	Monte Carlo simulation			

References

1. Basic electronics and linear circuits; N.N. Bhargava, D.C. Kulshreshtha, S.C.Gupta
2. OP- Amps and linear integrated circuits; Ramakant A. Gayakwad
3. Basic electronics; Santiram Kal
4. Basic electronics; B. L. Theraja
5. Principles of electronics; V. K. Mehta
6. A first course in Electronic s; Anwar A. Khan, Kanchan K. Dey .

Books for Reference:

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1	Understand and design electronics experiments	CL1; CL2; CL3; CL6
CO2	Critically evaluate and analyse the results of experimental measurements	CL4; CL5
CO3	Develop and execute C++ programs for solving problems	CL2; CL3; CL6

Course Code	PY1647
Course Title	Project and Research Institute/Science Museum visit
Credits	04
Hours/week	02
Category	Core Course (CC)-Theory
Semester	I
Regulation	2018

Course Overview

1. This course provides an opportunity to students to carry out literature search thoroughly on a specific topic following the principles of scientific research methodology.
2. This course helps the students to write a project proposal relevant to the topic based on the literature review.

3. A systematic and scientific approach to synthesize compounds/complexes and to characterize them using sophisticated analytical techniques can be learnt in this course.
4. Analytical skills required to perform experiments, interpret the data and to present the report with a meaningful summary and conclusion can also be acquired in this course.
5. 5. This course trains the students to harness soft skill for presenting their research findings in front of a panel of subject experts.

Course Objective

1. To review literature on a specified topic using scientific research methodology.
2. To write the project proposal scientifically with the mention of its industrial and commercial relevance also.
3. To carry out the synthesis of compounds/complexes and characterize them using various analytical instruments for its applications.
4. To learn the scientific methodology to collect and interpret the experimental data for the presentation of the report.
5. 5. To handle sponsored research projects of social and environmental importance.

Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

Expt	Content	Hours	COs	Cognitive Level
I	Performing experiments related to industrially and socially relevant projects.	**02**	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
II		18	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
Books for Study:				
Books for Reference:				
Web Resources				

Project Report 50 Marks

Standard of the subject and plan Preparation and mastery Originality and logical development Summary, conclusions and references

Viva-voce 25 marks

Use of power point, teaching aids, blackboard etc. Language, Communication and diction Economy of time Answer to questions

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1	To recall and comprehend the concepts of scientific research methodology for literature survey.	CL1; CL2
CO2	To characterize the synthesized compounds/complexes and to interpret the experimental data systematically	CL3
CO3	To explain and infer the chemical, biological, medicinal, industrial and commercial applications of the product obtained.	CL4
CO4	To report and summarize the findings of their project with respect to its social and environmental importance	CL4; CL5
CO5	To invent and adopt novel methodologies to solve interdisciplinary projects scientifically at national and international levels.	CL6

Course Code	**PY1551.4**
Course Title	**Environmental Physics**
Credits	02
Hours/week	03
Category	Open Course (OC)-Theory (Offered to other Departments)
Semester	V
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Essentials of Environmental physics** Structure and thermodynamics of the atmosphere; composition of air; Greenhouse effect; Transport of matter; energy and momentum in nature; Stratification and stability of the atmosphere; Laws of motion; Hydrostatic equilibrium; General circulation of the tropics; Elements of weather and climate in India.	**18**	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
II	**Environmental pollution and Degradation** Factors governing air, water and noise pollution; Air and water quality standards; Waste disposal; Heat Island effect; Land and sea breeze; Puffs and Plumes; Gaseous and particulate matter; Wet and dry deposition; Dispersal mechanism of air and water pollutants; Mixing height and turbulence; Gaussian plume models; Dispersion models; Environmental degradation; Thermal and radioactive pollution; Nuclear radiation; Health hazards and safety.	18	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
III	**Environmental Changes and remote sensing** Energy sources and combustion processes; Renewable sources of energy; Solar energy, Wind energy, Bio energy, hydro power; fuel cells; and nuclear energy; Forestry and bio-energy; Deforestation; Degradation of soils; Agriculture and land use changes; Changing composition of local and global environment; Remote sensing techniques.	18	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
Books for Study:				
Books for Reference:				
Web Resources				

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level

CO1		
CO2		
CO3		
CO4		
CO5		
CO6		
CO7		

Course Code	**PY1131.1**
Course Title	**Mechanics and Properties of Matter**
Credits	02
Hours/week	02
Category	Complementary Courses (Co.C) - Theory (Mathematics Main)
Semester	I
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Mechanics

SYLLABUS

Unit	Content	Hours	COs	Cognitive Level
I	**Dynamics of Rigid Bodies** Theorems of MI with proof-Calculation of MI of bodies of regular shapes rectangular lamina, uniform bar of rectangular cross section, annular disc, circular disc, solid sphere-K.E of a rotating body. Determination of MI of a fly wheel (theory and experiment). **Oscillations and Waves** Examples of SHM oscillator-compound pendulum-determination of g -torsion pendulum-oscillations of two particles connected by a spring-vibration state of a diatomic molecule Wave motion-general equation of wave motion-plane progressive harmonic wave - energy density of a plane progressive wave -intensity of wave and spherical waves- **Mechanics of Solids** Bending of beams-bending moment-cantilever-beam supported at its ends and loaded in the middle-uniform bending-experimental determination of Y using the above principles with pin and microscope-twisting couple on a cylinder-angle of twist and angle of shear-torsional rigidity**.**	**28**	CO1; CO2; CO3	CL1; CL2; CL3; CL4; CL5
II	**Surface Tension** Excess of pressure on a curved surface-force between two plates separated by a thin layer of liquid-experiment with theory to find surface tension and its temperature dependence by Jaeger' method-equilibrium of a liquid drop over solid and liquid surfaces. **Viscosity** Flow of liquid through a capillary tube-derivation of Poiseuille's formula - limitations-Ostwald's viscometer-variation of viscosity with temperature.	08	CO4	CL1; CL5; CL6
Books for Study: **Books for Study** 1. Mechanics: J.C. Upadhyaya, Ram Prasad & Sons 2. Oscillations & Waves: K. Rama Reddy, S. Badami& V. Balasubramanian (University Press)				
Books for Reference:				

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSO Addressed
CO1	Differentiate the rigid bodies, interpret the conservation laws and apply the concepts in analysing their advantages in day to day life situations	CL1;CL2;CL3	PSO1; PSO2
CO2	Analyse different oscillatory systems and apply the knowledge in practical systems	CL3; CL4	PSO1; PSO4
CO3	Apply the knowledge of elasticity and related mathematical formulation to elucidate the principles behind physical processes	CL4; CL5	PSO2; PSO4
CO4	Recollect the concepts of flow of fluids and surface tension and use them to solve everyday problems	CL1; CL5; CL6	PSO1; PSO4

Course Code	**PY1131.2**
Course Title	**Rotational Dynamics and Properties of Matter**
Credits	02
Hours/week	02
Category	Complementary Courses (Co.C) Theory- (Chemistry Main)
Semester	I
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Mechanics

SYLLABUS

Unit	Content	Hours	COs	Cognitive Level
	Dynamics of Rigid Bodies Theorems of MI with proof -Calculation of MI of bodies of regular shapes- rectangular lamina, uniform bar of rectangular cross section, annular disc,			

I	circular disc, solid cylinder, solid sphere-KE of a rotating body-Determination of MI of a flywheel (Theory and Experiment) **Oscillations and Waves** Examples of S.H oscillator-compound pendulum-determination of g-torsion pendulum-oscillations of two particles connected by a spring-vibration state of a diatomic molecule- Wave motion-general equation of wave motion-plane progressive harmonic wave - energy density of a plane progressive wave -intensity of wave and spherical waves- **Mechanics of Solids** Bending of beams-bending moment-cantilever-beam supported at its ends-and loaded in the middle-uniform bending-experimental determination of Y using the above principles with pin and microscope-twisting couple on a cylinder-angle of twist and	**28**	CO1; CO2; CO3	CL1; CL2; CL3; CL4; CL5
II	**Surface Tension** Excess of pressure on a curved surface-force between two plates separated by a thin layer of liquid-experiment with theory to find surface tension and its temperature dependence by Jaeger' method-equilibrium of a liquid drop over solid and liquid surfaces. **Viscosity** Flow of liquid through a capillary tube-derivation of Poiseuille's formula - limitations-Ostwald's viscometer-variation of viscosity with temperature.	08	CO4	CL1; CL5; CL6
Books for Study: 1. Mechanics: J.C. Upadhyaya, Ram Prasad & Sons **2.** Oscillations &Waves: K.Rama Reddy, S.B. Badami & V. Balasubramaniam (University Press).				
Books for Reference:				
Web Resources				

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSO Addressed
CO1	Differentiate the rigid bodies, interpret the conservation laws and apply the concepts in analysing their advantages in day to day life situations	CL1;CL2;CL3	PSO1; PSO2
CO2	Analyse different oscillatory systems and apply the knowledge in practical systems	CL3; CL4	PSO1; PSO4
CO3	Apply the knowledge of elasticity and related mathematical formulation to elucidate the principles behind physical processes	CL4; CL5	PSO2; PSO4
CO4	Recollect the concepts of flow of fluids and surface tension and use them to solve everyday problems	CL1; CL5; CL6	PSO1; PSO4

Course Code	**PY1231.1**
Course Title	**Thermal Physics and Statistical Mechanics**
Credits	02
Hours/week	02
Category	Complementary Courses (Co.C) - Theory (Mathematics Main)
Semester	II
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

Unit	Content	Hours	COs	Cognitive Level
I	**Transmission of Heat** Thermal conductivity and thermometric conductivity-Lee's disc experiment-Weidmann and Franz law (statement only)-energy distribution in the spectrum of black body and results-Wien's displacement law-Rayleigh-Jeans law-their failure and Planck's hypothesis-Planck's law-comparison-solar	14	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

	constant-its determination-temperature of sun.			
II	**Thermodynamics** Isothermal and adiabatic processes-work done-isothermal and adiabatic elasticity Heat engines-Carnot's cycle -derivation of efficiency-petrol and diesel engine cycles-efficiency in these two cases-second laws of thermodynamics-Kelvin and Clausius statements.	09	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
III	**Entropy (9 hours**) Concept of entropy-change of entropy in reversible and irreversible cycles-principle of increase of entropy-entropy and disorder-entropy and available energy-T-S diagram for Carnot's cycle-second law in terms of entropy-calculation of entropy when ice is converted into steam.	09	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
IV	**Statistical Mechanics (4hours)** Statistical probability-Macro and Microstates-Phase space-statistical ensemble-postulates of equal probability-Maxwell Boltzmann Distribution- velocity distribution.	04	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
Books for Study: 1. Heat & Thermodynamics: N.Subramaniam & Brijlal, S.Chand & Co 2. Heat & Thermodynamics: W. Zemansky, McGraw Hill **3.** Heat & Thermodynamics: C. L. Arora.				
Books for Reference:				
Web Resources				

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1	To develop a knowledge on the laws of thermal conductivity and thermodynamics.	CL1,CL2 & CL3
CO2	To understand the basic laws of thermodynamics.	CL2
CO3	To develop skills in problem solving using the concept of heat and thermodynamics	CL3 & CL4
CO4	To evaluate the entropy and its mathematical correlation with various thermodynamic parameters	CL3,CL4 & CL5
CO5	Applications of thermodynamics in the realization of practical heat engines and refrigerators. To develop an appreciation on the concept of theoretical heat	CL3 &CL6

	engines and practical heat engines.	
CO6	To solve statistical mechanics problems for simple systems.	CL4
CO7	Differentiate between micro and macrostates and its correlation with various thermodynamics systems.	CL5 &CL6

Course Code	**PY1231.2**
Course Title	**Thermal Physics**
Credits	02
Hours/week	02
Category	Complementary Courses (Co.C) Theory- (Chemistry Main)
Semester	II
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

Unit	Content	Hours	COs	Cognitive

				Level
I	**Diffusion** Graham's law of diffusion in liquids-Fick's law-analogy between liquid diffusion and heat conduction-methods of estimating concentrations-determination of coefficient of diffusivity.	**04**	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
II	**Transmission of Heat** Thermal conductivity and thermometric conductivity – Lee's Disc experiment-Weidmann and Franz law (statement only) -Radiation of heat-black body radiation-Kirchhoff's laws of heat radiation-absorptive power-emissive power-Stefan's law (no derivation) -energy distribution in the spectrum of black body and results-Wien's displacement law - Rayleigh-Jeans law-their failure and Planck's hypothesis - Planck's law-comparison-solar constant-temperature of sun.	14	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
III	**Thermodynamics** Isothermal and adiabatic processes-work done-isothermal and adiabatic elasticity Heat engines-Carnot's cycle -derivation of efficiency-petrol and diesel engine cycles-efficiency in these two cases-second laws of thermodynamics-Kelvin and Clausius statements.	09	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
IV	**Entropy (9 hours)** Concept of entropy-change of entropy in reversible and irreversible cycles-principle of increase of entropy-entropy and disorder-entropy and available energy-T-S diagram for Carnot's cycle-second law in terms of entropy-calculation of entropy when ice is converted into steam	09	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6

Books for Study:

1. The general Properties of matter: F. H. Newman&V. H. L. Searle
2. Heat & Thermodynamics: N. Subramaniam & Brijlal, S.Chand& Co
3. Heat & Thermodynamics: W. Zemansky, McGraw Hill
4. Heat & Thermodynamics: C. L. Arora.

Books for Reference:

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive

		Level
CO1		
CO2		
CO3		
CO4		
CO5		
CO6		
CO7		

Course Code	**PY1331.1**
Course Title	**Optics, Magnetism and Electricity**
Credits	03
Hours/week	03
Category	Complementary Courses (Co.C) - Theory (Mathematics Main)
Semester	III
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

Unit	Content	Hours	COs	Cognitive

				Level
I	**Interference** Analytical treatment of interference-theory of interference fringes and bandwidth-Interference in thin films-reflected system-colour of thin films-fringes of equal inclination and equal thickness -Newton's rings-reflected system-measurement of wavelength and refractive index of liquid **Diffraction** Phenomenon of diffraction-classification-Fresnel and Fraunhofer. Fresnel's theory of approximate rectilinear propagation of light-Fresnel diffraction at a straight edge and circular aperture Fraunhofer diffraction at a single slit, two slits and N slits. Plane transmission grating-determination of wavelength **Laser and Fibre Optics** Principle of operation of laser-population inversion-optical pumping-ruby laser applications of lasers Light propagation in optical fibres-step index fibre-graded index fibre-applications.	**34**	CO1; CO2; CO3	CL1; CL2; CL3; CL4
II	**Magnetism** Magnetic properties of matter-definition and relation between magnetic vectors B, H and M. Magnetic susceptibility and permeability. Magnetic properties-diamagnetism-paramagnetism-ferromagnetism-antiferromagnetism Electron theory of magnetism-explanation of ferromagnetism **Electricity** EMF induced in a coil rotating in a magnetic field-peak, mean, rms and effective values of A.C. Ac circuits-AC through RC, LC, LR and LCR series circuits-resonance-sharpness of resonance-power factor and choke coil-transformers.	20	CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
Books for Study: 1.A text book of optics – Brijlal & Subramaniam 2.Electricity and Magnetism – Murugesan, S. Chand& Co Ltd.				
Books for Reference:				
Web Resources				

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSO Addressed
CO1	Understanding the optical phenomena - interference and diffraction	CL1; CL2	PSO1;PSO2
CO2	Analyse the concepts of interference and diffraction and apply the knowledge in practical system -Newton's rings, air wedge and diffraction grating	CL2;CL3;CL4	PSO2;PSO3; PSO4
CO3	Understand the working and application of laser in the field of Fiber Optics	CL2;CL3	PSO1;PSO2
CO4	Distinguish different magnetic materials . Attain knowledge about the theory of magnetism	CL1;CL2;CL3;CL4	PSO1;PSO2
CO5	Explain the production of ac and its characteristics.	CL2;CL3	PSO1;PSO4
CO6	Apply the knowledge to analyse ac circuits to create practical devices	CL3;CL4;CL5; CL6	PSO4;PSO5
CO7			

Course Code	**PY1331.2**
Course Title	**Optics, Magnetism and Electricity**
Credits	03
Hours/week	03
Category	Complementary Courses (Co.C) - Theory (Chemistry Main)
Semester	III
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

Unit	Content	Hours	COs	Cognitive Level
I	**Interference** Analytical treatment of interference-theory of interference fringes and bandwidth- Interference in thin films-reflected system-colour of thin films-fringes of equal inclination and equal thickness Newton's rings-reflected system-measurement of wavelength and refractive index of a liquid. **Diffraction** Phenomenon of diffraction-classification-Fresnel and Fraunhofer- Fresnel's theory of approximate rectilinear propagation of light-Fresnel diffraction at a straight edge Fraunhofer diffraction at a single slit, two slits and N slits. Plane transmission grating-determination of wavelength. **Polarisation** Experiments showing the transverse nature of light-plane polarized light-polarization by reflection-Brewster's law-double refraction-Nicol prism-propagation of light in uni-axial crystals-positive and negative crystals-principal refractive indices-half wave plate and quarter wave plate-elliptically and circularly polarized light-optical activity. **Laser and Fibre Optics** Principle of operation of laser-population inversion-optical pumping-ruby laser applications of lasers. Light propagation in optical fibres-step index fibre-graded index fibre-applications.	**34**	CO1; CO2; CO3;	CL1; CL2; CL3; CL4;
II	**Magnetism** Magnetic properties of matter-definition and relation between magnetic vectors B, H and M. Magnetic susceptibility and permeability. Magnetic properties-			CL1;

	diamagnetismparamagnetism-ferromagnetism-antiferromagnetism. Electron theory of magnetism-explanation of ferromagnetism **Electricity** EMF induced in a coil rotating in a magnetic field-peak, mean, rms and effective values of A.C. Ac circuits-AC through RC, LC, LR and LCR series circuits-resonance-sharpness of resonance-power factor and choke coil-transformers.	20	CO4; CO5; CO6	CL2; CL3; CL4; CL5; CL6
Books for Study: 1. A text book of optics – Brijlal & Subramaniam 2. Electricity and Magnetism – R. Murugesan, S. Chand& Co Ltd.				
Books for Reference:				
Web Resources				

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSO Addressed
CO1	Understanding the optical phenomena - interference, polarisation and diffraction	CL1; CL2	PSO1;PSO2
CO2	Analyse the concepts of interference and diffraction and apply the knowledge in practical system -Newton's rings, air wedge and diffraction grating	CL2;CL3;CL4	PSO2;PSO3; PSO4
CO3	Understand the working and application of laser in the field of Fiber Optics	CL2;CL3	PSO1;PSO2
CO4	Distinguish different magnetic materials . Attain knowledge about the theory of magnetism	CL1;CL2;CL3;CL4	PSO1;PSO2
CO5	Explain the production of ac and its characteristics.	CL2;CL3	PSO1;PSO4
CO6	Apply the knowledge to analyse ac circuits to create practical devices	CL3;CL4;CL5; CL6	PSO4;PSO5

Course Code	PY1431.1
Course Title	Modern Physics and Electronics
Credits	03
Hours/week	03
Category	Complementary Courses (Co.C) - Theory (Mathematics Main)
Semester	IV
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

Unit	Content	Hours	COs	Cognitive Level
I	**Modern Physics** Basic features of Bohr atom model-Bohr's correspondence principle -vector atom model-various quantum numbers-magnetic moment of orbital electrons -electron spin-Spin-Orbit coupling-Pauli's exclusion principle- Atomic nucleus-basic properties of nucleus-charge, mass, spin, magnetic moment-binding energy and packing fraction-nuclear forces-salient features-radioactivity-radioactive decay-decay laws-decay constant-half life and mean life-radioactive equilibrium-secular and transient equilibrium-measurement of radioactivity. **Quantum Mechanics** Inadequacies of classical physics-experimental evidences- quantum theory-Planck's hypothesis-	**30**	CO1; CO2; CO3	CL1; CL2; CL3; CL4;

	foundation of quantum mechanics-wave function and probability density-Schrödinger equation-time dependent and time independent-particle in a potential box.			
II	**Electronics** Current-voltage characteristics of a diode-forward and reverse bias-breakdown mechanism of p -n junction diode-Zener diode and its characteristics-half wave and full wave rectifiers-bridge **r**ectifier-ripple factor, efficiency. Construction and operation of a bipolar junction transistor-transistor configurations current components-transistor characteristics-DC load line-Q point-AC load line transistor biasing-need for biasing-bias stabilization-biasing circuits- voltage divider bias. amplifier-basic features of an amplifier-gain, -frequency response and band width. **Digital Electronics** Number systems and codes-decimal numbers-binary arithmetic -1's and 2's compliment-decimal to binary conversion-octal numbers-hexadecimal numbers-binary coded decimal-digital codes-logic gates-NOT, OR, AND, NOR and NAND gates. Boolean algebra-Boolean operations -logic expressions-laws of Boolean algebra-DeMorgan's theorem-Boolean expression for gate network-simplification of Boolean expression	24	CO4; CO5;	CL1; CL2; CL3; CL4; CL5; CL6

Books for Study:

1. Modern Physics – Murugesan, S. Chand& Co. Ltd.
2. Principles of Electronics – V. K. Mehta.

Books for Reference:

1. Concepts of Modern Physics-Arthur Beiser, Shobhit Mahajan, S.Rai Choudhary, McGrawHill Education
2. Digital Integrated Electronics-Milman & Halkais, McGrawHill Education

Web Resources

1.https://nptel.ac.in/courses/122106034

2. http://vlabs.iitkgp.ernet.in/be/#

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1	Recognize different atomic models,	CL1, CL2

CO2	Identify radioactive process and its applications	CL1, CL2
CO3	Understand the concepts Quantum Mechanics, Planck's hypothesis and applications and to organise abstract ideas of wave functions into concepts	CL1, CL2, CL3, CL4
CO4	Obtain the theoretical concept of working of various electronic circuits and to analyse the working of electronic circuits	CL 1, CL2, CL3, CL4, CL5, CL6
CO5	Obtain the knowledge about basics of Digital electronics and its applications and to convert digital circuits to boolean logic	CL 1, CL2, CL3, CL4

Course Code	PY1431.2
Course Title	Atomic Physics, Quantum Mechanics and Electronics
Credits	03
Hours/week	03
Category	Complementary Courses (Co.C) Theory- (Chemistry Main)
Semester	IV
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

Unit	Content	Hours	COs	Cognitive

				Level
I	**Atomic Physics** Basic features of Bohr atom model-Bohr's correspondence principle -vector atom model-various quantum numbers-magnetic moment of orbital electrons -electron spin-Spin-Orbit coupling-Pauli's exclusion principle-periodic table.	**12**	CO1;	CL1; CL2;
II	**Superconductivity** Properties of superconductors-zero electrical resistance- Meissner effect- electrical magnetic field-Type I and Type II superconductors-isotope effect-high temperature ceramic superconductors-applications of superconductors.	08	CO2;	CL1; CL2;
III	**Quantum mechanics** Inadequacies of classical physics-experimental evidences-evidences for quantum theory-Planck's hypothesis-foundation of quantum mechanics-wave function and probability density-Schrodinger equation-time dependent and time independent-particle in a potential box.	14	CO3;	CL1; CL2; CL3; CL4;
IV	**Spectroscopic Techniques** EM Spectrum- UV, Visible, IR, Radio and microwave regions-principle of various spectrometers used in specific regions of EM spectrum-absorption spectroscopy, emission spectroscopy.	04	CO4;	CL1; CL2;
V	**Electronics** Current-voltage characteristics of a diode - forward and reverse bias-breakdown mechanism of p -n junction diode-Zener diode and its characteristics-half wave and full wave rectifiers-bridge rectifier-ripple factor, efficiency. Construction and operation of a bipolar junction transistor-transistor configurations current components-transistor characteristics-DC load line-Q point-AC load line transistor biasing-need for biasing-bias stabilization-biasing circuits-fixed bias, emitter feedback bias, voltage divider bias (qualitative study only). Transistor amplifier-basic features of an amplifier-gain, input and output resistances-frequency response and band width.	12	CO5	CL1; CL2; CL3; CL4;
VI	**Digital Electronics** Number systems and codes-decimal numbers-binary arithmetic -1's and 2's compliment-decimal to binary conversion-octal numbers-hexadecimal numbers-binary coded decimal-digital codes-logic gates-NOT, OR, AND, NOR	04	CO6	CL1; CL2; CL3; CL4; CL5; CL6

	and NAND gates.			

Books for Study:

1. Modern Physics –R. Murugesan, S. Chand& Co. Ltd.
2. Principles of Electronics – V. K.Mehta.

Books for Reference:

1. Concepts of Modern Physics-Arthur Beiser, Shobhit Mahajan, S.Rai Choudhary, McGrawHill Education
2. Digital Integrated Electronics-Milman & Halkais, McGrawHill Education

Web Resources

1.https://nptel.ac.in/courses/122106034

2. http://vlabs.iitkgp.ernet.in/be/#

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level
CO1	Distinguish different atom models	CL1, CL2
CO2	Obtain the theoretical aspects of different types of superconductors and its applications	CL1, CL2
CO3	Understand the concepts Quantum Mechanics, Planck's hypothesis and applications and organize concepts from abstract ideas	CL1, CL2, CL3, CL4
CO4	Understand different Spectroscopic techniques	CL1, Cl2
CO5	Obtain the theoretical concept of working of various electronic circuits and to analyse the working of amplifiers	CL1, CL2, CL3, CL4
CO6	Obtain the knowledge about basics of Digital electronics and its applications and to convert circuits to Boolean logic	CL1, CL2, CL3. CL4

Course Code	**PY1432**
Course Title	**Complementary Practical**
Credits	03
Hours/week	02
Category	Complementary Course (Co.C) Practical (Common for all Complementary subjects)
Semester	I, II, IV & IV
Regulation	2018
Course Overview	
Course Objective	
Prerequisites	Fundamental Knowledge in Physics, Chemistry and Mathematics

SYLLABUS

Sl.No	Content	Hours	COs	Cognitive Level
01.	Torsion Pendulum- n by torsional oscillations	02	CO1; CO2; CO3; CO4; CO5; CO6	CL1; CL2; CL3; CL4; CL5; CL6
02.	Torsion Pendulum- n and I using equal masses			
03.	Fly Wheel			
04.	Cantilever- Y by pin and microscope method			
05.	Uniform bending- Y by pin and icroscope			
06.	Symmetric bar pendulum - g and radius of gyration			
07.	Surface tension- capillary rise method			
08.	Coefficient of viscosity- capillary flow method			
09.	Specific heat-method of mixtures applying Barton's correction			
10.	Lee's disc- Thermal conductivity of cardboard			
11.	Melde's string- frequency of tuning fork			
12.	Method of parallax- optical constants of convex lens using i) mirror and mercury ii) mirror and water			
13.	Method of parallax- refractive index of liquid.			

14.	Spectrometer- A, D and n			
15.	Spectrometer- dispersive power of a prism			
16.	Spectrometer- Grating-normal incidence			
17.	Deflection and vibration magnetometer- M and Bh			
18.	Circular coil- magnetization of a magnet			
19.	Carey Foster's bridge - Resistivity			
20.	Potentiometer- Resistivity			
21.	Potentiometer- Calibration of ammeter			
22.	Mirror galvanometer- Current and Voltage sensitivity			
23.	Diode Characteristics (for Ge and Si diodes)			
24.	Half wave rectifier-Measurement of ripple factor with and without filter capacitor			
25.	Full wave rectifier- Measurement of ripple factor with and without filter capacitor			

References

1. Yarwood and Wittle; Experimental Physics for Students, Chapman &Hall Publishers.
2. An advanced course in practical physics, Chathopadhyaya, Rakshit and Saha, New central agency, Kolkata.
3. A text book of practical physics, S. Viswanathan& Co., Chennai.
4. Advanced Practical Physics, B. L. Worsnop and H. T. Flint, Khosla Publishers, Delhi.

Books for Reference:

Web Resources

Course Outcome (Cos) and Cognitive Level Mapping

COs	CO Description	Cognitive Level	PSOs addressed
CO1	Learn to experimentally determine various mechanical constants.Hand on experience on various light sources and spectrometer, learn to arrangeme optics related experimental set-up.	CL6	PSO2
CO2	Understand the different phenomenon of optics through though laboratory experiments	CL1, CL2	PSO1
CO3	Gain practical knowledge about electricity and magnetism and measurements such as: Resistance, Voltage, current etc.	CL3	PSO3
CO4	Apply the theories learnt and the skills acquired to solve real time problems	CL4	PSO5

CO5	Data analysis, error calculation and laboratory report preparation	CL5, CL4	PSO4

Learning Outcome (LOC) BASED Continuous Assessments Cognitive Level (CL) and Course Outcome (CO) Based CIA Question Paper Format (UG)

Section		Q. NO	Cognitive Level (CL)					
			CL1	CL2	CL3	CL4	CL5	CL6
A	(10 x 1 = 10) Answer All	1	+					
		2	+					
		3	+					
		4	+					
		5	+					
		6		+				
		7		+				
		8		+				
		9		+				
		10		+				
B	(8 x 2 = 16) Answer 8 out of 12	11			+			
		12			+			
		13			+			
		14			+			
		15			+			
		16			+			
		17			+			
		18				+		
		19				+		
		20				+		
		21				+		
		22				+		
C	(6 x 4 = 24) Answer 6 out of 9	23					+	
		24					+	
		25					+	
		26					+	
		27					+	
		28					+	
		29					+	

		30					+	
		31					+	
D	(2 x 15 = 30) Answer 2 out of 4	32						+
		33						+
		34						+
		35						+
No. of CL based Questions with Max. marks			5 (5)	5 (5)	4(2)	4(2)	6(4)	2(15)
No. of CO based Questions with Max. marks			CO1	CO2	CO3	CO4	CO5	CO6
			10(10)		8(16)		6(24)	2(30)

Bishop Moore College, Mavelikara
Department of Physics
First Semester B.Sc Degree Examination , June, 2022
First Continuous Assessment Examination
PY1141: BASIC MECHANICS & PROPERTIES OF MATTER

TIME: 1.30 hrs Max: 40 marks

SECTION A

Learning Outcome (LOC) BASED End Semester Examination Cognitive Level (CL) and Course Outcome (CO) Based CIA Question Paper Format (UG)

Section		Q. NO	Cognitive Level (CL)					
			CL1	CL2	CL3	CL4	CL5	CL6
A	(10 x 1 = 10) Answer All	1	+					
		2	+					
		3	+					
		4	+					
		5	+					
		6		+				
		7		+				
		8		+				
		9		+				
		10		+				
B	(8 x 2 = 16) Answer 8 out of 12	11			+			
		12			+			
		13			+			
		14			+			
		15			+			
		16			+			
		17			+			
		18				+		
		19				+		
		20				+		
		21				+		
		22				+		
C	(6 x 4 = 24) Answer 6 out of 9	23					+	
		24					+	
		25					+	
		26					+	
		27					+	
		28					+	
		29					+	
		30					+	

		31					+	
D	(2 x 15 = 30) Answer 2 out of 4	32						+
		33						+
		34						+
		35						+
No. of CL based Questions with Max. marks			5 (5)	5 (5)	4(2)	4(2)	6(4)	2(15)
No. of CO based Questions with Max. marks			CO1	CO2	CO3	CO4	CO5	CO6
			10(10)		8(16)		6(24)	2(30)

Bishop Moore College, Mavelikara
Department of Physics
First Semester B.Sc Degree Examination , June, 2022
End Semester Examination
PY1141: BASIC MECHANICS & PROPERTIES OF MATTER

TIME: 3 hrs Max: 80 marks

SECTION A

Learning Outcome (LOC) BASED Continuous Assessments Cognitive Level (CL) and Course Outcome (CO) Based LAB CIA Examination (UG)

Assessment	Criteria	Marks	Cognitive Level (CL)					
			CL1	CL2	CL3	CL4	CL5	CL6
Semester Practical Examination for 80 marks	Formula, circuit, graph, brief procedure	20	+					
	Setting and experimental skill	15		+				
	Observations and tabulations	15			+			
	Substitution, calculation, result with correct unit	20					+	+
	Certified record with 18 experiments	10				+		
No. of CL based Questions with Max. marks								
No. of CO based Questions with Max. marks								

Learning Outcome (LOC) BASED Continuous Assessments Cognitive Level (CL) and Course Outcome (CO) Based LAB End Semester Examination (UG)

Assessment	Criteria	Marks	Cognitive Level (CL)					
			CL1	CL2	CL3	CL4	CL5	CL6
Semester Practical Examination for 80 marks	Formula, circuit, graph, brief procedure	20	+					
	Setting and experimental skill	15		+				
	Observations and tabulations	15			+			
	Substitution, calculation, result with correct unit	20					+	+
	Certified record with 18 experiments	10				+		
No. of CL based Questions with Max. marks								
No. of CO based Questions with Max. marks								

Learning Outcome (LOC) BASED Continuous Assessments Cognitive Level (CL) and Course Outcome (CO) Based Project and Tour Report Examination (UG)

Assessment	Criteria	Marks	Cognitive Level (CL)					
			CL1	CL2	CL3	CL4	CL5	CL6
Semester Practical Examination for 80 marks	Originality of approach	20	+					
	Relevance of the topic	15		+				
	Involvement	15			+			
	Viva-voce	20					+	+
	Presentation of report	10				+		
	Research Institute/ Science museum visit and Report	30						
No. of CL based Questions with Max. marks								
No. of CO based Questions with Max. marks								