VELS UNIVERSITY

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)

PALLAVARAM - CHENNAI - INDIA

NAAC ACCREDITED

SCHOOL OF BASIC SCIENCES

Department of Physics

Program Outcome

Graduates with a major in physics will be able to :

PO1: Develop their basic knowledge in Physics, which enables them to be strong in scientific concepts and practical skills.

PO2: Expertise in mathematics and the mathematical concepts needed for a proper understanding of physics.

PO3: Acquire knowledge in Classical Mechanics, Quantum Mechanics, Electromagnetism, Thermal Physics, Atomic and Nuclear Physics and be able to apply this knowledge to analyze a broad range of physical phenomena.

PO4: Measure, analyze and interpret physical parameters.

PO5: Apply critical reasoning skills to model and solve physics related problems.

PO6: Communicate scientific information in oral, written, and graphical formats.

Program Specific Outcome

Graduates with a major in physics will be able to understand :

PSO1: Clear knowledge about mechanics of macroscopic and microscopic bodies (classical and quantum mechanics)

PSO2: Concept of heat, transmission of heat, kinetic theory of gases and laws of thermodynamics

PSO3: The concepts of optics, such as interference and diffraction properties of light and acquires the knowledge of handling optical instruments.

PSO4: Basic principles of electricity and magnetism and apply the concepts in energy applications.

PSO5: The principles of atomic physics and explore their knowledge in identification of structures and energy levels using X-rays and lasers for various spectroscopic studies.

PSO6: Concept of semiconductors and familiarize the operation of amplifiers & basic electronic circuits.

PSO7: The concept of radioactivity, nuclear fission and fusion and working mechanism of nuclear reactor.

PSO8: Basic concepts in nano science and explore the applications of nano materials in various technologies.

DEPARTMENT OF PHYSICS

Board of Studies in Physics (UG) - List of Members

S. No	Name & Designation	Address	Internal/External
1	Dr. S. Paulraj Assistant Professor & Head	Department of Physics, School of Basics Sciences, Vels Univesity, Chennai	Chairperson, Internal
2	Dr. A. Uthayakumar Assistant Professor	Department of Physics, Presisdency College, Chennai Mobile: 9445160544	External
3	Dr. M. Arivanandhan Associate Professor	Centre for Nanoscience & Technology, Anna University, Chennai Mobile: 7401182819	External
4	Dr. M. Sureshkumar Assistant Professor	Department of Physics, School of Basics Sciences, Vels Univesity, Chennai	Internal
5	Dr. G. Suresh Assistant Professor	Department of Physics, School of Basics Sciences, Vels Univesity, Chennai	Internal

B.Sc.
PHYSICS

Curriculum and Syllabus

(Based on Choice Based Credit System)
Effective from the Academic year

2017-2018

Department of Physics
School of Basic Sciences

BACHELOR DEGREE COURSE IN SCIENCE – UNDER THE FACULTY OF SCIENCE

B.Sc., DEGREE COURSE IN PHYSICS

SEMESTER SYSTEM

(Effective from the academic year 2017- 2018)

REGULATIONS

1.ELIGIBILITY FOR ADMISSION:

Candidates for admission to the first year of the Bachelor Degree shall be required to have passed the higher secondary Examinations (Academic or Vocational Stream) conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereof by the Vels University provided that candidates for admission into the specific Main Subject of Study shall also possess such other qualifying conditions as may be prescribed by the University. The student must have +2 with Physics. However non – Physics students in +2 can join Physics, but they have to do Physics Bridge course in the first semester.

2. ELIGIBILITY FOR THE AWARD OF DEGREE:

Candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed course of study in the University for a period of not less than three academic years, passed the examination of all the Six Semesters prescribed earning 150 credits and fulfilled such conditions as prescribed by the University.

3. DURATION:

a) Each academic year shall be divided into two semesters .The first academic year, shall comprise the first and second semesters, the second academic year, the third and fourth semesters and the third academic year, the fifth and sixth semesters, respectively.

b) The odd semesters shall consist of the period from June to November of each year and the even semesters from December to April of each year. There shall be not less than 90 working days for each semester.

4. COURSE OF STUDY:

The Main Subject of study for Bachelor Degree shall consist of the following:

(1) **FOUNDATION COURSES**: The course shall comprise the study of:

a) PART-1 Tamil or Hindi or French

b) PART – II English

(2) **MAIN COURSES** (consisting of (a) Core Subjects; (b) Discipline Specific Elective; (c) Generic Elective; (e) Practical, etc. if any)

5. COMPULSORY EXTENSION SERVICE:

A candidate shall be awarded a maximum of 2 credits for compulsory extension service.

All the students shall have to enroll for NSS/Sports & Games, Rotract / Youth Red Cross / any other service organization in the University compulsorily and shall have to put in compulsory minimum attendance of 20 hours in the prescribed semester. Literacy and population Education Field Work shall be compulsory components in the above extension service activities.

6. SCHEME OF EXAMINATION:

Scheme of Examination shall be as given in APPENDIX – A

7. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER:

i) Candidates shall register their names for the First Semester Examination after the admission in the UG Courses.

ii) Candidates shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the semester Examinations subject to the condition that the Candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) Semester subjects.

iii) candidates shall be eligible to go to subsequent semester, only if they earn, sufficient attendance as prescribed thereby the University from time to time, provided in case of a candidate earning less than 50% of attendance in any one of the Semester due to any extraordinary circumstance such as medical attendant (AMA) , duly certified by the Registrar of the University, shall be permitted to proceed to the next semester and to complete the Course of Study, Such candidates shall have to repeat the missed Semester by rejoining after completion of Final Semester of the Course, after paying the fee for the break of study as prescribed by the University from time to time.

8. PASSING MINIMUM:

A candidate shall be declared to have passed in each paper/practical of the Core / Discipline Specific Elective / Generic Elective Subjects/ Practical of Study wherever prescribed, if he/she secures NOT LESS THAN 40% of the marks prescribed for the examination. He/she shall be declared to have passed the whole examination, if he/she passes in the papers and practical wherever prescribed/as per the scheme of examinations earning 150 CREDITS. He/ she shall also fulfill the compulsory extension services prescribed earning a minimum 2 credit to qualify for the Degree.

9. CLASSIFICATION OF SUCCESSFUL CANDIDATES:

I. FOUNDATION COURSES

a) LANGUAGE OTHER THAN ENGLISH:

Successful candidates passing the examinations for the Language and securing the marks (i) 60 percent and above and (ii) 50 percent and above but below 60 percent in the aggregate shall be declared to have passed the examination in the FIRST and SECOND Class, respectively. All other successful candidates shall be declared to have passed the examination in the THIRD Class.

b) ENGLISH:

Successful candidates passing the examinations for English and securing the marks i) 60 percent and above and ii) 50 percent and above but below 60 percent in the aggregate shall be declared to have passed the examination in the FIRST and SECOND Class, respectively. All other successful candidates shall be declared to have passed the examination in the THIRD Class.

II. MAINCOURSES (consisting of a) Core Subjects; b) Discipline Specific Elective; c) Generic Elective Subjects and Practical, etc. if any)

Successful candidates passing the examinations for Main Courses together and securing the marks i) 60 percent and above ii) 50 percent and above but below 60 percent in the aggregate of the marks prescribed for the Main Courses together shall be declared to have passed the examination in the FIRST and SECOND Class respectively. All other successful candidates shall be declared to have passed the examinations in the THIRD Class.

10. RANKING:

Candidates who pass all the examinations prescribed for the course in the First appearance itself alone are eligible for Classification / Ranking / Distinction provided in the case of candidates who pass all the examinations prescribed for the course with a break in the first appearance due to the reasons as furnished in the Regulations 7 (iii) Supra are only eligible for Classification / Distinction.

APPENDIX – A- PATTERN OF QUESTION PAPER

PART – A (50 words) Answer 10 questions without choice	10 X 3 = 30 marks
PART – B (200 words) Answer 5 questions out of 8 questions	5 X 8 = 40 marks
PART – C (500 words) Answer 2 questions out of 5 questions	2 X 15 = 30 marks

Total = 100 marks

QUESTION PAPER FOR PRACTICALS

The External examiner will prepare a question paper on the spot from the syllabus prescribed and supplied by the Controller's Office.

B.Sc. Physics Curriculum

CHOICE BASED CREDIT SYSTEM

Effective from the Academic Year 2017 - 2018

Total number of Credit: 150

Category	Code No.	Course	Hours per week			Credits
			Lecture	Tutorial	Practical	
		Language–I (Tamil, Hindi & French)	5	0	0	4
		English–I	5	0	0	4
CORE		Properties of Matter & Acoustics	4	0	0	4
CORE		Mechanics	5	0	0	4
CORE		Physics Practical C - I	0	0	2	2
CORE		Physics Practical C - II	0	0	2	2
GE		Generic Elective – I	4	1	0	4
AECC		English for Communication	2	0	0	2
			25	**1**	**4**	**26**
SEMESTER II						
		Language–II (Tamil, Hindi & French)	5	0	0	4
		English–II	5	0	0	4
CORE		Thermal Physics	5	0	0	4
CORE		Optics	4	0	0	4
CORE		Physics Practical C - III	0	0	2	2
CORE		Physics Practical C- IV	0	0	2	2
GE		Generic Elective – II	4	1	0	4
AECC		Environmental Studies	2	0	0	2
			25	**1**	**4**	**26**
SEMESTER III						
		Language–III (Tamil, Hindi & French)	5	0	0	4
		English–III	5	0	0	4
CORE		Electricity & Magnetism	4	0	0	4
CORE		Analog electronics	4	0	0	4
CORE		Physics Practical C– V	0	0	2	2
CORE		Physics Practical C– VI	0	0	2	2
GE		Generic Elective III	4	0	0	3
GE		Generic Elective III – Practical	0	0	2	2
SEC		Skill Enhancement Course - I	2	0	0	2
			24	0	**6**	**27**

Category	Code No.	Course	Hours per week			Credits
			Lecture	Tutorial	Practical	
SEMESTER IV						
		Language–IV (Tamil, Hindi & French)	5	0	0	4
		English–IV	5	0	0	4
CORE		Atomic Physics	4	1	0	4
CORE		Digital Electronics	5	0	0	4
CORE		Physics Practical C – VII	0	0	2	2
GE		Generic Elective – IV	4	0	0	3
GE		Generic Elective – IV Practical	0	0	2	2
SEC		Skill Enhancement Course - II	2	0	0	2
			25	**1**	**4**	**25**
SEMESTER V						
CORE		Laser Physics & Spectroscopy	5	1	0	4
CORE		Mathematical Physics	5	1	0	4
CORE		Solid State Physics	4	0	0	4
CORE		Physics Practical C – VIII	0	0	2	2
D		Discipline Specific Elective – I	4	0	0	4
D		Discipline Specific Elective – I	0	0	2	2
D S		Discipline Specific Elective - II	5	1	0	4
			23	**3**	**4**	**24**
SEMESTER VI						
CORE		Nuclear & Particle Physics	5	1	0	4
CORE		Quantum Mechanics	5	1	0	4
CORE		Nanomaterials & Applications	5	0	0	4
CORE		Physics Practical C - IX	0	0	2	2
DSE		Discipline Specific Elective – III	4	1	0	4
D S		Discipline Specific Elective – IV - Dissertation	0	0	6	4
			19	**3**	**8**	**22**
						150

LIST OF DISCIPLINESPECIFIC ELECTIVE COURSES (DSE)

S. No.	Courses
1.	Microprocessor
2	Energy Physics
3	Low Temperature Physics
4	Electronic Communication
5	Laser Physics
6	Solar Technology
7	Astrophysics
8	Dissertation

LIST OF GENERIC ELECTIVE COURSES (GEC)

S. No.	Courses
1	Physics- I
2	Physics –II
3	Properties of Matter and Acoustics
4	Mechanics
5	Thermal Physics
6	Optics
7	Electricity and Magnetism
8	Atomic Physics
9	Analog Electronics
10	Digital Electronics

LIST OF ABILITY ENHANCEMENT COMPULSARY COURSES (AECC)

S. No.	Courses
1	English for Communication
2	Environmental Studies

LIST OF SKILL ENHANCEMENT COURSES (SEC)

S. No.	Courses
1	Physics Workshop Skills
2	Electrical Circuit and Network Skills
3	Basic Instrumentation Skills
4	Renewable Energy and Energy Harvesting
5	Radiation Safety
6	Weather Forecasting
7	National Service Scheme – I
8	National Service Scheme – II
9	National Service Scheme – III

SYLLABUS
CORE COURSES

	PROPERTIES OF MATTER & ACCOUSTICS	L	T	P	Credits
		4	0	0	4

Course Objective: To make the students to understand, the different kinds of moduli via experimental methods; surface tension for liquids; wave phenomena, in general and sound wave in particular; ultrasonics and acoustics.

UNIT –I Elasticity **9**

Hooke's law – Stress – strain diagram – Elastic Moduli, Work done per unit volume in shearing strain – Relation between elastic constants – Poisson's Ratio – Expression for Poisson's ratio in terms of elastic constants – Twisting couple on a wire – Work done in twisting – Torsional pendulum – determination of rigidity modulus of a wire - q, η and κ by Searles method.

UNIT – II Bending of Beams **9**

Expression for bending moment – Cantilever – Expression for depression – Experiment to find Young's modulus – Cantilever oscillation – Expression for period – Uniform bending – Expression for elevation – Experiment to find Young's modulus using microscope – Non Uniform bending – Expression for depression – Experiment to determine Young's modulus using mirror and telescope.

UNIT – III Surface Tension **9**

Surface tension - Surface energy - Angle of contact and its determination - Excess of pressure inside curved surface - Formation of drops - Experimental study of variation of Surface tension - Drop weight method of determining surface tension and interfacial surface tension

UNIT – IV Viscosity **9**

Streamlined motion – Turbulent motion – Coefficient of viscosity and its dimension – Rate of flow of liquid in a capillary tube – Poiseuilles' Method and experimental verification (Two different liquids) – Stokes Method and experiment verification – Effect of temperature on viscosity.

UNIT – V Acoustics **9**

Music and noise – Characteristics of musical sound, quality of tone, consonance and dissonance – musical scale – tempered scale – decibel – noise pollution. Acoustics of buildings - Reverberation - Reverberation time – Sabine's formula derivation – measurement of reverberation time – absorption coefficient – acoustical design of buildings– Ultrasonics – production, properties and applications.

TOTAL HOURS : 45

Course Outcome

CO1: At the end of the course the student should be able to:
CO2: Understand the difference between solids, liquids, and gases.
CO3: Distinguish between the different forces that hold atoms together.
CO4: Describe the characteristics of the three states of matter.
CO5: Explain the applications of the elastic properties of solids.
CO6: To describe the main features of intermolecular forces

CO7: Apply knowledge of sound waves, and light waves to explain natural physical processes and related technological advances.
CO8: Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies.
CO9: Apply the knowledge of Gravitation at various situations.

Text Books

1. R. Murugesan - Properties of Matter, S. Chand & Co, Delhi, 1994.
2. D.S. Mathur–Elements of Properties of Matter, S. Chand & Co, Delhi, 2006.
3. Brij Lal & Subramaniam–A Text book of Sound, Second Edition, Vikas Publishing, Delhi, 2008.

References

1. Resnick and Halliday - Physics, Volume – I & II, Wiley and Sons inc, Sixth edition.
2. C. J. Smith - General Properties of Matter, Orient & Longman Publishers, 1960.

	MECHANICS	L	T	P	Credits
		5	0	0	4

Course Objective: To have clear knowledge of mechanics so as to enable them to understand the other branches of Physics especially the mechanics of microscopic bodies, Quantum mechanics.

UNIT-I Laws of Motion **9**

Newton's law of motion – Force – Mass – Momentum and Impulse, Law of Conservation of Linear Momentum – Collision – Elastic and Inelastic collision – Newton's law of impact. Coefficient of restitution – Impact of moving sphere on a fixed plane – Direct and Oblique impact of moving two smooth spheres – Calculation of final velocities – Laws of Kinetic energy – Projectile motion – Frictional forces – Center of mass of solid objects – Conservation of Momentum in a system of particles.

UNIT-II Dynamics of Rigid Bodies **9**

Moment of Inertia - Angular Momentum - Torque - Conservation of linear and angular momentum - Kinetic energy of rotating body - Theory of Compound Pendulum - determination of g and k - Centre of Mass - Velocity and acceleration - M.I. of a diatomic molecule.

UNIT-III Gravitation **9**

Centre of Gravity: Center of Gravity of a solid and hollow hemisphere, solid tetrahedron - Newton's Law of Gravitation- Determination of mass and Density of earth. Determination of 'G' by Boy's Method – Kepler's Laws of Planetary Motion - Newton's Law from Kepler's Law – Escape Velocity - Motion of Rocket - Orbital Velocity – Geo-stationary Orbit and its applications.

Unit – IV Oscillations **9**

Differential equation and the solution for a simple harmonic oscillator, some examples (simple pendulum, and compound pendulum). Damped Oscillator: Equation of motion and its solution, qualitative description of the

effect of different amounts of damping on the motion. Forced oscillations and resonance: Solution of differential equation of a forced oscillator and variation of amplitude with frequency and damping, Q factor.

UNIT-V Relativity **9**

Frames of references - Michelson-Morley experiment - significance of negative result - postulates of special theory of relativity - Lorentz transformation equations - Length contraction - Time dilation - Relativity of simultaneity - Law of addition of velocities - variation of mass with velocity - relativistic kinetic energy equations - postulates of general theory of relativity - gravitational red shift

TOTAL HOURS : 45

Course Outcome

At the end of the course the student should be able to:

CO1: Understand the basic idea about mechanics of microscopic bodies
CO2: Analyze systems that include frictional forces.
CO3: Impart the knowledge about the dynamics of rigid bodies
CO4: Understand the applications of gravitational laws for solids
CO5: Determine the resultant of a system of forces.
CO6: Understand the planetary motion.
CO7: Solve oscillating system problems.
CO8: Understand the concept of theory of relativity.

Text Books

1. Narayanamoorthy - Mechanics Part I and II, National Publishing Company.
2. D. S. Mathur– Mechanics, II Edition, S. Chand and Co, 2001.
3. R. Murugeshan - Mechanics and Mathematical Methods, 1st Edition, S. Chand and Co, 1996.

References

1. R.P. Feynman, R.B. Leighton and M. Sands - The Feynman Lectures on Physics, Vols. 1, 2 and 3, Narosa, New Delhi 1998.
2. D. Halliday, R. Resnick and J. Walker - Fundamentals of Physics, 6th Edition, Wiley, New York, 2001.

.	PHYSICS PRACTICAL C – I	L	T	P	Credits
		0	0	2	2

List of Experiments

1. Measurements of length (or diameter) of solid material using vernier caliper, screw gauge
2. Travelling microscope – To determine the radius of the capillary tube.
3. Young's modulus- uniform bending (pin & microscope)
4. Young's modulus- Cantilever/Stretching (pin & microscope)
5. Young's modulus- Non-uniform bending (pin & microscope)
6. Rigidity modulus- Torsion pendulum
7. Surface tension – capillary rise method
8. Viscosity of liquid- Poiseuille's method
9. Viscosity of liquid- Stoke's method.
10. Sonometer - Frequency of tuning fork

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to

CO1: Measure the internal diameter and depth of a given beaker/calorimeter and hence find its volume.
CO2: Design and conduct Young's modulus experiments and interpret the experimental results.
CO3: Analyze the physical principle involved in the various instruments; also relate the principle to new application.
CO4: Determine the coefficient of viscosity of high viscous liquid (Castor oil) by Stokes' method.
CO5: Measure fluid pressure and relate it to flow velocity.
CO6: Determine the frequency of the tuning fork by using Sonometer

	PHYSICS PRACTICAL C - II	L	T	P	Credits
		0	0	2	2

List of Experiments

1. Compound pendulum- To determine 'g'
2. Rigidity modulus - Static torsion
3. Hook's Law – To study the Motion of a Spring and calculate (a) Spring Constant, (b) g.
4. Lamis Theorem
5. To measure the coefficient of friction for different materials – Inclined plane.
6. To determine the Moment of Inertia of a Flywheel.
7. Bifilar Pendulum
8. Young's modulus - uniform bending (Optical Lever)
9. Young's modulus - non-uniform bending (Optical Lever)
10. To determine the Elastic Constants of a Wire by Searle's method

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to :

CO1: Determine the acceleration due to gravity by using compound pendulum
CO2: Design and conduct Young's modulus experiments by using optic lever and interpret the experimental results.
CO3: Analyze the elastic constants of a wire by Searle's method
CO4: Identify the two physical quantities to be measured as the variables - the independent and dependent variables
CO5: Analyze different types of stresses induced in beams and shafts due to bending and twisting moments respectively
CO6: To understand geometrical properties such as centroid, moment of inertia etc of sections of different shapes.

	THERMAL PHYSICS	L	T	P	Credits
		5	0	0	4

Course Objective: To understand the concept of heat, transmission of heat, kinetic theory of gases and laws of thermodynamics

UNIT I Specific Heat **9**

Specific heat of solids – Method of mixtures – Radation correction – Dulong and Petit's law - Quantum theory - Einstein's theory of specific heat – Debye's theory of specific heat– Specific heat of liquids – Newton's law of cooling - Specific heat of gases – Mayer's Relation – Quantization of various contributions to energy of diatomic molecules – Specific heat of diatomic gases.

UNIT II Conduction & Radiation **9**

Definition of thermal conductivity – thermal conductivity of bad conductor – Lee's disc method-radial flow of heat-thermal conductivity of rubber.

Radiation – Black body radiation – Wien's law, Rayleigh-Jean's law-Planck's quantum theory of radiation - Planck's law – Stefan's law-Deduction of Newton's law of cooling from Stefan's law – solar constant (Definition only).

.

UNIT III Kinetic Theory of Gases **9**

Maxwell's law of distribution of molecular velocities – Experimental verification of molecular velocities – Equilibrium of velocities - Mean free path of gaseous molecules – Transport phenomena – Diffusion of gases – Viscosity and thermal conduction of gases – Vander Waals equation of state – Determination of Vander Waals constant – Comparison of Vander Waals equation with Andrews experiment - Relation between Vander Waals constant and critical constants.

UNIT IV Low Temperature **9**

Joule – Thomson's effect – Porous plug experiment – Liquefaction of gases – Linde's method – Adiabatic demagnetization – Properties of He^1 and He^2 – Practical applications of low temperature – Refrigeration and air conditioning.

UNIT V Laws of Thermodynamics **9**

Zeroth law of thermodynamics – First law of thermodynamics – Heat engines – Reversible and irreversible process – Isothermal and adiabatic process – Carnot's engine - Carnot's theorem – Second law of thermodynamics - Thermodynamic Scale of temperature – Entropy – Change of entropy in reversible and irreversible processes – Temperature – entropy diagram (T.S) – Law of increase of entropy – Gibbs free energy.

TOTAL HOURS : 45

Course Outcome:

At the end of the course the student should be able to:

CO1: Apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.

CO2: Identify and describe the statistical nature of concepts in thermodynamics, in particular: entropy, temperature, chemical potential, Free energies, partition functions.

CO3: Understand all the concepts needed to state the laws of thermodynamics.

CO4: Use the laws of thermodynamics (particularly the first and second laws) to solve a variety of problems, such as the expansion of gases and the efficiency of heat engines.
CO5: Understand the efficiency and properties of thermodynamic cycles for heat engines, refrigerators and heat pumps.
CO6: Acquire information on the kinetic theory of gases.
CO7: Explain the possibilities of heat transmission through conduction & radiation.
CO8: Understand the mechanism behind the working of a refrigerator and air conditioning.

Text Books

1. Brijilal and Subramininan, Heat & Thermodynamics, S. Chand &Co.1999.

References

1. R. Murugesan, Thermal Physics- S. Chand & Co, 2015.
2. D.S. Mathur, Heat and Thermodynamics, S. Chand and Company, 2006.

	OPTICS	L	T	P	Credits
		4	0	0	4

Course Objective: To understand the concepts of optics, to study interference and diffraction of light and to learn the techniques of optical instruments

UNIT I Geometrical Optics 9

Dispersion – Dispersive power – dispersion in small angle prism – Dispersion without deviation – Deviation without dispersion –Defect of lenses –Spherical aberration– Methods of reducing spherical aberration – Coma – Aplanatic lens – Astigmatism – Distortion – Chromatic aberration– Achromatic lenses.

UNIT II Interference 9

Air wedge – Newton's rings – Haidinger's fringes – Brewster's fringes – Michelson Interferometer and its applications – Fabry- Perot Interferometer – Interference filter – Stationary waves in light – Colour photography (qualitatively) – Holography- Construction and reconstruction of a hologram – Applications.

UNIT III Diffraction 9

Fresnel's diffraction – Diffraction at a (1) circular aperture (2) Straight edge (3) narrow wire – Fraunhofer diffraction at a single slit – Double slit – Diffraction pattern – Grating (theory) – Resolving power – Rayleigh's criterion of resolution- Resolving power of a Telescope and Grating – Dispersive power and resolving power of a grating.

UNIT IV Polarization 9

Nicol prism – Nicol prism as an analyzer and polarizer – Huygens's explanation of Double refraction in uniaxial crystals – Double Image polarizing prisms – Elliptical and Circularly polarized light – Production and detection – Quarter wave and half wave plates – Babinets compensator – Optical activity – Fresnel's explanation of optical activity – Laurent's Half shade polarimeter.

UNIT V Optical Instruments **9**

Microscopes – Simple Microscope (Magnifying glass) – Compound Microscope – Ultra-Microscope – Eyepieces - Huygen's Eyepiece - Ramsden's Eyepiese — Comparison of Eyepieces – Telescope – Refracting astronomical telescope – Abbe Refractometer – Pulfrichrefractometer - Photographic Camera – Prism binocular

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to:

CO1: Acquire the basic concepts of wave optics.

CO2: Describe how light can constructively and destructively interfere.

CO3: Explain why a light beam spreads out after passing through an aperture.

CO4: Summarize the polarization characteristics of electromagnetic waves

CO5: Appreciate the operation of many modern optical devices that utilize wave optics

CO6: Understand optical phenomena such as polarization, interference and diffraction in terms of the wave model.

CO7: Analyse simple examples of interference and diffraction phenomena.

CO8: Be familiar with a range of equipment used in modern optics.

Text Book

1. Subramaniam N &Brij Lal, Optics, S Chand & Co. Pvt. Ltd., New Delhi, 2004
2. Murugeshan, Optics and Spectroscopy, S Chand & Co. Pvt. Ltd., New Delhi, 2010.

References

1. Eugene Hecht, Optics, 4th Edition, Addison Wesley, 2002.
2. Okan K. Ersoy, Diffraction, Fourier Optics and Imaging, John Wiley & Sons,2007
3. Optics by Khanna D R & Gulati H R, R Chand & Co. Pvt. Ltd., New Delhi, 1979
4. Singh & Agarwal, Optics and Atomic Physics, Pragati Prakashan Meerut, Nineth edition, 2002.

	PHYSICS PRACTICAL C - III	L	T	P	Credits
		0	0	2	2

Any 10 Experiments

1. Lee's Disc method – Thermal conductivity of bad conductor
2. Joule's Calorimeter - determination of Specific heat capacity of liquid
3. Verification of Boyle's law
4. Newton's law of cooling
5. Joule's Calorimeter – Specific heat capacity of Liquids
6. Specific heat capacity- Liquid
7. Specific heat capacity- Solid
8. Specific heat capacity- Mixture of Solid and Liquid
9. To study the variation of .thermo emf across two junctions of a thermocouple with temperature.
10. P.O box temperature co-efficient.
11. Solar constant

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome:

At the end of the course the students will be able to

CO1: Determine the thermal conductivity of bad conductor by Lee's disc method

CO2: Measure the specific heat capacity of liquid by Joule's calorimeter method

CO3: Understand the basic concepts of Boyles law and its applications.

CO4: Identify the relation between pressure and volume of a given mass of the gas.

CO5: Measure the temperature coefficient of resistance of a given wire by P.O box method.

CO6: Analyze the luminosity of the sun by solar constant method.

	PHYSICS PRACTICAL C- IV	L	T	P	Credits
		0	0	2	2

List of Experiments

1. Spectrometer-μ of the small angle prism.
2. Spectrometer – Grating (N & λ)
3. Spectrometer – Dispersive power of prism
4. Air wedge
5. Newton's Ring-Sodium lamp (Microscope)
6. Spectrometer- i-i' curve using prism.
7. Spectrometer-i-d curve
8. Spectrometer – Cauchy's constant
9. Convex lens – f, R and m
10. Concave lens – f, R and m

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to

CO1: Analyze the spectrum of a mercury lamp and record the angle of deviation for the spectral lines

CO2: Demonstrate the dispersion of light through a prism and the principle of a prism spectrometer.

CO3: Determine the thickness of a thin wire by Air-wedge method.

CO4: Determine the experimental values for the Cauchy's constants for the glass prism.

CO5: Define and demonstrate image sizes as compared to object sizes: enlarged, same size, minified.

CO6: Measure the focal length, radius of curvature and magnification by convex lens.

CO7: Determine the focal length, radius of curvature and magnification by concave lens.

	ELECTRICITY & MAGNETISM	L	T	P	Credits
		4	0	0	4

Course Objective: To understand the general concepts in Electrostatics, to educate scientifically the principles of magnetism and apply the physics concepts in solving problems.

UNIT-I Electrostatics 9

Coulomb's inverse square law – Gauss theorem and its applications (Intensity at a point due to a charged sphere & cylinder) – Principle of a capacitor – Capacity of spherical and cylindrical capacitors – Energy stored in a capacitor – Loss of energy due to sharing of charges.

UNIT II Current Electricity 9

Ampere's circuital law and its applications - Field along the axis of a circular coil and Solenoid – Force on a conductor in a magnetic field – Theory of Ballistic Galvanometer – Figure of merit – Damping Correction – Wheatstone network – Carey Foster's Bridge – Potentiometer - Measurement of current, resistance and low voltage.

UNIT-III Chemical Effects and Magnetic Effects of Electric Current 9

Electrical conductivity of an electrolyte - Faraday's laws of electrolysis - Determination of specific conductivity of an electrolyte (Kohlrausch bridge) – Gibbs-Helmholts equation for the emf of a reversible cell - calculation of emf of a Daniel Cell - Helmholtz Galvanometer - Theory of moving coil Ballistic Galvanometer - Damping correction - Absolute capacitance of a capacitor.

UNIT IV Electromagnetic Induction 9

Laws of electromagnetic induction– Self and mutual induction– Self-inductance of a solenoid– Mutual inductance of a pair of solenoids–Coefficient of coupling– Experimental determination of self (Rayleigh's method) and mutual inductance– Growth and decay of current in a circuit containing L and R–Growth and decay of charge in a circuit containing C and R– Measurement of High resistance by leakage.

UNIT V Magnetism 9

Intensity of Magnetization– Magnetic Susceptibility– Magnetic Permeability – Types of magnetic materials– Properties of para, dia and ferromagnetic materials– Langevin's theory of dia and para magnetism – Weiss's theory of ferromagnetism – B-H curve–Energy loss due to magnetic hysteresis – Ballistic Galvanometer method for plotting B-H curve - Magnetic properties of iron and steel.

TOTAL HOURS : 45

Course Outcome

At the end of the course the student should be able to:

CO1: Explain the basic physics of capacitors and resistors.

CO2: Predict the behavior of simple and complex direct current circuits using the fundamental conservation laws.

CO3: Explain the basic electric and magnetic interactions due to charged particles and currents

CO4: Describe how the electric interactions due to single or collection of charged particles are embodied in the concepts of the electric field and the electric potential.

CO5: Predict the motion of charged particles in electric and magnetic fields.

CO6: Write a project on an application or a natural phenomenon based on the fundamental laws of electricity and magnetism

CO7: Understand the necessity of electricity and magnetism in transportation technology.

CO8: Understand the occurrence of loss in energy due to charged particles.

Text Books

1. Brijlal and N. Subrahmanyam, A Text Book of Electricity and Magnetism, Ratan Prakasan Mandir Educational & University Publishers, New Deihi,2000.
2. R. Murugeshan, Electricity and Magnetism, 7th Edition, S. Chand & Company Pvt. Ltd. 2008
3. D. L. Sehgal, K. L. Chopra and N. K. Sehgal, Electricity and Magnetism, S. Chand & Sons. New Delhi. 1996.

References

1. Griffth D.J, Introduction to Electrodynamics, 4th Edition, Prentice Hall of India, 2012.
2. Halliday Resnick and Walker, Fundamentals of Physics – Electricity and Magnetism, Wiley India Pvt Ltd, 2011.
3. Navina Wadhani, Electricity and Magnetism, Prentice Hall of India, 2012.

	ANALOG ELECTRONICS	L	T	P	Credits
		4	0	0	4

Course Objective: To understand the concept of semiconductors, diodes, transistors. To familiarize the operation of amplifiers

UNIT I Semiconductors and diodes 9

Intrinsic and extrinsic semi conductors – PN junction diode – Biasing of PN junction – VI Characteristics of diode – Rectifiers – Half wave – full wave and bridge rectifiers – Break down mechanisms – Zener- diode characteristics of Zener diode – Zener diode as voltage regulator.

UNIT II Bipolar Transistors 9

Bipolar junction transistor – Basic configurations relation between a and ß – Characteristic curves of transistor – CB,CE mode – DC load line – DC bias and stabilization – fixed bias – voltage divider bias – Transistor as an amplifier – Transistor as a two port network – h parameters.

UNIT III Amplifiers and Oscillators 9

Single stage CE amplifier – Analysis of hybrid equivalent circuit – Power amplifiers – Efficiency of class B Power amplifier – Push – pull amplifier - General theory of feedback – Properties of negative feedback – Criterion for oscillations – Hartley oscillator – Colpitt's oscillator.

UNIT IV Special Semiconductor devices 9

FET – JFET – MOS FET – FET parameters – Comparison between FET and Transistor – Photo transistor – SCR – SCR as a switch – UJT – UJT relaxation oscillator.

UNIT V Operational Amplifiers 9

Differential amplifier - Common mode rejection ratio – Characteristics of an ideal op-amp – Virtual ground – Inverting amplifier – Non inverting amplifier – Applications. Adder – subs tractor – Integrator – Differentiator – Unity gain buffer.

TOTAL HOURS : 45

Course Outcome

At the end of the course the student should be able to

CO1: Understand the properties and applications of semiconductor diodes.

CO2: Study and analyze the rectifier and regulator circuits.

CO3: Understand the properties and working of transistors.

CO4: Understand and analyze the different biasing techniques used in BJTs and FETs.

CO5: Analyze and design Oscillators using BJTS, FETs and OPAMPs

CO6: Understand the functions of operational amplifiers

CO7: Analyze and design idealized active linear circuits containing OPAMPs

CO8: Acquire the practical knowledge in electronics experiments.

Text Books

1. V K Mehta, Principles of electronics, S Chand & Co., 5th edition, 2001.
2. M Arul Thalapathi, Basic and Applied Electronics, Comptek Publishers, Chennai, 2005.

References

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, Electron Devices and Circuits, Tata McGraw Hill, 2010.
2. Millman and Halkias, Electronics Devices and Circuits, Tata McGraw Hill, 2008.
3. William H. Hyte, Jr, J. E. Kemmerly and Steven M. Durban, Engineering Circuit Analysis, 7th Edition, McGraw Hill, 2010.

	PHYSICS PRACTICAL C - V	L	T	P	Credits
		0	0	2	2

List of Experiments

1. M and B_H - Deflection magnetometer – Tan A & Tan B position
2. Carey Foster Bridge – Determination of specific resistance of unknown coil
3. Potentiometer – EMF of thermocouple
4. Potentiometer-Calibration of Ammeter
5. Potentiometer- Calibration of Low range voltmeter
6. Potentiometer- Calibration of High range voltmeter
7. Sonometer- Frequency of Tuning Fork
8. Deflection magnetometer - Field along the axis of a coil.
9. Absolute capacitance of a capacitor -B.G
10. Post office Box

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to

CO1: Measure the temperature coefficient of resistance of a given wire by P.O box method.

CO2: Determine the frequency of the tuning fork by using Sonometer

CO3: Determination of specific resistance of unknown coil by Carey Foster Bridge

CO4: Compare the emf's of two given primary cells using a potentiometer.

CO5: Analyze the magnetic dipole moment of a bar magnet and horizontal intensity of earth's magnetic field using a deflection magnetometer.

CO6: Measure the magnetic dipole moment of a bar magnet using a deflection magnetometer by Tan A & Tan B position.

	PHYSICS PRACTICAL C - VI	L	T	P	Credits
		0	0	2	2

Any 10 Experiments

1. Transistor characteristics Common Emitter.
2. Transistor characteristics Common Base.
3. FET characteristics.
4. UJT Characteristics.
5. Diode characteristics (PN & ZENER)
6. Bridge rectifier – π filter.
7. Dual power supply using IC
8. Single stage amplifier-with and without feedback
9. OPAMP-Adder & Subtractor
10. OPAMP-Differentiator & Integrator
11. OPAMP-Low pass and high pass filter
12. Full wave rectifier without and with filters

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to

CO1: Demonstrate the input and output characteristics of a transistor in Common Emitter configuration.

CO2: Design the transistor characteristics in Common Base configuration.

CO3: Understand the basic concepts in IC's and digital devices

CO4: Apply the concepts of basic electronics and do the interpretation and acquire the result.

CO5: Design and verify the operations of Differentiator and Integrator circuit using 741Op-amp.

CO6: Design and verify the operations of Adder and Subtractor circuit using 741Op-amp.

	ATOMIC PHYSICS	L	T	P	Credits
		4	1	0	4

Course Objective: To make the student understand the principles of atomic physics. To enable the student to explore the field of atomic structure, energy levels, and X-rays.

UNIT I Discharge Phenomenon through Gases 9

Motion of a charge in transverse electric and magnetic fields - Specific charge of an electron - Dunnington's method - Positive rays – Aston's, Dempster's mass spectrographs

UNIT II Photo-electric Effect 9

Richardson and Crompton experiment - Laws of photoelectric emission - Einstein photo electric equation - Millikan's experiment - Verification of photoelectric equation - Photo electric cells - Photo emissive cells - Photovoltaic cell - Photo conducting cell - Photomultiplier.

UNIT III Atomic Structure 9

Vector atom model - spatial quantisation–various quantum numbers -Pauli's exclusion principle - angular momentum and magnetic moment - coupling schemes - LS and JJ coupling - Bohr magnetron explanation of periodic table - Stern and Gerlach experiment.

Spectral terms and notations - selection rules - intensity rule and interval rule - fine structure of sodium D lines - alkali spectra - fine structure of alkali spectra - spectrum of Helium.

UNIT IV Ionization Potential and Splitting of Energy Levels 9

Excitation and ionization potential - Davis and Goucher's method - Zeeman effect - Larmor's theorem - Debye's explanation of normal Zeeman effect - Anamalous Zeeman effect - theoretical explanation. Lande's 'g' factor and explanation of splitting of D1 and D2 lines of sodium - Paschen back effect-theory - Stark effect (qualitative treatment only).

UNIT V X-Rays 9

Origin of X- ray spectrum – Continuous and characteristics spectra – X-ray Spectroscopy – Auger effect - X-ray absorption and fluorescence - Moseley's law - uses of X-rays - Compton Effect - experimental verification of Compton Effect.

Course Outcome

At the end of the course the student should be able to

CO1: Discuss the effect of the intensity and frequency on the photoelectric effect and demonstrate the use of photo cell.

CO2: Understand the quantum numbers, including their physical significance, and quantum mechanical states of the hydrogen atom.

CO3: Understand time independent perturbation theory including its derivation and be able to apply it to simple systems, including the Stark-Effect and Zeeman Effect.

CO4: Know about the origins of fine structure in atomic spectra.

CO5: Understand the exchange degeneracy and how this affects the excited states of helium.

CO6: Understand the Periodic table from the viewpoint of the electronic structure.

CO7: Understand and be able to apply to simple cases time dependent perturbation theory.
CO8: Understand the derivation of and be able to apply the selection rules for the interaction of electric dipole radiation and atoms.

Text Books

1. R. Murugeshan, Kiruthiga Sivaprasath, Modern Physics, S. Chand & Co., New Delhi, 2008.
2. N Subramanian and Brij Lal, Atomic and Nuclear Physics, S. Chand & Co. - 2000

References

1. Robley D. Evans, The Atomic Nucleus, TMH, 1982
2. Christopher .J. Foot, Atomic physics, Oxford University Press Inc, 2005.

	DIGITAL ELECTRONICS	L	T	P	Credits
		5	0	0	4

Course Objective: To understand the basic concepts of number systems. To develop the digital concepts using logic gates. To apply digital concepts in sequential logic systems. To study operational amplifiers and clocks.

UNIT I Number Systems and Logic Gates 9

Introduction to decimal, binary, octal, hexadecimal number systems – Inter conversions– 1's and 2's complements –Logic gates, Symbols and their truth tables – AND, OR, NOT, NAND, NOR, XOR, and XNOR – Universality of NAND and NOR gates.

UNIT II Boolean Algebra and Simplification of Logic Expressions 9

Boolean algebra – Basic laws of Boolean algebra – De-Morgan's theorems - Reducing Boolean expressions using Boolean laws – SOP and POS forms of expressions miniterms and maxterms – Karnaugh map simplification.

UNIT III Combinational Digital Systems 9

Half and full adders – Binary address – Half and full subtractors – Binary subtractor Two's complement adder / subractor circuits – Decoder – Encoder – Multiplexer – Demultiplexer – A/D conversion – Successive approximation method – D/A conversion – R-2R ladder network.

UNIT IV Sequential Digital Systems 9

Flip flop – RS – clocked RS – T and D flip flops – JK and master slave flip flops – Counters – Four bit asynchronous ripple counter – Mod-10 counter – Ring counter – Synchronous counter – Shift registers – SISO and SIPO shift registers.

UNIT V Operational Amplifier & Timers 9

Operational amplifier - Characteristics – Operational amplifier theory - Inverting and Non-inverting amplifier - Single Stage transistor amplifier - gain calculation - current amplification analysis (CE only) - Feed back in amplifier - Voltage gain of feedback amplifier - advantages of negative feedback emitter follower - positive feedback amplifier as an oscillator. IC 555 timer – Astable multi vibrator - Mono stable multi vibrator.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Explain concepts and terminology of digital electronics.

CO2: Application of logic to design and creation, using gates, to solutions to a problem.

CO3: Use DeMorgan's theorem to simplify a negated expression.

CO4: Illustrate the algebraic representation of logic circuits using DeMorgan's theorems

CO5: Create circuits to solve problems using gates to replicate all logic functions.

CO6: Design and implement combinational logic circuits using reprogrammable logic devices.

CO7: Demonstrate the programs of digital to analog and analog to digital conversion

CO8: Create circuits to solve clocked Flip-Flops problems.

Text Books:

1. Donald P Leech, Albert Paul Malvino and Goutham Saha, Digital Principles and Applications by 7th Edition, Tata McGraw Hill, 2011.

References:

1. W. H. Gothmann, Digital Electronics, Prentice Hall of India, Pvt. Ltd., New Delhi 1996.
2. D.A. Godse and A.P. Godse, Digital Electronics, Technical Publisher, Pune, 2008

	PHYSICS PRACTICAL C - VII	L	T	P	Credits
		0	0	2	2

Any 10 Experiments

1. Study of basic Gates (IC)
2. NAND as universal building blocks
3. NOR as universal building blocks.
4. Astable multivibrator using IC555
5. Monostable multivibrator using IC555
6. Colpitt's Oscillator
7. Hartley Oscillator
8. D/A convertor
9. A/D convertor.
10. Wienbridge oscillator
11. 555 timers Schmitt Trigger.
12. Half adder and Half Subtractor.
13. Full adder and Full Subtractor.

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to

CO1: Understand the basic concepts of Gates (IC) as universal building blocks

CO2: Design and verify the operations of Astable and Monostable multivibrator using IC555

CO3: Compute the working of Colpitt's and Hartley Oscillator.

CO4: Analyze and understand the working of D/A convertor and A/D convertor,

CO5: Design and verify the operations of Wienbridge oscillator.

CO6: Determine the working of 555 timers Schmitt Trigger

CO7: Design and verify the operations of Half adder and Half Subtractor.

CO8: Design and verify the operations of Full adder and Full Subtractor

	LASER PHYSICS & SPECTROSCOPY	L	T	P	Credits
		5	1	0	4

Course Objective: To enable the students to understand the basic concepts of Lasers. To emphasize the principles involved in various spectroscopes.

UNIT I Fundamentals of Lasers and Types **9**

Characteristics of a Laser - Directionality- High Intensity-High Degree of Coherence- Spatial and temporal coherence- Spontaneous and stimulated emission - Einstein's coefficients and possibility of Amplification- Population Inversion- Laser pumping- Resonance cavity- Threshold condition for Laser emission - Ruby Laser- He-Ne Laser - Nd-YAG laser- Applications of Laser. Laser-CO_2

UNIT II Control of Laser Properties and Production **9**

Resonators - Vibration modes of resonators- Number of modes/unit volume - Open resonators- Control resonators- Q Factor- Losses in the cavity- Threshold condition- Quantum yield-Mode locking (active and passive)-Q Switching.

UNIT III Microwave Spectroscopy **9**

Rotation of molecules-Rotational spectra-Rigid and non-rigid diatomic rotator-Intensity of spectral lines-Isotopic substitution-Poly atomic molecules (Linear and symmetric top)-Hyperfine structure and quadrupole effects-Inversion spectrum of ammonia chemical analysis by Microwave spectroscopy-Techniques and instrumentation**.**

UNIT IV Infra Red Spectroscopy **9**

Basic Theory- Vibration of molecules-Diatomic vibrating rotator-vibrational rotational spectrum Interactions of rotations and vibrations-Influence of rotation on the vibrational spectrum of linear and symmetric top and poly atomic molecules -Instrumentation-Sample Handling- Characteristic Vibrational Frequencies- Effect of Hydrogen Bonding and solvent effect on Vibrational Frequencies- Overtones- Combination bands and Fermi Resonance-FTIR.

UNIT V Resonance Spectroscopy **9**

NMR - Basic principles - Classical and quantum mechanical description- Bloch equations - Spin-spin and spin-lattice relaxation times – Chemical shift and coupling constant Experimental methods – Single coil and double coil methods. ESR: Basic principles – ESR spectrometer – Nuclear interaction and hyperfine structure – relaxation effects – g-factor – Characteristics – Free radical studies and biological applications.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Restate the properties of fundamental optical processes

CO2: Describe fundamental operation principle of modern lasers

CO3: Relate the laser operation principles to atom and molecular physics, solid state physics, quantum mechanics and physical optics

CO4: Calculate the properties of various lasers and the propagation of laser beams

CO5: Demonstrate solid knowledge of modern laser spectroscopic techniques

CO6: Will be able to interpret microwave spectroscopy.

CO7: Will be able to interpret IR spectroscopy. Explain working principles and taking spectrum of IR spectroscopy device.

CO8: Explain basic principles of NMR and ESR spectroscopy

Text Books

1. Colin Banwell and McCash, Fundamentals of Molecular Spectroscopy, TMH Publishers, 4th Edition, 2002.
2. R. Murugeshan - Optics & Spectroscopy, S. Chand & Co., New Delhi

References

1. Sune Svanbag, Atomic and Molecular Spectroscopy: Basic Aspects and Practical Applications, Springer, 3rd Edition, 2001.
2. Jeanne L Mc Hale, Molecular Spectroscopy, Pearson Education, 1Indian Edition, 2008.
3. Aruldhas G., Molecular Structure and Spectroscopy, Prentice Hall of India, 2001.

	MATHEMATICAL PHYSICS	L	T	P	Credits
		5	1	0	4

Course Objective: To enable the students to understand the basic concepts of mathematical functional quantities. To emphasize the significance involved in various special functions.

UNIT I Vector Analysis Scalar and Vector Fields **9**

Gradient, divergence and curl - physical interpretation, Lamellar and solenoidal field – (only definition), line, surface and volume integrals – Gauss Divergence theorem – Stoke's theorem – Green's theorem - Application of vectors to hydrodynamics: Equation of continuity, Bernoulli's theorem.

UNIT II Matrices **9**

Characteristic equation of a matrix – eigen values and eigen vectors – Cayley Hamilton theorem – Theorems on eigens values and eigen vectors – Hermitian and unitary matrices – Diagonalisation of matrices – matrices in Physics: rotation matrix, Pauli spin matrices (elementary ideas only).

UNIT III Special Functions **9**

Gamma and Beta functions – definition – Evaluation – other forms of the functions – symmetry property of Beta function- relation between Beta and Gamma functions - Series solutions of Bessel's differential equation and Legendre differential equation.

UNIT IV Lagrangian Formulation **9**

Mechanics of a system of particles – Degrees of freedom – constraints – Generalized coordinates – Configuration space – principle of virtual work – D'Alembert's principle – Lagrange's equation of motion from D'Alembert's principle for a conservative system - Applications of Lagrange's equation: Atwood's machine, a bead sliding on uniformly rotating wire – simple pendulum.

UNIT V Hamiltonian Formulation **9**

Phase space – Hamiltonian function H – Physical significance – Hamilton's equations - Applications of Hamiltonian equations: Simple pendulum – Motion of a particle in a central force field.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Demonstrate an original and critical approach to analyze the current state of knowledge in a particular area of physics or theoretical physics.

CO2: Develop the capacity to identify and evaluate a problem and define the important elements required for its solution.

CO3: Explain linear dependence and linear combination of vectors as quantities in physics.

CO4: Identify various types of matrices and explain how one type of matrix differs from another explain the differences between matrices and determinants.

CO5: Identify different special mathematical functions.

CO6: Special mathematical function appropriately in solving problems in physics

CO7: Understand fundamental concept in Lagrangian Formulation.

CO8: Understand the concept of phase space and Hamitonian formulation..

Text Books

1. Satya Prakash, Mathematical Physics, S. Chand & Sons, New Delhi (1996)
2. J.C. Upadhyaya, Classical Mechanics, Himalaya Publishing House, Mumbai (2003)
3. R. Murugesan, Mechanics and Mathematical methods, S. Chand & Company, New Delhi (1996)

References

1. B.D. Gupta, Mathematical Physics, Vikas Publishing House Pvt. Ltd, New Delhi (1996)
2. H. Goldstein, Classical Mechanics, Special Indian Student Edition, Narosa Publishing House, New Delhi (1985)

	SOLID STATE PHYSICS	L	T	P	Credits
		5	0	0	4

Course Objective: The course is to understand the basic knowledge on crystal structures and crystal systems. To understand the various techniques available in X-Ray Crystallography. To acquire the knowledge of bonding in solids and Lattice waves. To comprehend the concepts of dielectric properties of solids and superconductivity.

UNIT I Crystal Physics **9**

Crystalline and amorphous solids- Lattice and basis-Unit cell and primitive cell-Crystal systems- Translation vectors-Number of atoms per unit cell in a Cubic Crystal -Bravais lattice - Simple - Body centered and face centered cubic lattices-Hexagonal close packed and diamond structure - Miller indices -Interplanar spacing.

UNIT II Bonding in Solids 9

Crystal binding- Crystal binding-Crystals of inert gas-Van der Waals-Cohesive energy Compressibility and bulk modulus-Ionic Crystals-Madelung energy-Evaluation of Madelung constant – Covalent crystals- Energy value for single covalent bonds – Metallic crystals- Hydrogen bonding– Atomic radii –Tetrahedral covalent radii and ionic crystal radii.

UNIT III Lattice Vibration and Thermal Properties of Solids 9

Vibration of one dimensional monatomic linear lattice-Derivation of force constant Dispersion relation-Phase velocity-Group velocity-Phonons-characteristics of phonons – Phonon momentum-Thermal Properties of Solids-Classical theory of specific heat – Einstein's theory of specific heat-Debye's theory of specific heat.

UNIT IV Free Electron Theory of Metals 9

Free electron theory – Drude Lorentz theory – Explanation of Ohm's law – Electrical conductivity – Thermal conductivity –Wiedmann and Franz law – Sommerfield model – Schotcky effect – Hall effect – Hall voltage and Hall coefficient – Mobility and Hall angle – Importance of Hall effect – Experimental determination of Hall coefficient.

UNIT V Dielectrics and Superconductivity 9

Dielectrics- Dielectric constant and displacement vector – Polarization – Types of polarization – Clausiss-Mossotti relation– Superconductivity Occurrence of superconductivity – Destruction of superconductivity by magnetic fields – Meissner effect - Type I and Type II superconductors – London equation – Josephson effect – Elements of BCS theory –Application of superconductors.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Basic knowledge of crystal systems and spatial symmetries

CO2: Number of atoms per unit cell, calculate coordination number for different crystal systems

CO3: Understand the concept of reciprocal space and be able to use it as a tool and the significance of Brillouin zones

CO4: Able to account for interatomic forces and bonds

CO5: Formulate the theory of lattice vibrations (phonons) and use that to determine thermal properties of solids

CO6: Understand the properties of metals on the basis of the free electron theory

CO7: Able to calculate thermal and electrical properties in the free-electron model

CO8: Understand the basics of dielectric materials and superconductors.

Text Books

1. Pillai S.O., Solid State Physics, 6th Edition, New Age Science, 2013.
2. Charles Kittel, Introduction to Solid State Physics, Wiley, 2005.

References

1. Ashcroft W and Mermin N.D., Solid State Physics, Holt-Rinehart-Winston, 1976.
2. Blakemore J. S., Solid State Physics, 2nd Edition, Cambridge University Press, Cambridge, 1974.
3. Dekker A. J., Solid State Physics, Mac Millan, 1971.

	PHYSICS PRACTICAL C - VIII	L	T	P	Credits
		0	0	2	2

Any 10 Experiments

1. Semiconductor Diode – To determine the particle size using diffraction method.
2. Band gap determination – Post Office Box
3. Band gap determination of a thermistor using meter bridge
4. Resistivity determination for a semiconductor wafer – Four probe method Dielectic Constant Measurement
5. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method)
6. To determine the Hall coefficient of a semiconductor sample.
7. To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis.
8. To study the PE Hysteresis loop of a Ferroelectric Crystal.
9. Comparison of EMFs – B.G
10. To determine the wavelength of the Laser source using Grating
11. I-V Characteristics of Photo diode and Photo transistor

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to

CO1: Determine the particle size using Semiconductor Diode by diffraction method
CO2: Compute the bandgap value of a thermistor using Post office box and Meter Bridge.
CO3: Measure the Resistivity for a semiconductor wafer using Four probe method.
CO4: Measure the susceptibility of paramagnetic solution by Quinck's Tube Method.
CO5: Determine the I-V Characteristics of a Photo diode and Photo transistor
CO6: Determine the wavelength of the Laser source using Grating
CO7: Analyze and Compare the EMFs using Ballistic Galvanometer.
CO8: Analyze and understand PE Hysteresis loop of a Ferroelectric Crystal.

	NULCEAR & PARTICLE PHYSICS	L	T	P	Credits
		5	1	0	4

Course Objective: To make the student understand the principles of nuclear physics. To enable the student to explore the field of nuclear structure. To understand the concept of radioactivity, nuclear fission and fusion. To understand the elementary particles and their interactions.

UNIT I Structure of Nuclei 9

Structure of nucleus - Proton-electron hypothesis and its failure - Proton –Neutron hypothesis –Nucleus properties- Nuclear size –Density – Charge – Spin – Nuclearmagnetic moment - Electric quadrupole moment - Atomic mass unit and binding energy - Mass defect and packing fraction –Nuclear Model (Liquid drop model of nucleus).

UNIT II Radioactivity 9

Radioactive decay law-Half life and Average life - Activity or strength of a radio – sample - Successive transformation - Radioactive chain- Radioactive equilibrium - Radioactive dating - α- decay - Geiger-Nuttall law - Tunnel effect - Gamow's theory of α decay - β-decay - Energetics of β-decay - Continuous β-spectrum - Inverse β-decay -Parity violation in β-decay - Neutrino hypothesis - Properties of neutrino - Gamma rays- origin of the gamma rays - Internal conversion.

UNIT III Nuclear Detectors & Accelerators 9

Principle and working - solid state detector - proportional Counter - Wilson's cloud chamber - Scintillation counter. Accelerators: Synchrocyclotron - Synchrotron - Electron synchrotron - proton synchrotron - Betatron.

UNIT IV Nuclear Fission and Fusion 9

Nuclear fission - Bohr Wheeler theory - chain reaction - critical size and critical mass – Controlled chain reaction - Reactors - Nuclear fusion - source of stellar energy - carbon - Nitrogen cycle - Proton - proton cycle - Thermo Nuclear reaction - Controlled thermo nuclear reaction - plasma.

UNIT V Elementary Particles 9

Elementary Particles - types of interaction - Classification of elementary particles – Pions and Muons - K-mesons – Hyperons- Conservation laws - Exact laws - Approximate conservative laws- Fundamental interactions – Antiparticles -Resonance particles – Hypernucleus - Symmetry classification of elementary particles - Quark model.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Understand the fundamental principles and concepts governing classical nuclear and particle physics
CO2: Demonstrate a knowledge of fundamental aspects of the structure of the nucleus
CO3: Understand the basic nuclear properties of mass, dimension, angular momentum and magnetic moment.
CO4: Understand the differences between various decay modes, state selection rules, and determine whether a given decay can take place.
CO5: Acquire the knowledge of nuclear fission and fusion reactions
CO6: Describe modern accelerators and particle detectors
CO7: Classify different kinds of interactions between elementary particles
CO8: List all elementary particles in the standard model and give their quantum numbers

Text Books

1. D. C. Tayal, Nuclear Physics, Himalaya Publishing House, 2009
2. S. N. Ghoshal, Nuclear Physics, S. Chand & Co., Edition, 2003.

References

1. M. L. Pandya& R. P .S. Yadav, Elements of Nuclear Physics, Kedaar Nath & Ram Nath, 2000.
2. Satya Prakash, Nuclear Physics, A Pragati Prakasan Publication, 2011.
3. Jahan Singh, Fundamentals of Nuclear Physics, A Pragati Publication, 2012.

	QUANTUM AND STATISTICAL MECHANICS	L	T	P	Credits
		5	1	0	4

Course Objective: To understand the dual nature of matter wave. To apply the Schrodinger equation to different potential. To understand the Heisenberg Uncertainty Relation and its application. To emphasize the significance of Harmonic Oscillator Potential and Hydrogen atom.

UNIT I Wave Nature of Matter wave 9

Failures of classical mechanics: Blackbody radiation, Photoelectric effect, Compton effect, Wave nature of particles: de-Broglie waves. Discreteness of energy levels: Bohr model of hydrogen atom, energy levels of hydrogen atom, Frank and Hertz experiment. Localized wave packets, Wave packets and the uncertainty principle.

UNIT II Postulates in Quantum Mechanics 9

The basic postulates of quantum mechanics, properties, physical significance and Born interpretation of wave functions in quantum mechanics, probability density. Ehrenfest theorem, Heisenberg's uncertainty principle (Derivation) and its simple applications (size and energy of hydrogen atom, electrons in nucleus, range of nuclear force).

UNIT III Schrödinger Equations and its Applications 9

Schrödinger equation - time dependent and time independent - application of Schrödinger equations - linear harmonic oscillator - zero point energy - particle in a one dimensional box - barrier penetration and tunneling effect - rigid rotator - hydrogen atom.

UNIT IV Statistical Basis of Thermodynamics 9

Probability- principle of equal a priori probability -microstate and macro state- thermodynamic probability - constrains on a system -static and dynamic systems -most probable state (equilibrium state) -concept of a cell in a compartment ensemble and average properties. Degrees of freedom –position space –momentum space- phase space- the mu-space and gamma space.

UNIT V Classical and Quantum Statistics 9

Maxwell-Boltzmann (MB)statistics – Application of MB statistics to molecular energies in an ideal gas – Bose Einstein (BE) statistics - Application of BE statistics to photon gases – Fermi-Dirac (FD) statistics – Application of FD statistics to electron gas – Comparison of three statistics.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Know the background for and the main features in the historical development of quantum mechanics.

CO2: Explain, qualitatively and quantitatively, the role of photons in understanding phenonema such as the photoelectric effect, X-rays and Compton scattering

CO3: Be able to discuss and interpret experiments displaying wavelike behavior of matter.

CO4: Understand the postulates of quantum mechanics and to understand its importance in explaining significant phenomena in Physics.

CO5: Understand the concepts of Bohr model of hydrogen atom, energy levels, localized wave packets and the Heisenberg's uncertainty principle.

CO6: Understand the central concepts and principles of quantum mechanics: the Schrödinger equation, the wave function and its physical interpretation.
CO7: Understand the phenomenon of Statistical thermodynamics and its micro and macro states with static and dynamic systems.
CO8: Use the statistical physics methods, such as Boltzmann distribution, Gibbs distribution, Fermi-Dirac and Bose-Einstein distributions to solve problems in some physical systems.

Text Books

1. Satya Prakash, Advanced Quantum Mechanics, 5th Edition, Kedar Nath Ram Nath Publishing Ltd, 2013
2. P. M. Mathews and S. Venkatesan, A Text book of Quantum mechanics by, Tata McGraw Hill, New Delhi , 2005.
3. Brij Lal and Subramaniyam, Heat and Thermodynamics & Statistical physics, S. Chand & Co. 2015.

References

1. V. K. Thankappan, Quantum Mechanics, New Age International (P) Ltd. Publishers, New Delhi, 2003.
2. K. K. Chopra and G.C. Agrawal, Quantum mechanics, Krishna Prakasam Media (P) Ltd., Meerut First Edition1998).
3. A. Ghatak and Loganathan, Quantum mechanics, Macmillan India Pvt. Ltd.

	NANOMATERIALS AND APPLICATIONS	L	T	P	Credits
		5	0	0	4

Course Objective: To make the student understand the basic concepts in nanoscience. To enable the student to explore the field of nanomaterials. To acquire knowledge on the various applications of nanotechnology.

UNIT I Basics of Nanoscience 9

Nano revolution of the 20th century - Difference between bulk and nanoscale materials and their significance - Properties at the nanoscale - Optical property - Magnetic property and electronic property - Size dependent behavior – Scaling - Mechanical properties of Nano materials and Chemical properties of Nanoparticles.

UNIT II Classes of Nanomaterials 9

Metals and Semiconductor Nanomaterials - Quantum dots - Nano wells - Nano ribbons and Nano Wires - Bucky balls - Carbon nanotubes - Single walled and Multi walled CNT-Structure - Synthesis- Properties- Functionalization and applications - Fullerenes/Bucky Balls/ C60- Synthesis - Properties - Functionalization and application.

UNIT III Synthesis of Nanomaterials 9

Top-down approach – Nanolithography - Soft lithography and hard lithography - Physical Vapor deposition (PVD) - Chemical Vapor Deposition(CVD) – E-beam lithography - Bottom-up approach- Sol-gel processing and chemical methods - Self assembly.

UNIT IV Characterization of Nanomaterials 9

X-Ray Diffraction - Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - Atomic Force Microscope (AFM) - Scanning Tunneling Microscopy (STM) – Types- Manipulating atoms and Molecules with STM - Scanning Tunneling Spectroscopy and Dip pen Nanolithography.

UNIT V Applications of Nanotechnology 9

Nanotechnology in Energy systems - Electronics - Environment - Space and Aviation - Textiles - Food and Agriculture - Automotive Industry - Solar Technology - Chemical engineering - Building and Construction - Biotech and Biomedical Engineering - Pharmaceutical and drugs - Molecular Nanoelectronics - Nanobots - Photonic crystals – NEMS (Nano Electro Mechanical Systems) based device - Nanosensors and Devices.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Describe Nanomaterials based on their dimensionality.

CO2: Explain the importance of reduction in materials dimensionality, and its relationship with materials properties.

CO3: Recognize and explain the difference in physical properties of the major classes of nanomaterials as compared to the bulk counterparts.

CO4: Explain top-down and bottom-up approaches for Nanomaterial fabrication.

CO5: Understand and apply methodologies and techniques of synthesis, processing and characterization of major classes of nanomaterials.

CO6: Understand the various instrumentation principles and techniques like SEM, TEM, AFM and STM.

CO7: Recognize major application areas of nanomaterials and nanotechnologies in contemporary world and be able to generate creative solutions for different applications

CO8: Identify the research areas like NEMS, nanosensors and nanobots.

Text Books

1. Pradeep T., Fundamentals of Nanoscience and Nanotechnology, McGraw Hill, 2012.
2. Chris Binns, Introduction to Nanoscience and Nanotechnology, 1ST Edition, Willey- Publication, 2010.

References

1. Gabor L.Hornyak, H. F. Tibbals, Joydeep Dutta, John J. Moore, Introduction to Nanoscience and Nanotechnology, CRC Press, 2008.
2. Chattopadhay K.K., Introduction to Nanoscience and Nanotechnology, APH Publishing Corporation, 2006.
3. Charles P. Poole Jr and Frank J. Owens, Introduction to Nanotechnology, Wiley Interscience, 2007.

	PHYSICS PRACTICAL IX	L	T	P	Credits
		0	0	2	2

Any 10 Experiments

1. Synthesis of Iron oxide nanoparticles
2. Synthesis of Ferro fluid
3. Synthesis of Copper oxide nanoparticles
4. Synthesis of Silver oxide nanoparticles
5. Synthesis of Titanium oxide nanoparticles
6. Characterization of Iron oxide nanoparticles using XRD (particle size determination)
7. Characterization of Copper oxide nanoparticles using XRD (particle size determination)

8. Characterization of Silver oxide nanoparticles using XRD (particle size determination)
9. UV-Visible Characterization of Iron oxide nanoparticles (particle size/Band gap determination)
10. UV-Visible Characterization of Titanium oxide nanoparticles (particle size/Band gap determination)

Course Outcome

At the end of the course the students will be able to

CO1: Synthesizing iron oxide, silver oxide, and copper oxide nanoparticle by suitable method

CO2: By adopting suitable method ferro fluid will be synthesized

CO3: Titanium oxide nanoparticle will be synthesized.

CO4: Iron oxide, silver oxide, and copper oxide nanoparticle will be subjected to XRD analysis. It will enable the students to understand the particle size concept.

CO5: UV- Vis spectrum will be recoreded for iron oxide nanoparticle and the particle size, bandgap will be determined.

CO6: UV- Vis analysis will be carried out for titanium oxide nanoparticle and the particle size, bandgap will be determined.

SYLLABUS
DISCIPLINE SPECIFIC
ELECTIVE (DSE) COURSES

	MICROPROCESSOR	L	T	P	Credits
		4	0	0	4

Course Objective: To understand the architecture of 8085 and to impart the knowledge about the instruction set.

UNITI Architecture 9

Architecture of 8085 – registers, flags, ALU, address and data bus, demultiplexing address/data bus – control and status signals – control bus, Programmer's model of 8085 – Pin out diagram – Functions of different pins.

UNITII Programming Techniques 9

Instruction set of 8085 – data transfer, arithmetic, logic, branching and machine control group of instructions – addressing modes – register indirect, direct, immediate and implied addressing modes. Assembly language & machine language – programming techniques: addition, subtraction, multiplication, division, ascending, descending order, largest and smallest (single byte)

UNITIII Interfacing memory to 8085 **9**

Memory interfacing – Interfacing 2kx8 ROM and RAM, Timing diagram of 8085 (MOV Rd, Rs – MVI R, data (8)).

UNIT IV Interfacing I/O Ports to 8085 **9**

Interfacing input port and output port to 8085 – Programmable peripheral interface 8255 – Flashing LEDs – Stepper Motors - Keyboards.

UNITV Interrupts **9**

Interrupts in 8085 - hardware and software interrupts – RIM, SIM instructions – Priorities – Simple polled and interrupt controlled data transfer.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Identify and explain the need for advance microprocessors.
CO2: Illustrate the different types of microprocessor instructions with suitable example programs
CO3: Demonstrate the use of procedures and macros with suitable example programs.
CO4: Illustrate the use of interrupts with suitable examples.
CO5: Demonstrate the interfacing of various peripheral devices with the microprocessor.
CO6: Compare the characteristics of various microprocessors.
CO7: Identify the controls and functions of different pins.
CO8: Develop enough confidence to take up the challenges in building useful microprocessor based applications.

Text Books:

1. R. S. Gaonkar, Microprocessor Architecture programming and application with 8085/8080A, Wiley Eastern Ltd., 1992.
2. V. Vijayendran and S.Viswanathan, Fundamental of microprocessor 8085 by Publishers, Chennai, 2003.
3. B. Ram – Dhanpat, Fundamentals of Microprocessors and microcomputers, RAI publication.

References:

1. Aditya Mathur, Introduction to microprocessor Tata McGraw Hill Publishing Company Ltd., 1987.
2. Dougles V. Hall, Microprocessor and digital system, 2nd Edition - McGraw Hill Company, 1983.

	MICROPROCESSOR PRACTICAL	L	T	P	Credits
		0	0	2	2

Any 10 Experiments

1. Microprocessor – 8085 – 8 bit Addition
2. Microprocessor – 8085 – 8 bit Subtraction
3. Microprocessor – 8085 – 8 bit Multiplication
4. Microprocessor – 8085 - Multiplication by repeated addition
5. Microprocessor – 8085 – 8 bit Division
6. Microprocessor – 8085 - Division by repeated subtraction

7. Microprocessor – 8085 – Addition of N Number of single byte numbers
8. Microprocessor – 8085 – Sorting of given set of numbers in ascending order
9. Microprocessor – 8085 – Sorting of given set of numbers in descending order
10. Microprocessor – 8085 – Finding the largest number in a given set of numbers.
11. Microprocessor– 8085 – Finding the smallest number in a given set of numbers

Course Outcome

At the end of the course the students will be able to

CO1: Understand the operations of 8 bit addition, subtraction, multiplication and division programmed in 8085 microprocessors by addressing mode and memory location.

CO2: Multiplication by repeated addition will be performed in 8085 microprocessor kit

CO3: Division by repeated addition will be performed in 8085 microprocessor kit

CO4: Addition of N Number of single byte numbers in 8085 microprocessor kit

Co5: Sorting of given set of numbers in ascending order & descending order in 8085 microprocessor kit

CO6: Finding the largest number & smallest number in a given set of numbers

	ENERGY PHYSICS	L	T	P	Credits
		5	1	0	4

Course Objective: To make the students to understand the present day crisis of need for conserving energy and alternatives are provided.

UNIT I Conventional Energy Sources **9**

Conventional Energy Sources - Coal – Oil – Gas – Agriculture And Organic Wastes – Water Power – Nuclear Power – thermal Power

UNIT II Non Conventional Energy Sources **9**

Non Conventional Energy Sources - Solar Energy – Wind Energy – Energy From Bio Mass And Bio-Gas – Ocean Energy – Tidal Energy – Geo Thermal Energy – Advantages Of Renewable Energy

UNIT III Solar Energy **9**

Solar Radiation – Solar Constant – Solar Radiation Measurements – Pyrheliometers – Pyranometers – Estimation Of Average Solar Radiation – Applications Of Solar Energy

UNIT IV Wind Energy **9**

The Nature Of Wind – Power In The Wind – Wind Energy Conversion – Basic Components Of A Wind Energy Conversion System(WECS)- Advantages And Disadvantages Of WECS.

UNIT V Energy from Biomass **9**

Biomass Conversion Technologies – Wet Process – Dry Process – Photosynthesis – Bio Gas Generation – Bio Gas From Plant Wastes – Methods For Maintaining Biogas Production – Fuel Properties Of Bio Gas

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Understand the existence of different forms of energy, by which it can be produced and utilized.

CO2: Illustrate the need and advantages of Renewable energy sources

CO3: Understand the concepts of various energy resources and its importance

CO4: Understand the theoretically and practically to the utilization of Non-conventional technologies.

CO5: Identify and get the skilled knowledge about the various solar energy.

CO6: Understand the concepts of wind energy conversion and its systems.

CO7: Understand the concepts of biomass process, production.

CO8: Illustrate the advantages and disadvantages of Wind energy conversion system.

Text Books:

1. G.D. Rai, Non- Conventional Energy Sources, Khanna Publishers, 2011
2. D.P. Kothari, K.C. Singal & Rakesh Ranjan, Renewable energy sources and emerging Technologies, Prentice Hall of India Pvt. Ltd., New Delhi (2008).

References:

1. Solar Energies of Thermal Processes, A. Duffie and W. A. Beckmann, John-Wiley, 1980.
2. F. Kreith and J. F. Kreider, Principle of Solar Engineering, McGraw-Hill, 1978
3. S.A. Abbasi and Nasema Abbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd., New Delhi, 2008.

	LOW TEMPERATURE PHYSICS	L	T	P	Credits
		5	1	0	4

Course Objective: To understand the general scientific concepts of low temperature physics. To understand the properties of materials at low temperature. To educate the new techniques available to produce and measure low temperatures. To understand the concept of specific heat and hyperfine properties.

UNIT I Production of Low Temperature 9

Introduction - Joule Thomson effect - Regenerative cooling - Vacuum pumps - liquefaction of air - Hydrogen - Helium - Maintenance of low temperature -production of temperature below 1 K - Adiabatic demagnetization - Evaporative cooling of He-3 - Dilution refrigeration - Laser cooling - Nuclear demagnetization.

UNIT II Measurement of Low Temperature 9

The gas thermometer and it corrections - Secondary thermometers- resistance thermometers, thermocouples- vapour pressure thermometers- magnetic thermometers.

UNIT III Liquid and Solid Cryogens 9

Liquid Nitrogen - Liquid oxygen - Liquid hydrogen - Liquid He -4 and He -3 - Solid He– 4 and He -3 - Lamda point - Superfluidity - Density - Compressibility factor - viscosity and thermal properties - Velocity of sound in liquid helium.

UNIT IV Electrical and Magnetic Properties 9

Experimental observations - Theories of Sommerfield and block - Superconductivity - magnetic properties of superconductors - Thermal properties of superconductors - penetration depth and high frequency resistance - Ferromagnetism - Diamagnetism - paramagnetism - Paramagnetic saturation.

UNIT V Specific Heats, Spectroscopic and Hyperfine Properties 9

Specific heats - Rotational specific heat of Hydrogen – Einstein's and Debye's theories -Schottky effect - Anomalies in specific heats at low temperature - Infrared- visible spectra - Zeeman spectra at low temperature - Dielectric constant and its measurement - Magnetic susceptibility - NMR and electron paramagnetic resonance at low temperature - Nuclear magnetic properties - Mossbauer effect and other hyperfine properties at low temperature.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Understand the fundamental quantum phenomenon which can be observed at low temperature

CO2: Illustrate the behavior of materials during Adiabatic demagnetization, Nuclear demagnetization process.

CO3: Identify the research in low temperature physics and in particular appreciate the outstanding problems in the field.

CO4: Understand the concepts of Liquid and Solid Cryogens in the various Helium energy levels and its compressibility factor.

CO5: Describe and understand the electrical, magnetic properties and thermal properties of superconductivity.

CO6: Understand the concepts of specific heats of hydrogen

CO7: Understand the concepts of Zeeman spectra at low temperature behind the NMR.

CO8: Study the behavior of materials using Infrared- visible spectra, NMR spectra.

Text Books:

1. Cornelis Jacobus Gorter, D. F. Brewer, Progress in Low Temperature Physics, Elsevier Ltd, 2011.
2. Christian E. and Siegfried H, Low Temperature Physics, Springer, 2005.

References:

1. Jack Ekin, Experimental Techniques for Low-Temperature Measurements, OUP Oxford, 2006.
2. Charles P. Poole Jr., Horacio A. Farach, Richard J. Creswick and Ruslan Prozorov, Superconductivity Elsevier Ltd, 2007.
3. John Wilks, Properties of Liquid and Solid Helium, Oxford University Press, 1967.
4. Jackson L.C., Low Temperature Physics, Methuen and Company, 1962.
5. Ching Wu Chu and J. Woollam, High Pressure and Low Temperature Physics, Plenum Press, 1978.

	ELECTRONIC COMMUNICATIONS	L	T	P	Credits
		5	1	0	4

Course Objective: To understand the several ways of communication systems and their necessity in different fields for the development of technology.

UNIT I Radio Transmission and Reception 9

Transmitter-modulation-need for modulation- types of modulation-amplitude,frequency and phase modulation-modulation factor-sideband frequencies in AM wave-limitations of amplitude modulation - frequency modulation-block diagram of AM and FM Transmitter. Receiver- demodulation-AM & FM radio receivers-super heterodyne radio receiver

UNIT II Fiber Optic Communication 9

Introduction –structure of optical fiber –total internal reflection in optical fiber – principal and propagation of light in optical fiber - acceptance angle - numerical aperture – types of optical fibers based on material – number of modes – refractive index profile - fiber optical communication system (block diagram) - fiber optic sensors – Temperature sensor – fiber optic endoscope.

UNIT III Radar Communication 9

Basic radar system -Radar range –Antenna scanning – Pulsed radar system - AScope- Plan position indicator- Tracking radar- Moving target indicator- Doppler effect-MTI Principle- CW Doppler Radar- Frequency modulator CW Radar.

UNIT IV Satellite Communication 9

Introduction – history of satellites – satellite communication system – satellite orbits – classification of satellites – types of satellites – basic components of satellite communication – constructional features of satellites- multiple access – communication package – antenna- power source – satellite foot points- satellite communication in India.

UNIT V Mobile Communication 9

GSM – mobile services- concept of cell – system architecture – radio interface – logical channels and frame hierarchy – protocols – localization and calling – Handover- facsimile (FAX) – application – VSAT (very small aperture terminals) – Modem – IPTV (internet protocol television) – Wi-Fi - 3G (Basic ideas only).

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Identify and explain the techniques used for waveform coding.
CO2: Demonstrate the Pulse Amplitude Modulation (PAM) and Pulse Code Modulation (PCM).
CO3: Understand the different types of modulation used for receiving and transmitting frequencies
CO4: Identify the various types of communication like fiber optic based communication
CO5: Understand the necessity of mobile communication and ideas about Wi-Fi.
CO6: Describe different digital modulation schemes, and compare advantages/ Disadvantages of each as applied to baseband signal.
CO7: Identify the presence of error bits signal, and calculate unknown phase of noise in the received signal in satellite communication system.
CO8: Illustrate the working of antenna and basics of Radar system.

Text Books:

1. Gupta & Kumar, Hand book of Electronics, Pragati Prakhasan, 2012
2. G. Kennedy and B. Davis, Electronics Communication Systems, Tata McGraw Hill Education Pvt. Ltd., 1999.

References:

1. Metha V.K., Principles of Electronics, S. Chand & Company Ltd., 2013
2. Anokh Singh and Chopra A.K., Principles of communication Engineering, S. Chand & Company PVT. Ltd., 2013.

	LASER PHYSICS	L	T	P	Credits
		5	1	0	4

Course Objective: To introduce the physical and engineering principles of laser operation and their applications.

UNIT I Fundamentals of LASER **9**

Spontaneous emission – stimulated emission – meta stable state – Population inversion – pumping – Laser Characteristics

UNIT II Types of LASER **9**

Nd-YAG laser - Helium – Neon Laser – Ruby Laser – CO_2 Laser – Semiconductor Laser (homojunction and heterojunction)

UNIT III Industrial Applications of LASER **9**

Laser cutting – welding – drilling – Hologram – Recording and reconstruction of hologram

UNIT IV Lasers in Medicine **9**

Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment

UNIT V Lasers in Communication **9**

Optic fibre communication- Total internal reflection – Block diagram of fibre optic communication system – Advantages of fibre optic communication

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Understand trends of development of modern lasers.

CO2: Gain the basic skills of practical work with lasers.

CO3: Understand and explain the operational principles and construction of lasers.

CO4: Explain the output characteristics of different types of lasers.

CO5: Relate the laser operation principles to atom and molecular physics, solid state physics, quantum mechanics and physical optics.

CO7: Describe optical components that can be used to tailor the properties of the laser.

CO8: Illustrate the applications of various Lasers with their properties.

CO9: Understand the use of lasers as light sources for low and high energy applications

Text Books:

1. N. Avadhanulu, An introduction to LASERS, S. Chand & Company, 2001

References:

1. William T. Silfvast, Laser fundamentals, Cambridge University Press – Published in South Asia by foundation books, 23, Ansari Road, New Delhi.
2. K. Thyagarajan and A. K. Ghatak, LASER Theory and Application, Mac millan, India Ltd.

	SOLAR TECHNOLGY	L	T	P	Credits
		5	1	0	4

Course Objective: To learn the fundamentals of Solar Energy Technologies. To learn the Solar thermal based energy systems. To learn basic principles and applications of Photovoltaic systems.

UNIT I Solar Radiation **9**

Energy emitted by sun and energy that reaches the earth - Sun-Earth geometry-Solar angles - Angles of incidence- Zenith angle - Azimuthal angle - Hour angle - Latitude and longitude - Solar Spectrum and Solar constant – Extraterrestrial characteristics - Measurement and estimation on horizontal and tilted surfaces.

UNIT II Solar Collectors **9**

Solar Collector Basics - Flat plate collector – Evacuated tubular collectors - Concentrator collectors - Tracking systems - Compound parabolic concentrators - Parabolic trough concentrators - Concentrators with point focus.

UNIT II Solar Thermal Technologies **9**

Solar heating and cooling system - Principle of working – Types - Design and operation - Thermal Energy storage - Types of thermal Energy Storage systems - Sensible Heat Storage – Liquids - Latent heat Storage - Thermo chemical storage - Solar thermal power plant - Solar Desalination - Solar cooker – Domestic - Community - Solar pond technology - Principle of working and description - Solar drying.

UNIT IV Solar Photovoltaic Fundamentals and Design **9**

Semiconductor – Properties – Energy levels – P-N junction - Homo and hetro junctions – Basic Silicon Solar cell - Efficiency limits – Variation of efficiency with band gap and temperature - Photovoltaic cell – Photovoltaic module – PV array - Solar cell array design concepts – PV system design - Hybrid and Grid connected system – System installation – Operation and maintenances

UNIT V Solar Passive Architecture **9**

Passive heating concepts - Direct heat gain – Indirect heat gain - Thermal storage wall - Attached Green house – Isolated gain and sunspaces – Passive cooling concepts - Evaporative cooling – Shading and ventilation - Radiative cooling – Green coupling - Application of wind - Water and earth for cooling – Paints and cavity walls for cooling – Roof radiation traps – Energy efficient landscape design.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Analyze solar radiation data and its measurement.

CO2: Understand Operation of solar thermal energy systems.

CO3: Understand the working of solar concentrators and their applications to produce energy

CO4: Explain the principles that underlie the ability of various natural phenomena to deliver solar energy.

CO5: Discuss the positive and negative aspects of solar energy in relation to natural and human aspects of the environment.

CO6: Develop skills to design, model, analyze and evaluate solar thermal systems.

CO7: Develop creative thinking and to deal with complex multi-disciplinary solar thermal energy projects that involve the provision of effective and efficient solutions.

CO8: Understand of solar heating systems, liquid based solar heating systems for buildings.

CO9: Understand the photovoltaic theory and implementation process.
CO10: Understand and use quantitative methods to analyze the design and performance of passive and active solar systems.

Text Books:

1. Sukhatme S P and J K Nayak, Solar Energy, Principle of Thermal Storage and Collection, 3rdEdition, Tata McGraw Hill, 2008.
2. Chetan Singh Solanki, Solar Photovoltatics, Fundamentals, Technologies and Applications, PHI Learning Private Limited, 2011.

References:

1. Peter Würfel, Physics of Solar Cells: From Basic Principles to Advanced Concepts, Wiley-VCH, 2009.
2. Jeffrey M. Gordon, Solar Energy: The State of the Art, Earthscan, 2013.
3. Garg H. P. and Prakash J., Solar Energy Fundamentals and application, Tata McGraw- Hill Publishing, 7thReprint 2006.
4. Roger A. Messenger and Jerry Vnetre, Photovoltaic Systems Engineering, CRC Press, 2010.
5. Kalogirou S. A., Solar Energy Engineering: Processes and Systems, 2ndEdition, Academic Press, 2013

	ASTRO PHYSICS	L	T	P	Credits
		5	1	0	4

Course Objective: Describe the nature, structure, distribution, and formation of astronomical objects, including planets, stars, and galaxies, and the history of the universe. Demonstrate an appreciation of the universality of physical laws and apply these laws to explain phenomena in astronomical systems and the universe. Define and interpret the observational properties of astronomical objects

UNIT I Astronomical Instruments 9

Optical telescope - reflecting telescope - types of reflecting telescope - advantages of reflecting telescope - Radio telescopes - astronomical spectrographs - photographic photometry - photo electric photometry - detectors and image processing.

UNIT II Solar System 9

The sun-physical and orbital data - Photosphere - Chromosphere - corona - solar prominences - sunspot - sunspot cycle - theory of sunspots - solar flare - mass of the sun - solar constant - temperature of the sun - source of solar energy - solar wind. Other members of the solar system - Mercury - Venus - Earth - Mars - Jupiter - Saturn - Uranus - Neptune - Pluto - Moon - Bode's law - Asteroids - comets - Meteors.

UNIT III Stellar Evolution, Binary and variable stars 9

Birth of a star - Death of a star - Chandrasekhar limit - white dwarfs - Neutron stars - black holes - Quasars - Nebulae - Supernovae Binary stars - Origin of Binary stars. Variable stars - Cepheid variables - RV Tauri variables - long period variables - irregular variables - flare stars.

UNIT IV Magnitudes, distance and spectral classification of stars 9

Magnitude and brightness - apparent magnitude of stars - absolute magnetic of stars - relation between apparent magnitude and absolute magnitude of stars - Luminosities of stars - measurement of stellar distance - Geometrical parallax method - distance from red shift measurement - Harvard system of spectral classification .

UNIT V Theories of the universe, galaxies and star clusters 9

Origin of the universe - the big bang theory - the steady state theory - the oscillating universe theory - Hubble's law. Galaxies - types of galaxies - Milky Way - star clusters - open clusters - globular clusters.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Identify the requirements and limitations of instrumentation for modern astrophysical observations.

CO2: Understand the key physical concepts underlying the properties of stars, galaxies, and the universe at large.

CO3: Apply basic cosmological models to predict the age and structure of the universe for various geometries.

CO4: Explain the basic issues involved in present day astrophysical investigations.

CO5: Understand the basic ideas and stellar formation and evolution, and be able to apply current basic models.

CO6: Describe the methodology of modern science, the relationship between observations and theory, and the foundational principles that underlie the scientific process.

CO7: Know fundamental theories that explain star properties, their life histories, origin and evolution of the universe and planetary systems and the birth of the stars and planets.

CO8: Have a knowledge on the bigbang theory

Text Books:

1. Matts Roos, Introduction to Cosmology, 3rd Edition, John Wiley and Sons Ltd, 2003.
2. Bradley W. Carroll, Dale A. Ostlie, An Introduction to Modern Astrophysics, 2nd Edition, Pearson, 2013

References

1. K.S. Krishnasamy, Astro Physics a modern perspective, Reprint, New Age International (p) Ltd, New Delhi, 2002.
2. Baidyanath Basu, An introduction to Astro physics, second printing, prentice - Hall of India Private limited, New Delhi, 2001.
3. Baker and Fredrick, 'Astronomy, ninth edition, Van No strand Rein hold, Co, New York - 1964.

SYLLABUS
GENERIC ELECTIVE
COURSES

	PHYSICS I	L	T	P	Credits
		4	0	0	3

Course Objective: To make the students to understand, the elasticity of a material and different kinds of moduli; surface tension and viscosity of fluids; transmission of heat via Conduction, Radiation process involved in thermal physics; properties of sound using experimental methods and principles of electricity and its conversion into ammeter and voltmeter.

UNIT I Elasticity and Bending Moment 9

Hooke's law - Elastic modulli - Work done in stretching and work done in twisting a wire - Twisting couple on a wire - Determination of rigidity modulus of a wire using torsion pendulum - Expression for bending moment - Uniform bending - Experiment to determine young's modulus using pin and microscope method.

UNIT II Fluids 9

Surface Tension: Synclastic and anticlastic surface - Excess of pressure -Viscosity: Poiseuille's formula forb rate of flow of liquid in a capillary tube by dimensions - Analogy between current flow and liquid flow - streamlined motion – Stoke's formula.

UNIT III Thermal Physics 9

Conduction in solids: Thermal conductivity - Lee's disc method - Wiedmann-Franz law - Convection: Newton's law of cooling – Radiation: Distribution of energy in the spectrum of a black body - results – Planck's law of radiation (no derivation) and its deduction.

UNIT IV Sound 9

Simple harmonic motion: free, damped, forced vibrations and resonance - Intensity and loudness of sound - Decibels – Melde's string experiment – Determination of frequency of tuning fork - Acoustics of buildings: Reverberation time - Sabine's formula.

UNIT V Electricity 9

Current and Current density – Ohm's law - Resistors - I-V characteristics - colour coding- conversion of galvanometer into an ammeter and voltmeter – Kirchhoff's laws – Balance condition of Wheatstone's bridge - Potentiometer – Measurement of potential difference and current

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Understand the bending of beams under different loading conditions.

CO2: Identify the stress developed in beams due to bending.

CO3: Analyze and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials.

CO4: Develop an understanding of the general energy equation and its application to the flow of fluids.

CO5: Describe fluid properties such as density and viscosity and how these properties influence flow.

CO6: Apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.

CO7: Apply advanced tools to characterize and improve the performance of sound reproduction and reinforcement systems.

CO8: Analyze acoustic properties of typically used materials for design consideration.

CO9: Understand electrical potential and potential difference.

CO10: Illustrate Kirchhoff's law and analyze circuit diagram.

Text Books:

1. R. Murugesan - Properties of Matter, S.Chand& Co, Delhi, 1994
2. Brijilal and Subramininan. Heat & Thermodynamics, S. Chand & Co.1999.
3. M N Srinivasan, Text book of Sound, Himalaya Publications, 1991
4. K KTewari, Electricity & Magnetism, S Chand & Co., 3rd Edition, 2001.

	PHYSICS I PRACTICAL	L	T	P	Credits
		0	0	2	2

Any 10 Experiments

1. Measurements of length (or diameter) of solid material using vernier caliper, screw gauge
2. Young's modulus by uniform bending - Pin and Microscope.
3. Young's modulus by non-uniform bending - Pin and Microscope
4. Rigidity modulus - torsion pendulum
5. Coefficient of viscosity of a liquid - Poiseuille's method
6. Thermal conductivity of a bad conductor - Lee's disc method.
7. Newton's law of cooling (with graphical plot)
8. Melde's string experiment – frequency of tuning fork (both modes)
9. Potentiometer - calibration of low range voltmeter
10. Potentiometer - calibration of ammeter
11. Coefficient of viscosity of a liquid – Stoke's method
12. Sonometer - Frequency of tuning fork

Course Outcome

At the end of the course the students will be able to

CO1: Enabling the students to understand the uses of screwguage and vernier caliper

CO2: Determination of material constants such as Youngs Modulus and Rigidity Modulus by suitable experimental methods

CO3: Undertstanding the concept of Co-efficient of viscosity by different experimental methods
CO4: Determining the thermal conductivity of a bad conductor
CO5: Finding the frequency of sonometer by different experimental methods
CO6: Calibrating a potentiometer using ammeter and low range voltmeter

	PHYSICS II	L	T	P	Credits
		4	0	0	3

Course Objective: To make the students to understand and study, the interference and diffraction properties of light; principles of magnetism; dual nature of matter wave and significance of wave function and Schrodinger equation; principles of nuclear physics and radiation physics; the working of electronic components in the digital circuits.

UNIT I OPTICS: Interference 9

Air wedge - determination of diameter of a thin wire by air wedge – Diffraction: Fresnel diffraction & Fraunhofer diffraction - plane diffraction grating - theory and experiment to determine wavelength (normal incidence) - Polarization: Double refraction – half wave and quarter wave plate, plane, elliptically and circularly polarized light – production (theory) .

UNIT II Magnetism and Electromagnetism 9

Magnetism: Susceptibility - permeability - intensity of magnetization - properties of dia, para and ferro magnetic materials – Electromagnetism: Faraday's laws of electromagnetic induction, Lenz's law – self-inductance - self-inductance of a toroid – mutual inductance – coefficient of coupling- determination of mutual inductance using a ballastic galvanometer.

UNIT III Relativity and Quantum Mechanics 9

Relativity: Frames of references - postulates of special theory of relativity - Lorentz transformation equations - Wave mechanics: matter waves - de Broglie wavelength - properties of wave functions - Quantum mechanics: postulates of quantum mechanics -Schrödinger equation.

UNIT IV Nuclear Physics and Radiation Physics 9

Nuclear Physics: Nuclear constituents, size, mass, spin and charge - binding energy - binding energy curve - nuclear fission - chain reaction – nuclear reactor - Radiation Physics: radioactive disintegration – half-life period - radiation hazards.

UNIT V Electronics 9

Diodes, transistors and ICs: - Zener diode – characteristics - transistor configuration CE mode - IC – Pin diagram of 741 – Digital electronics: binary numbers – conversion of decimal number to binary number - binary number to decimal number – binary addition, subtraction and basic logic gates (OR, AND, NOT. NOR & NAND) – EXOR gate – De Morgan's theorem.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Understand the basics of interference, diffraction and polarization.

CO2: Describe diffraction gratings and solve problems using the diffraction grating equation.

CO3: Identify some typical magnetic materials and their properties such as magnetic permeability, susceptibility of paramagnetic, diamagnetic and ferromagnetic.

CO4: State Faraday's Law of Induction with Lenz's Law and use these equations to solve technical problems associated with induction.

CO5: Understand the central concepts and principles of quantum mechanics: the Schrödinger equation, the wave function and its physical interpretation.

CO6: Demonstrate an understanding of the basic principles of the special theory of relativity.

CO7: Demonstrate knowledge of fundamental aspects of the structure of the nucleus, radioactive decay, nuclear reactions and the interaction of radiation and matter.

CO8: Understand and examine the structure of various number systems and its application in digital design.

CO9: Design and analyze the combinational logic circuits.

CO10: Understand the operation mechanism of basic components of electronic devices, such as transistors and diodes.

Text Books:

1. Brij Lal & Subramaniam, Optics: S Chand & Co., New Delhi
2. R Murugeshan, Electricity and Magnetism, 8th Edition, S Chand & Co., New Delhi, 2006
3. V. K. Mehta, Principles of Electronics, 5th Edition, S Chand & Co., New Delhi, 2001
4. Brij Lal & Subramaniam, Atomic and Nuclear Physics, S Chand & Co., 2000
5. Satya Prakash, Advanced Quantum Mechanics, 5th Edition, Kedar Nath Ram Nath Publishing Ltd, 2013
6. R. Murugeshan, Kiruthiga and Sivaprasath, Modern Physics, S Chand & Co. 2007

References:

1. D Halliday, R Resnick and J Walker, Fundamentals of Physics, 6th Edition by, Wiley NY, 2001.
2. D Halliday, R Resnick and K S Krane, Physics, 4th Edition vols. I, II & II Extended, Wiley NY 1994.
3. R. Chandra, Nuclear Medicine Physics, Lippincot Williams and Wilkins Publishers, 7th Edition 2011.

	PHYSICS II PRACTICAL	L	T	P	Credits
		0	0	2	2

Any 10 Experiments

1. Convex lens – f, R and m
2. Concave lens – f, R and m.
3. Spectrometer - grating - normal incidence method.
4. Air wedge - thickness of a wire.
5. Ultrasonic Interferrometer.
6. Spectrometer – Dispersive Power of a prism.
7. Compound Pendulum.
8. Bandgap determination –P.O.Box.
9. Basic Logic gates (OR. AND, NOT)
10. Zener Diode characteristics; I-V curve and breakdown voltage
11. Semiconductor Diode – To determine the particle size using diffraction method.
12. Newton's Ring-Sodium lamp (Microscope)

Course Outcome

At the end of the course the students will be able to

CO1: Analyze the spectrum of a mercury lamp by the angle of deviation

CO2: Demonstrate the dispersion of light using a prism

CO3: Determine the thickness of a thin wire by Air-wedge method.

CO4: Measure the focal length, radius of curvature and magnification for concave and convex lens.

CO5: Determine the velocity of ultrasonicwaves and to understand the concept of compressibility using ultrasonic interferometer

CO6: Understanding the operation of basic logic gates

CO7: Understand the I-V curve and breakdown voltage of a zener diode

	PROPERTIES OF MATTER & ACCOUSTICS	L	T	P	Credits
		4	0	0	4

Course Objective: To make the students to understand, the different kinds of moduli via experimental methods; surface tension for liquids; wave phenomena, in general and sound wave in particular; ultrasonics and acoustics.

UNIT –I Elasticity **9**

Hooke's law – Stress – strain diagram – Elastic Moduli, Work done per unit volume in shearing strain – Relation between elastic constants – Poisson's Ratio – Expression for Poisson's ratio in terms of elastic constants – Twisting couple on a wire – Work done in twisting – Torsional pendulum – determination of rigidity modulus of a wire - q, η and κ by Searles method.

UNIT – II Bending of Beams **9**

Expression for bending moment – Cantilever – Expression for depression – Experiment to find Young's modulus – Cantilever oscillation – Expression for period – Uniform bending – Expression for elevation – Experiment to find Young's modulus using microscope – Non Uniform bending – Expression for depression – Experiment to determine Young's modulus using mirror and telescope.

UNIT – III Surface Tension **9**

Surface tension - Surface energy - Angle of contact and its determination - Excess of pressure inside curved surface - Formation of drops - Experimental study of variation of Surface tension - Drop weight method of determining surface tension and interfacial surface tension

UNIT – IV Viscosity **9**

Streamlined motion – Turbulent motion – Coefficient of viscosity and its dimension – Rate of flow of liquid in a capillary tube – Poiseuilles' Method and experimental verification (Two different liquids) – Stokes Method and experiment verification – Effect of temperature on viscosity.

UNIT – V Acoustics **9**

Music and noise – Characteristics of musical sound, quality of tone, consonance and dissonance – musical scale – tempered scale – decibel – noise pollution. Acoustics of buildings - Reverberation - Reverberation time – Sabine's formula derivation – measurement of reverberation time – absorption coefficient – acoustical design of buildings– Ultrasonics – production, properties and applications.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Understand the difference between solids, liquids, and gases.
CO2: Distinguish between the different forces that hold atoms together.
CO3: Describe the characteristics of the three states of matter.
CO4: Explain the applications of the elastic properties of solids.
CO5: To describe the main features of intermolecular forces
CO6: Apply knowledge of sound waves, and light waves to explain natural physical processes and related technological advances.
CO7: Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies.
CO8: Apply the knowledge of Gravitation at various situations.

Text Books

4. R. Murugesan - Properties of Matter, S. Chand & Co, Delhi, 1994.
5. D.S. Mathur–Elements of Properties of Matter, S. Chand & Co, Delhi, 2006.
6. Brij Lal & Subramaniam–A Text book of Sound, Second Edition, Vikas Publishing, Delhi, 2008.

References

3. Resnick and Halliday - Physics, Volume – I & II, Wiley and Sons inc, Sixth edition.
4. C. J. Smith - General Properties of Matter, Orient & Longman Publishers, 1960.

	PROPERTIES OF MATTER & ACCOUSTICS PRACTICAL	L	T	P	Credits
		0	0	2	2

List of Experiments

1. Measurements of length (or diameter) of solid material using vernier caliper, screw gauge
2. Travelling microscope – To determine the radius of the capillary tube.
3. Young's modulus- uniform bending (pin & microscope)
4. Young's modulus- Cantilever/Stretching (pin & microscope)
5. Young's modulus- Non-uniform bending (pin & microscope)
6. Rigidity modulus- Torsion pendulum
7. Surface tension – capillary rise method
8. Viscosity of liquid- Poiseuille's method
9. Viscosity of liquid- Stoke's method.
10. Sonometer - Frequency of tuning fork

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to

CO1: Measure the internal diameter and depth of a given beaker/calorimeter and hence find its volume.
CO2: Design and conduct Young's modulus experiments and interpret the experimental results.
CO3: Analyze the physical principle involved in the various instruments; also relate the principle to new application.
CO4: Determine the coefficient of viscosity of high viscous liquid (Castor oil) by Stokes' method.
CO5: Measure fluid pressure and relate it to flow velocity.
CO6: Determine the frequency of the tuning fork by using Sonometer

	MECHANICS	L	T	P	Credits
		4	0	0	4

Course Objective: To have clear knowledge of mechanics so as to enable them to understand the other branches of Physics especially the mechanics of microscopic bodies, Quantum mechanics.

UNIT-I Laws of Motion 9

Newton's law of motion – Force – Mass – Momentum and Impulse, Law of Conservation of Linear Momentum – Collision – Elastic and Inelastic collision – Newton's law of impact. Coefficient of restitution – Impact of moving sphere on a fixed plane – Direct and Oblique impact of moving two smooth spheres – Calculation of final velocities – Laws of Kinetic energy – Projectile motion – Frictional forces – Center of mass of solid objects – Conservation of Momentum in a system of particles.

UNIT-II Dynamics of Rigid Bodies 9

Moment of Inertia - Angular Momentum - Torque - Conservation of linear and angular momentum - Kinetic energy of rotating body - Theory of Compound Pendulum - determination of g and k - Centre of Mass - Velocity and acceleration - M.I. of a diatomic molecule.

UNIT-III Gravitation 9

Centre of Gravity: Center of Gravity of a solid and hollow hemisphere, solid tetrahedron - Newton's Law of Gravitation- Determination of mass and Density of earth. Determination of 'G' by Boy's Method – Kepler's Laws of Planetary Motion - Newton's Law from Kepler's Law – Escape Velocity - Motion of Rocket - Orbital Velocity – Geo-stationary Orbit and its applications

Unit – IV Oscillations 9

Differential equation and the solution for a simple harmonic oscillator, some examples (simple pendulum, and compound pendulum). Damped Oscillator: Equation of motion and its solution, qualitative description of the effect of different amounts of damping on the motion. Forced oscillations and resonance: Solution of differential equation of a forced oscillator and variation of amplitude with frequency and damping, Q factor.

UNIT-V Relativity **9**

Frames of references - Michelson-Morley experiment - significance of negative result - postulates of special theory of relativity - Lorentz transformation equations - Length contraction - Time dilation - Relativity of simultaneity - Law of addition of velocities - variation of mass with velocity - relativistic kinetic energy equations - postulates of general theory of relativity - gravitational red shift

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Understand the basic idea about mechanics of microscopic bodies
CO2: Analyze systems that include frictional forces.
CO3: Impart the knowledge about the dynamics of rigid bodies
CO4: Understand the applications of gravitational laws for solids
CO5: Determine the resultant of a system of forces.
CO6: Understand the planetary motion.
CO7: Solve oscillating system problems.
CO8: Understand the concept of theory of relativity.

Text Books

4. Narayanamoorthy - Mechanics Part I and II, National Publishing Company.
5. D. S. Mathur– Mechanics, II Edition, S. Chand and Co, 2001.
6. R. Murugeshan - Mechanics and Mathematical Methods, 1st Edition, S. Chand and Co, 1996.

References

3. R.P. Feynman, R.B. Leighton and M. Sands - The Feynman Lectures on Physics, Vols. 1, 2 and 3, Narosa, New Delhi 1998.
4. D. Halliday, R. Resnick and J. Walker - Fundamentals of Physics, 6th Edition, Wiley, New York, 2001.

	MECHANICS PRACTICAL	L	T	P	Credits
		0	0	2	2

List of Experiments

1. Compound pendulum- To determine ‘g’
2. Rigidity modulus - Static torsion
3. Hook’s Law – To study the Motion of a Spring and calculate (a) Spring Constant, (b) g.
4. Lamis Theorem
5. To measure the coefficient of friction for different materials – Inclined plane.
6. To determine the Moment of Inertia of a Flywheel.
7. Bifilar Pendulum
8. Young’s modulus - uniform bending (Optical Lever)
9. Young’s modulus - non-uniform bending (Optical Lever)
10. To determine the Elastic Constants of a Wire by Searle’s method

Course Outcome

At the end of the course the students will be able to

CO1: Determine the acceleration due to gravity by using compound pendulum
CO2: Design and conduct Young’s modulus experiments by using optic lever and interpret the experimental results.
CO3: Analyze the elastic constants of a wire by Searle’s method

CO4: Identify the two physical quantities to be measured as the variables - the independent and dependent variables

CO5: Analyze different types of stresses induced in beams and shafts due to bending and twisting moments respectively

CO6: To understand geometrical properties such as centroid, moment of inertia etc of sections of different shapes.

	THERMAL PHYSICS	L	T	P	Credits
		4	0	0	4

Course Objective: To understand the concept of heat, transmission of heat, kinetic theory of gases and laws of thermodynamics

UNIT I Specific Heat **9**

Specific heat of solids – Method of mixtures – Radation correction – Dulong and Petit's law - Quantum theory - Einstein's theory of specific heat – Debye's theory of specific heat– Specific heat of liquids – Newton's law of cooling - Specific heat of gases – Mayer's Relation – Quantization of various contributions to energy of diatomic molecules – Specific heat of diatomic gases.

UNIT II Conduction & Radiation **9**

Definition of thermal conductivity – thermal conductivity of bad conductor – Lee's disc method-radial flow of heat-thermal conductivity of rubber.

Radiation – Black body radiation – Wien's law, Rayleigh-Jean's law-Planck's quantum theory of radiation - Planck's law – Stefan's law-Deduction of Newton's law of cooling from Stefan's law – solar constant (Definition only).

.

UNIT III Kinetic Theory of Gases **9**

Maxwell's law of distribution of molecular velocities – Experimental verification of molecular velocities – Equilibrium of velocities - Mean free path of gaseous molecules – Transport phenomena – Diffusion of gases – Viscosity and thermal conduction of gases – Vander Waals equation of state – Determination of Vander Waals constant – Comparison of Vander Waals equation with Andrews experiment - Relation between Vander Waals constant and critical constants.

UNIT IV Low Temperature **9**

Joule – Thomson's effect – Porous plug experiment – Liquefaction of gases – Linde's method – Adiabatic demagnetization – Properties of He^1 and He^2 – Practical applications of low temperature – Refrigeration and air conditioning.

UNIT V Laws of Thermodynamics **9**

Zeroth law of thermodynamics – First law of thermodynamics – Heat engines – Reversible and irreversible process – Isothermal and adiabatic process – Carnot's engine - Carnot's theorem – Second law of thermodynamics - Thermodynamic Scale of temperature – Entropy – Change of entropy in reversible and irreversible processes – Temperature – entropy diagram (T.S) – Law of increase of entropy – Gibbs free energy.

TOTAL HOURS : 45

Course Outcome:

At the end of the course the students will be able to

CO1: Apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.

CO2: Identify and describe the statistical nature of concepts in thermodynamics, in particular: entropy, temperature, chemical potential, Free energies, partition functions.

CO3: Understand all the concepts needed to state the laws of thermodynamics.

CO4: Use the laws of thermodynamics (particularly the first and second laws) to solve a variety of problems, such as the expansion of gases and the efficiency of heat engines.

CO5: Understand the efficiency and properties of thermodynamic cycles for heat engines, refrigerators and heat pumps.

CO6: Acquire information on the kinetic theory of gases.

CO7: Explain the possibilities of heat transmission through conduction & radiation.

CO8: Understand the mechanism behind the working of a refrigerator and air conditioning.

Text Books

2. Brijilal and Subramininan, Heat & Thermodynamics, S. Chand &Co.1999.

References

3. R. Murugesan, Thermal Physics- S. Chand & Co, 2015.
4. D.S. Mathur, Heat and Thermodynamics, S. Chand and Company, 2006.

	THERMAL PHYSICS PRACTICAL	L	T	P	Credits
		0	0	2	2

Any 10 Experiments

1. Lees's Disc method – Thermal conductivity of bad conductor
2. Joule's Calorimeter - determination of Specific heat capacity of liquid
3. Verification of Boyle's law
4. Newtons,s law of cooling
5. Joule's Calorimeter – Specific heat capacity of Liquids
6. Specific heat capacity- Liquid
7. Specific heat capacity- Solid
8. Specific heat capacity- Mixture of Solid and Liquid
9. To study the variation of thermo emf across two junctions of a thermocouple with temperature.
10. P.O box temperature co-efficient.
11. Solar constant

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome:

At the end of the course the students will be able to

CO1: Determine the thermal conductivity of bad conductor by Lee's disc method

CO2: Measure the specific heat capacity of liquid by Joule's calorimeter method

CO3: Understand the basic concepts of Boyles law and its applications.

CO4: Identify the relation between pressure and volume of a given mass of the gas.
CO5: Measure the temperature coefficient of resistance of a given wire by P.O box method.
CO6: Analyze the luminosity of the sun by solar constant method.

	OPTICS	L	T	P	Credits
		4	0	0	4

Course Objective: To understand the concepts of optics, to study interference and diffraction of light and to learn the techniques of optical instruments

UNIT I Geometrical Optics 9

Dispersion – Dispersive power – dispersion in small angle prism – Dispersion without deviation – Deviation without dispersion –Defect of lenses –Spherical aberration– Methods of reducing spherical aberration – Coma – Aplanatic lens – Astigmatism – Distortion – Chromatic aberration– Achromatic lenses.

UNIT II Interference 9

Air wedge – Newton's rings – Haidinger's fringes – Brewster's fringes – Michelson Interferometer and its applications – Fabry- Perot Interferometer – Interference filter – Stationary waves in light – Colour photography (qualitatively) – Holography- Construction and reconstruction of a hologram – Applications.

UNIT III Diffraction 9

Fresnel's diffraction – Diffraction at a (1) circular aperture (2) Straight edge (3) narrow wire – Fraunhofer diffraction at a single slit – Double slit – Diffraction pattern – Grating (theory) – Resolving power – Rayleigh's criterion of resolution- Resolving power of a Telescope and Grating – Dispersive power and resolving power of a grating.

UNIT IV Polarization 9

Nicol prism – Nicol prism as an analyzer and polarizer – Huygens's explanation of Double refraction in uniaxial crystals – Double Image polarizing prisms – Elliptical and Circularly polarized light – Production and detection – Quarter wave and half wave plates – Babinets compensator – Optical activity – Fresnel's explanation of optical activity – Laurent's Half shade polarimeter.

UNIT V Optical Instruments 9

Microscopes – Simple Microscope (Magnifying glass) – Compound Microscope – Ultra-Microscope – Eyepieces - Huygen's Eyepiece - Ramsden's Eyepiese — Comparison of Eyepieces – Telescope – Refracting astronomical telescope – Abbe Refractometer – Pulfrichrefractometer - Photographic Camera – Prism binocular

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to
CO1: Acquire the basic concepts of wave optics.
CO2: Describe how light can constructively and destructively interfere.
CO3: Explain why a light beam spreads out after passing through an aperture.

CO4: Summarize the polarization characteristics of electromagnetic waves
CO5: Appreciate the operation of many modern optical devices that utilize wave optics
CO6: Understand optical phenomena such as polarization, interference and diffraction in terms of the wave model.
CO7: Analyse simple examples of interference and diffraction phenomena.
CO8: Be familiar with a range of equipment used in modern optics.

Text Book

3. Subramaniam N &Brij Lal, Optics, S Chand & Co. Pvt. Ltd., New Delhi, 2004
4. Murugeshan, Optics and Spectroscopy, S Chand & Co. Pvt. Ltd., New Delhi, 2010.

References

5. Eugene Hecht, Optics, 4th Edition, Addison Wesley, 2002.
6. Okan K. Ersoy, Diffraction, Fourier Optics and Imaging, John Wiley & Sons,2007
7. Optics by Khanna D R & Gulati H R, R Chand & Co. Pvt. Ltd., New Delhi, 1979
8. Singh & Agarwal, Optics and Atomic Physics, Pragati Prakashan Meerut, Nineth edition, 2002.

	OPTICS PRACTICAL	**L**	**T**	**P**	**Credits**
		0	**0**	**2**	**2**

List of Experiments

1. Spectrometer-μ of the small angle prism.
2. Spectrometer – Grating (N & λ)
3. Spectrometer – Dispersive power of prism
4. Air wedge
5. Newton's Ring-Sodium lamp (Microscope)
6. Spectrometer- i-i' curve using prism.
7. Spectrometer-i-d curve
8. Spectrometer – Cauchy's constant
9. Convex lens – f, R and m
10. Concave lens – f, R and m

Text Book

1 C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to
CO1: Analyze the spectrum of a mercury lamp and record the angle of deviation for the spectral lines
CO2: Demonstrate the dispersion of light through a prism and the principle of a prism spectrometer.
CO3: Determine the thickness of a thin wire by Air-wedge method.
CO4: Determine the experimental values for the Cauchy's constants for the glass prism.
CO5: Define and demonstrate image sizes as compared to object sizes: enlarged, same size, minified.
CO6: Measure the focal length, radius of curvature and magnification by convex lens.
CO7: Determine the focal length, radius of curvature and magnification by concave lens.

	ELECTRICITY & MAGNETISM	L	T	P	Credits
		4	0	0	4

Course Objective: To understand the general concepts in Electrostatics, to educate scientifically the principles of magnetism and apply the physics concepts in solving problems.

UNIT-I Electrostatics 9

Coulomb's inverse square law – Gauss theorem and its applications (Intensity at a point due to a charged sphere & cylinder) – Principle of a capacitor – Capacity of spherical and cylindrical capacitors – Energy stored in a capacitor – Loss of energy due to sharing of charges.

UNIT II Current Electricity 9

Ampere's circuital law and its applications - Field along the axis of a circular coil and Solenoid – Force on a conductor in a magnetic field – Theory of Ballistic Galvanometer – Figure of merit – Damping Correction – Wheatstone network – Carey Foster's Bridge – Potentiometer - Measurement of current, resistance and low voltage.

UNIT-III Chemical Effects and Magnetic Effects of Electric Current 9

Electrical conductivity of an electrolyte - Faraday's laws of electrolysis - Determination of specific conductivity of an electrolyte (Kohlrausch bridge) – Gibbs-Helmholts equation for the emf of a reversible cell - calculation of emf of a Daniel Cell - Helmholtz Galvanometer - Theory of moving coil Ballistic Galvanometer - Damping correction - Absolute capacitance of a capacitor.

UNIT IV Electromagnetic Induction 9

Laws of electromagnetic induction– Self and mutual induction– Self-inductance of a solenoid– Mutual inductance of a pair of solenoids–Coefficient of coupling– Experimental determination of self (Rayleigh's method) and mutual inductance– Growth and decay of current in a circuit containing L and R–Growth and decay of charge in a circuit containing C and R– Measurement of High resistance by leakage.

UNIT V Magnetism 9

Intensity of Magnetization– Magnetic Susceptibility– Magnetic Permeability – Types of magnetic materials– Properties of para, dia and ferromagnetic materials– Langevin's theory of dia and para magnetism – Weiss's theory of ferromagnetism – B-H curve–Energy loss due to magnetic hysteresis – Ballistic Galvanometer method for plotting B-H curve - Magnetic properties of iron and steel.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Explain the basic physics of capacitors and resistors.

CO2: Predict the behavior of simple and complex direct current circuits using the fundamental conservation laws.

CO3: Explain the basic electric and magnetic interactions due to charged particles and currents

CO4: Describe how the electric interactions due to single or collection of charged particles are embodied in the concepts of the electric field and the electric potential.

CO5: Predict the motion of charged particles in electric and magnetic fields.

CO6: Write a project on an application or a natural phenomenon based on the fundamental laws of electricity and magnetism

CO7: Understand the necessity of electricity and magnetism in transportation technology.

CO8: Understand the occurrence of loss in energy due to charged particles.

Text Books

4. Brijlal and N. Subrahmanyam, A Text Book of Electricity and Magnetism, Ratan Prakasan Mandir Educational & University Publishers, New Deihi,2000.
5. R. Murugeshan, Electricity and Magnetism, 7th Edition, S. Chand & Company Pvt. Ltd. 2008
6. D. L. Sehgal, K. L. Chopra and N. K. Sehgal, Electricity and Magnetism, S. Chand & Sons. New Delhi. 1996.

References

4. Griffth D.J, Introduction to Electrodynamics, 4th Edition, Prentice Hall of India, 2012.
5. Halliday Resnick and Walker, Fundamentals of Physics – Electricity and Magnetism, Wiley India Pvt Ltd, 2011.
6. Navina Wadhani, Electricity and Magnetism, Prentice Hall of India, 2012.

	ELECTRICITY & MAGNETISM PRACTICAL	L	T	P	Credits
		0	0	2	2

List of Experiments

1. M and B_H - Deflection magnetometer – Tan A & Tan B position
2. Carey Foster Bridge – Determination of specific resistance of unknown coil
3. Potentiometer – EMF of thermocouple
4. Potentiometer-Calibration of Ammeter
5. Potentiometer- Calibration of Low range voltmeter
6. Potentiometer- Calibration of High range voltmeter
7. Sonometer- Frequency of Tuning Fork
8. Deflection magnetometer - Field along the axis of a coil.
9. Absolute capacitance of a capacitor -B.G
10. Post office Box

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to

CO1: Measure the temperature coefficient of resistance of a given wire by P.O box method.

CO2: Determine the frequency of the tuning fork by using Sonometer

CO3: Determination of specific resistance of unknown coil by Carey Foster Bridge

CO4: Compare the emf's of two given primary cells using a potentiometer.

CO5: Analyze the magnetic dipole moment of a bar magnet and horizontal intensity of earth's magnetic field using a deflection magnetometer.

CO6: Measure the magnetic dipole moment of a bar magnet using a deflection magnetometer by Tan A & Tan B position.

	ATOMIC PHYSICS	L	T	P	Credits
		4	1	0	4

Course Objective: To make the student understand the principles of atomic physics. To enable the student to explore the field of atomic structure, energy levels, and X-rays.

UNIT I Discharge Phenomenon through Gases 9

Motion of a charge in transverse electric and magnetic fields - Specific charge of an electron - Dunnington's method - Positive rays – Aston's, Dempster's mass spectrographs

UNIT II Photo-electric Effect 9

Richardson and Crompton experiment - Laws of photoelectric emission - Einstein photo electric equation - Millikan's experiment - Verification of photoelectric equation - Photo electric cells - Photo emissive cells - Photovoltaic cell - Photo conducting cell - Photomultiplier.

UNIT III Atomic Structure 9

Vector atom model - spatial quantisation–various quantum numbers -Pauli's exclusion principle - angular momentum and magnetic moment - coupling schemes - LS and JJ coupling - Bohr magnetron explanation of periodic table - Stern and Gerlach experiment.

Spectral terms and notations - selection rules - intensity rule and interval rule - fine structure of sodium D lines - alkali spectra - fine structure of alkali spectra - spectrum of Helium.

UNIT IV Ionization Potential and Splitting of Energy Levels 9

Excitation and ionization potential - Davis and Goucher's method - Zeeman effect - Larmor's theorem - Debye's explanation of normal Zeeman effect - Anamalous Zeeman effect - theoretical explanation. Lande's 'g' factor and explanation of splitting of D1 and D2 lines of sodium - Paschen back effect-theory - Stark effect (qualitative treatment only).

UNIT V X-Rays 9

Origin of X- ray spectrum – Continuous and characteristics spectra – X-ray Spectroscopy – Auger effect - X-ray absorption and fluorescence - Moseley's law - uses of X-rays - Compton Effect - experimental verification of Compton Effect.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Discuss the effect of the intensity and frequency on the photoelectric effect and demonstrate the use of photo cell.

CO2: Understand the quantum numbers, including their physical significance, and quantum mechanical states of the hydrogen atom.

CO3: Understand time independent perturbation theory including its derivation and be able to apply it to simple systems, including the Stark-Effect and Zeeman Effect.

CO4: Know about the origins of fine structure in atomic spectra.

CO5: Understand the exchange degeneracy and how this affects the excited states of helium.

CO6: Understand the Periodic table from the viewpoint of the electronic structure.

CO7: Understand and be able to apply to simple cases time dependent perturbation theory.
CO8: Understand the derivation of and be able to apply the selection rules for the interaction of electric dipole radiation and atoms.

Text Books

1. R. Murugeshan, Kiruthiga Sivaprasath, Modern Physics, S. Chand & Co., New Delhi, 2008.
2. N Subramanian and Brij Lal, Atomic and Nuclear Physics, S. Chand & Co. - 2000

References

1. Robley D. Evans, The Atomic Nucleus, TMH, 1982
2. Christopher .J. Foot, Atomic physics, Oxford University Press Inc, 2005.

	ANALOG ELECTRONICS	L	T	P	Credits
		4	0	0	4

Course Objective: To understand the concept of semiconductors, diodes, transistors. To familiarize the operation of amplifiers

UNIT I Semiconductors and diodes 9

Intrinsic and extrinsic semi conductors – PN junction diode – Biasing of PN junction – VI Characteristics of diode – Rectifiers – Half wave – full wave and bridge rectifiers – Break down mechanisms – Zener- diode characteristics of Zener diode – Zener diode as voltage regulator.

UNIT II Bipolar Transistors 9

Bipolar junction transistor – Basic configurations relation between a and ß – Characteristic curves of transistor – CB,CE mode – DC load line – DC bias and stabilization – fixed bias – voltage divider bias – Transistor as an amplifier – Transistor as a two port network – h parameters.

UNIT III Amplifiers and Oscillators 9

Single stage CE amplifier – Analysis of hybrid equivalent circuit – Power amplifiers – Efficiency of class B Power amplifier – Push – pull amplifier - General theory of feedback – Properties of negative feedback – Criterion for oscillations – Hartley oscillator – Colpitt's oscillator.

UNIT IV Special Semiconductor devices 9

FET – JFET – MOS FET – FET parameters – Comparison between FET and Transistor – Photo transistor – SCR – SCR as a switch – UJT – UJT relaxation oscillator.

UNIT V Operational Amplifiers 9

Differential amplifier - Common mode rejection ratio – Characteristics of an ideal op-amp – Virtual ground – Inverting amplifier – Non inverting amplifier – Applications. Adder – subs tractor – Integrator – Differentiator – Unity gain buffer.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Understand the properties and applications of semiconductor diodes.
CO2: Study and analyze the rectifier and regulator circuits.
CO3: Understand the properties and working of transistors.
CO4: Understand and analyze the different biasing techniques used in BJTs and FETs.
CO5: Analyze and design Oscillators using BJTS, FETs and OPAMPs
CO6: Understand the functions of operational amplifiers
CO7: Analyze and design idealized active linear circuits containing OPAMPs
CO8: Acquire the practical knowledge in electronics experiments.

Text Books

1. V K Mehta, Principles of electronics, S Chand & Co., 5th edition, 2001.
2. M Arul Thalapathi, Basic and Applied Electronics, Comptek Publishers, Chennai, 2005.

References

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, Electron Devices and Circuits, Tata McGraw Hill, 2010.
2. Millman and Halkias, Electronics Devices and Circuits, Tata McGraw Hill, 2008.
3. William H. Hyte, Jr, J. E. Kemmerly and Steven M. Durban, Engineering Circuit Analysis, 7th Edition, McGraw Hill, 2010.

	ANALOG ELECTRONICS PRACTICAL	L	T	P	Credits
		0	0	2	0

Any 10 Experiments

1. Transistor characteristics Common Emitter.
2. Transistor characteristics Common Base.
3. FET characteristics.
4. UJT Characteristics.
5. Diode characteristics (PN&ZENER)
6. Bridge rectifier – π filter.
7. Dual power supply using IC
8. Single stage amplifier-with and without feedback
9. OPAMP-Adder & Subtractor
10. OPAMP-Differentiator & Integrator
11. OPAMP-Low pass and high pass filter
12. Full wave rectifier without and with filters

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to

CO1: Demonstrate the input and output characteristics of a transistor in Common Emitter

configuration.

CO2: Design the transistor characteristics in Common Base configuration.

CO3: Understand the basic concepts in IC's and digital devices

CO4: Apply the concepts of basic electronics and do the interpretation and acquire the result.

CO5: Design and verify the operations of Differentiator and Integrator circuit using 741Op-amp.

CO6: Design and verify the operations of Adder and Subtractor circuit using 741Op-amp.

	DIGITAL ELECTRONICS	L	T	P	Credits
		4	0	0	4

Course Objective: To understand the basic concepts of number systems. To develop the digital concepts using logic gates. To apply digital concepts in sequential logic systems. To study operational amplifiers and clocks.

UNIT I Number Systems and Logic Gates 9

Introduction to decimal, binary, octal, hexadecimal number systems – Inter conversions– 1's and 2's complements –Logic gates, Symbols and their truth tables – AND, OR, NOT, NAND, NOR, XOR, and XNOR – Universality of NAND and NOR gates.

UNIT II Boolean Algebra and Simplification of Logic Expressions 9

Boolean algebra – Basic laws of Boolean algebra – De-Morgan's theorems Reducing Boolean expressions using Boolean laws – SOP and POS forms of expressions miniterms and maxterms – Karnaugh map simplification.

UNIT III Combinational Digital Systems 9

Half and full adders – Binary address – Half and full subtractors – Binary subtractor Two's complement adder / subractor circuits – Decoder – Encoder – Multiplexer – Demultiplexer – A/D conversion – Successive approximation method – D/A conversion – R-2R ladder network.

UNIT IV Sequential Digital Systems 9

Flip flop – RS – clocked RS – T and D flip flops – JK and master slave flip flops – Counters – Four bit asynchronous ripple counter – Mod-10 counter – Ring counter – Synchronous counter – Shift registers – SISO and SIPO shift registers.

UNIT V Operational Amplifier & Timers 9

Operational amplifier - Characteristics – Operational amplifier theory - Inverting and Non-inverting amplifier - Single Stage transistor amplifier - gain calculation - current amplification analysis (CE only) - Feed back in amplifier - Voltage gain of feedback amplifier - advantages of negative feedback emitter follower - positive feedback amplifier as an oscillator. IC 555 timer – Astable multi vibrator - Mono stable multi vibrator.

TOTAL HOURS : 45

Course Outcome

At the end of the course the students will be able to

CO1: Explain concepts and terminology of digital electronics.

CO2: Application of logic to design and creation, using gates, to solutions to a problem.

CO3: Use DeMorgan's theorem to simplify a negated expression.

CO4: Illustrate the algebraic representation of logic circuits using DeMorgan's theorems

CO5: Create circuits to solve problems using gates to replicate all logic functions.
CO6: Design and implement combinational logic circuits using reprogrammable logic devices.
CO7: Demonstrate the programs of digital to analog and analog to digital conversion
CO8: Create circuits to solve clocked Flip-Flops problems.

Text Books:

1. Donald P Leech, Albert Paul Malvino and Goutham Saha, Digital Principles and Applications by 7th Edition, Tata McGraw Hill, 2011.

References:

1. W. H. Gothmann, Digital Electronics, Prentice Hall of India, Pvt. Ltd., New Delhi 1996.
2. D.A. Godse and A.P. Godse, Digital Electronics, Technical Publisher, Pune, 2008

	DIGITAL ELECTRONICS PRACTICAL	L	T	P	Credits
		0	0	2	2

Any 10 Experiments

1. Study of basic Gates (IC).
2. NAND as universal building blocks
3. NOR as universal building blocks.
4. Astable multivibrator using IC555
5. Monostable multivibrator using IC555
6. Colpitt's Oscillator
7. Hartley Oscillator
8. D/A convertor
9. A/D convertor.
10. Wienbridge oscillator
11. 555 timers Schmitt Trigger.
12. Half adder and Half Subtractor.
13. Full adder and Full Subtractor.

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015

Course Outcome

At the end of the course the students will be able to

CO1: Understand the basic concepts of Gates (IC) as universal building blocks
CO2: Design and verify the operations of Astable and Monostable multivibrator using IC555
CO3: Compute the working of Colpitt's and Hartley Oscillator.
CO4: Analyze and understand the working of D/A convertor and A/D convertor,
CO5: Design and verify the operations of Wienbridge oscillator.
CO6: Determine the working of 555 timers Schmitt Trigger
CO7: Design and verify the operations of Half adder and Half Subtractor.
CO8: Design and verify the operations of Full adder and Full Subtractor.

SYLLABUS
ABILITY ENHANCEMENT
COMPULSORY COURSES

	ENGLISH FOR COMMUNICATIONS	L	T	P	Credits
		2	0	0	2

Objective

Upon completion of this course, students should be able to:

- introduce themselves and talk about familiar, everyday conversation topics
- ask for opinions and either agree or disagree politely
- discuss various personal and ethical problems and solutions
- write an essay and submit it online
- conduct one cycle of academic research

UNIT I

What is Communication? - Objectives of Communication - Types of Communication

UNIT II

Importance and benefits of effective Communication - Communication at work place - Components and process of communication.

UNIT III

Barriers to Communication - Principles of Communication

UNIT IV

Report Writing - Writing Advertisements - Precis Writing - Letter Writing.

UNIT V

Group Discussion - Better Public Speaking and Presentation - Preparing for Job interviews.
Time Management.

Reference Books.

1. Essentials of Business Communication by Rajendra Pal and JS Korlaballi.
2. Business Communication by M K Sehgal and Vandana Khetarpal

	ENVIRONMENTAL STUDIES	L	T	P	Credits
		2	0	0	2

Objective: To inculcate the importance of environmental pollution, preservation of nature and environmental management for human welfare.

UNIT I Multidisciplinary Nature of Environmental Studies **2**

Definition, scope and importance, need for public awareness.

UNIT II Natural Resources **8**

Renewable and non-renewable resources - Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Role of an individual in conservation of natural resources- Equitable use of resoureces for sustainable lifestyles.

UNIT III Ecosystems **6**

Concept of an ecosystem. - Structure and function of an ecosystem Producers, consumers and decomposers. - Energy flow in the ecosystem. Ecological succession. - Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT IV Biodiversity and its Conservation **8**

Introduction–Definition,genetic, species and ecosystem diversity. Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels. Inida as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT V Environmental Pollution **8**

Definition, Cause, effects and control measures of a) Air pollution b) Water pollution c) Soil pollution d) Marine pollution e) Noise pollution f) Thermal pollution g) Nuclear hazards. Solid waste Management. Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Diaster management- floods, earthquake, cyclone and landslides.

UNIT VI Social Issues and the Environment **7**

From Unsustainable to Sustainable development, Urban problems related to energy - Water conservation, rain water harvesting, watershed management- Resettlement and rahabilitation of people; its problems and concerns. Case Studies - Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention

and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act - Issues involved in enforcement of environmental legislation. Public awareness.

UNIT VII Human Population and the Environment 6

Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.

UNIT VIII Field Work 5

Visit to a local area to document environmental assetsriver/forest/grassland/hill/mountain, Visit to a local polluted site-Urban/Rural/Industrial/Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hill slopes, etc.

Total: 50 hours

Course Outcome

CO1: To understand the nature and facts about environment.
CO2: To find and implement scientific, technological, economic solutions to environmental problems.
CO3: To know about the interrelationship between living organisms and environment.
CO4: To understand the integrated themes and biodiversity, natural resources, pollution control and waste management.
CO5: To appreciate the importance of environment by assessing its impact on the human world.
CO6: To study the dynamic processes and understand the features of the earth's interior and surface.
CO7: To know about what is the role of an individual in Conservation of Natural Resources.
CO8: To know about the various social issues.
CO9: To understand the role of government in solving the environmental problems.
CO10: To know about Population Growth and variation among Nations

Text Books:

1. De AK, Environmental Chemistry, Wiley Eastern Ltd.
2. Bharucha Erach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, India.
3. Brunner RC, 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480pgs.
4. Clark RS, Marine Pollution, Clanderson Press, Oxofrd (TB).

Reference Books:

1. Agarwal KC, 2001. Environmental Biology, Nidi Publishers Ltd. Bikaner.
2. Gleick HP, 1993. Water in Crisis, Pacific Institute for Studies in Development, Environment and Security. Stockholm Environmental Institute, Oxford University Press, 473pgs.
3. Heywood VH, and Watson RT, 1995. global Biodiversity Assessment. Cambridge University Press 1140pgs.
4. Jadhav H and Bhosale VM, 1995. Environmental Protection and Laws. Himalaya Publishing House, Delhi 284pgs.
5. Mckinney ML and Schoch RM, 1996. Environmental Science Systems and Solutions. Web enhanced edition, 639pgs.
6. Miller TG, Jr. Environmental Science, Wadsworth Publishing CO. (TB)

SYLLABUS
SKILL ENCHANCEMENT COURSES

	PHYSICS WORKSHOP SKILL	L	T	P	Credits
		2	0	0	2

Objectives: The aim of this course is to enable the students to familiar and experience with various mechanical and electrical tools through hands-on mode

Introduction: Measuring units. Conversion to SI and CGS. Familiarization with meter scale, Vernier calliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

Mechanical Skill: Concept of workshop practice. Overview of manufacturing methods:
casting, foundry, machining, forming and welding. Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood. Concept of machine processing, introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet.

Electrical and Electronic Skill: Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor and relay.

Course Outcome

At the end of the course the students will be able to
CO1: Describe the general relationship between the U.S. customary units and metric units of length, weight/mass, and volume.
CO2: Solve application problems involving metric units of length, mass, and volume.
CO3: Define units of capacity and convert from one to another.
CO4: Explain basic operations of shaper, milling and wooden lathe machines.
CO5: Display the use of safety equipment during workshop practice.
CO6: Demonstrate the safety concepts and practices in workshop. Demonstrate use of different fitting tools – like work holding, marking, measuring, cutting, finishing and miscellaneous.
CO7: Understand the basic concepts of timer circuit and electronic switch using transistor.
CO8: Identify functions of digital multimeter, cathode ray oscilloscope and transducers in the measurement of physical variables.

Reference Books:

1. B L Theraja, A text book in Electrical Technology, S. Chand and Company.
2. M.G. Say, Performance and design of AC machines, ELBS Edn.
3. K.C. John, Mechanical workshop practice, 2010, PHI Learning Pvt. Ltd.
4. Bruce J Black, Workshop Processes, Practices and Materials, 2005, 3rd Edn., Editor Newnes [ISBN: 0750660732]

	ELECTRICAL CIRCUITS AND NETWORK SKILLS	L	T	P	Credits
		2	0	0	2

Objectives: The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter.

Understanding Electrical Circuits: Main electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source. Power factor. Saving energy and money.

Electrical Drawing and Symbols: Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop.

Generators and Transformers: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers.

Electric Motors: Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor.

Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources

Electrical Protection: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Interfacing DC or AC sources to control elements (relay protection device)

Electrical Wiring: Different types of conductors and cables. Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays. Splices: wirenuts, crimps, terminal blocks, split bolts, and solder. Preparation of extension board.

Course Outcome

At the end of the course the students will be able to

CO1: Understand and to verify Ohm's law for parallel and series circuits.
CO2: Have hands-on learning of multimeter, voltmeter, ammeter.
CO3: Understand various circuital components and their combinations in a circuit
CO4: Analyze various electrical parameters and their significance involved AC and DC circuits
CO5: Study electrical symbols and circuits, applying it to power circuits
CO6: Study DC power source and to analyze the physical parameters involved in it.
CO7: To understand different protections methods in handling a circuit.
CO8: To study different types of conductors and cables, analyzing the properties by applying it to different circuits.

Reference Books:

1. B L Theraja, A text book in Electrical Technology, S Chand & Co.
2. M G Say, Performance and design of AC machines, ELBS Edn.

	BASIC INSTRUMENTATION SKILLS	L	T	P	Credits
		2	0	0	2

Objectives: This course is to get exposure with various aspects of instruments and their usage through hands-on mode. Experiments listed below are to be done in continuation of the topics.

Basic of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects.

Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance.

AC Millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter**,** specifications and their significance.

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.

Course Outcome

At the end of the course the students will be able to

CO1: Understand basic measurements in instrumentation
CO2: Study the working principle, working of multimeter and to analyze various specification
CO3: Perform compartive study of electronic voltmeter over a multimeter
CO4: Study about AC multimeter and applying it to different circuits
CO5: Know the construction, working and applications of Cathode Ray Oscilloscope (CRO)
CO6: Understand different types of signal generator and analyze the physical parameters involved in it.
CO7: Understand the Principle, working and characteristics of digital meter
CO8: Study digital multimeter under different conditions.

Reference Books:

1. B L Theraja, A text book in Electrical Technology, S Chand & Co.
2. M G Say, Performance and design of AC Machines , ELBS Edn.
3. Venugopal, Digital Circuits and systems, 2011, Tata McGraw Hill.
4. Shimon P. Vingron, Logic circuit design, 2012, Springer.
5. S. Salivahanan & N. S.Kumar, Electronic Devices and circuits, 3rd Ed., 2012, Tata Mc-Graw Hill

	RENEWABLE ENERGY AND ENERGY HARVESTING	L	T	P	Credits
		2	0	0	2

Objectives: The aim of this course is not just to impart theoretical knowledge to the students but to provide them with exposure and hands-on learning wherever possible

Fossil fuels and Alternate Sources of energy: Fossil fuels and nuclear energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.

Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies.

Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass.

Geothermal Energy: Geothermal Resources, Geothermal Technologies.

Hydro Energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources.

Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications. Carbon captured technologies, cell, batteries, power consumption. Environmental issues and Renewable sources of energy, sustainability.

Course Outcome

At the end of the course the students will be able to

CO1: Know the importance of renewable energy sources and to get a clear idea of various energy resources
CO2: Understand the various applications of solar energy and to analyze photovoltaic systems thoroughly
CO3: Know various electrical and power electronics function in wind energy system.
CO4: Acquire knowledge of the recent advancements in ocean energy application.
CO5: Know various resources and technologies for Geothermal and Hydropower energy
CO6: Analyze the environmental impact of hydropower sources
CO7: Develop physics mathematical model to study the recent applications of electromagnetic energy harvesting system.
CO8: Discuss about the environmental issues and sustainability of renewable energy sources

Reference Books:

1. G.D Rai, Non-conventional energy sources, Khanna Publishers, New Delhi
2. M P Agarwal, Solar energy, S Chand and Co. Ltd.
3. Suhas P Sukhative, Solar Energy, Tata McGraw - Hill Publishing Company Ltd.
4. Godfrey Boyle, Renewable Energy, Power for a sustainable future, 2004, Oxford University Press, in association with The Open University.
5. Dr. P Jayakumar, Solar Energy: Resource Assesment Handbook, 2009
6. J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).

	RADIATION SAFETY	L	T	P	Credits
		2	0	0	2

Objectives: The aim of this course is for awareness and understanding regarding radiation hazards and safety. The list of laboratory skills and experiments listed below the course are to be done in continuation of the topics

Basics of Atomic and Nuclear Physics: Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron, The composition of nucleus and its properties, mass number, isotopes of element, spin, binding energy, stable and unstable isotopes, law of radioactive decay, Mean life and half life, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission.

Interaction of Radiation with matter: Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources,

Interaction of Photons – Photoelectric effect, Compton Scattering, Pair Production, Linear and Mass Attenuation Coefficients,

Interaction of Charged Particles: Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation. Beta Particles- Collision and Radiation loss (Bremsstrahlung),

Interaction of Neutrons- Collision, slowing down and Moderation.

Radiation detection and monitoring devices

Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived Air Concentration (DAC).

Radiation detection: Basic concept and working principle of gas detectors (Ionization Chambers, Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter), Scintillation Detectors **(**Inorganic and Organic Scintillators), Solid States Detectors and Neutron Detectors, Thermo luminescent Dosimetry.

Radiation safety management: Biological effects of ionizing radiation, Operational limits and basics of radiation hazards evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for waste management.

Application of nuclear techniques: Application in medical science (e.g., MRI, PET, Projection Imaging Gamma Camera, radiation therapy), Archaeology, Art, Crime detection, Mining and oil. Industrial Uses: Tracing, Gauging, Material Modification, Sterization, Food preservation.

Course Outcome

At the end of the course the students will be able to

CO1: Understand the atomic structure and various nuclear process involved in radiation
CO2: Understand the interaction of radiation with matter
CO3: Illustrate the interaction of photon with matter by different experiments
CO4: Understand the theoretical concepts of interaction between charged particles.
CO5: Know the nuclear process involved in interaction of charged particles
CO6: Understand the basic quantities in nuclear radiations
CO7: Understand the working principle of various detectors
CO8: Evaluate and control the biological effects of ionizing radiation

Reference Books:

1. W.E. Burcham and M. Jobes – Nuclear and Particle Physics – Longman (1995)
2. G.F.Knoll, Radiation detection and measurements
3. Mcknlay, A.F., Bristol, Adam Hilger, Thermoluninescense Dosimetry, (Medical Physics Handbook 5)
4. W.J. Meredith and J.B. Massey, Fundamental Physics of Radiology, John Wright and Sons, UK, 1989.
5. J.R. Greening, Fundamentals of Radiation Dosimetry, Medical Physics Hand Book Series, No.6, Adam Hilger Ltd., Bristol 1981.
6. G.C. Lowental and P.L. Airey, Practical Applications of Radioactivity and Nuclear Radiations, Cambridge University Press, U.K., 2001
7. Martin and S.A. Harbisor, An Introduction to Radiation Protection, John Willey & Sons, Inc. New York, 1981.
8. W.R. Hendee, Medical Radiation Physics, Year Book – Medical Publishers Inc. London, 1981

	WEATHER FORECASTING	L	T	P	Credits
		2	0	0	2

Objectives: The aim of this course is not just to impart theoretical knowledge to the students but to enable them to develop an awareness and understanding regarding the causes and effects of different weather phenomenon and basic forecasting techniques

Introduction to atmosphere: Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; temperature sensors: types; atmospheric pressure: its measurement; cyclones and anticyclones: its characteristics.

Measuring the weather: Wind; forces acting to produce wind; wind speed direction: units, its direction; measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws.

Weather systems: Global wind systems; air masses and fronts: classifications; jet streams; local thunderstorms; tropical cyclones: classification; tornadoes; hurricanes.

Climate and Climate Change: Climate: its classification; causes of climate change; global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate.

Basics of weather forecasting: Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts.

Course Outcome

At the end of the course the students will be able to

CO1: Understand the elementary idea of atmosphere

CO2: Explain the physical structure and composition of the atmosphere.

CO3: Understand the concepts of cyclones and anticyclones and their characteristics.

CO4: Measure wind speed and it direction, humidity, clouds and rainfall.

CO5: Understand the absorption and emission scattering in atmosphere.

CO6: Understand the global weather systems.
CO7: Have the knowledge of global warming and environmental issues related to climate.
CO8: Know the basics of weather forecasting.

Reference books:

1. I.C. Joshi, Aviation Meteorology, 3rd edition 2014, Himalayan Books
2. Stephen Burt, The weather Observers Hand book, 2012, Cambridge University Press.
3. S.R. Ghadekar, Meteorology, 2001, Agromet Publishers, Nagpur.
4. S.R. Ghadekar, Text Book of Agrometeorology, 2005, Agromet Publishers, Nagpur.
5. Charls Franklin Brooks, Why the weather, 1924, Chpraman & Hall, London.
6. John G. Harvey, Atmosphere and Ocean, 1995, The Artemis Press.

	NATIONAL SERVICE SCHEME - I	L	T	P	Credits
		0	0	0	2

Unit -I: Introduction and Basic Concepts of NSS **0 4**

a) History, philosophy, aims & objectives of NSS
b) Emblem, flag motto, song, badge etc.,
c) Organizational structure, roles and responsibilities of various NSS Functionaries

Unit-II: NSS Programmes and Activities **10**

a) Concept of regular activities, special camping, Day Camps
b) Basis of adoption of village/slums, Methodology of conducting Survey
c) Financial pattern of the scheme
d) Other youth prog./schemes of GOI
e) Coordination with different agencies
f) Maintenance of Diary

Unit-III: Understanding Youth **05**

a) Definition, profile of youth, categories of youth
b) Issues, challenges and opportunities for youth
c) Youth as an agent of social change

Unit-IV: Community Mobilization **09**

a) Mapping of community stakeholders
b) Designing the message in the context of the problem and culture of the community
c) Identifying methods of mobilization
d) Youth – adult partnership

Unit -V: Volunteerism and Shramdan **07**

a) Indian Tradition of volunteerism
b) Needs &Importance of volunteerism
c) Motivation and Constraints of Volunteerism
d) Shramdan as a part of volunteerism

Total: 35 hours

	NATIONAL SERVICE SCHEME - II	L	T	P	Credits
		0	0	0	2

Unit-I: Importance and Role of Youth Leadership **06**

a) Meaning and types of leadership

b) Qualities of good leaders; traits of leadership c) Importance and role of youth leadership

Unit-II: Life Competencies **11**

a) Definition and importance of life competencies b) Communication

c) Inter Personal

d) Problem – solving and decision-making

Unit-III: Social Harmony and National Intergration **09**

a) Indian history and culture

b) Role of youth in peace-building and conflict resolution c) Role of youth in Nation building

Unit-IV: Youth Development Programmes in India **09**

a) National Youth Policy

b) Youth development Programmes at the National level, State Level and Voluntar y sector

c) Youth-focused and Youth –led organizations

Total: 35 hours

Project work /Practical

Conducting Surveys on special theme and preparing a report thereof.

	NATIONAL SERVICE SCHEME - I	L	T	P	Credits
		0	0	0	2

Unit – I: Citizenship **07**

a) Basic Features of constitution of India
b) Fundamental Rights and
Duties c) Human Rights
d) Consumer awareness and the legal rights of the consumer RTI

Unit – II: Family and Society **06**

a) Concept of family, community,(PRIs and other community-based Organizations and society b) Growing up in the family – dynamics and impact
c) Human Values
d) IV Gender justice

Unit – III: Health, Hygiene & sanitation **07**

a) Definition, needs and scope of health education
b) Food and Nutrition
c) Safe drinking water, waterborne diseases and sanitation (swatch Bharat Abhiyan)
d) National Health
Programme e)
Reproductive Health

Unit – IV: Youth Health **06**

a) Healthy lifestyles
b) HIV AIDS, Drugs and
substance abuse c) Home Nursing
d) First Aid

Unit – V: Youth and Yoga **09**

a) History, Philosophy and concept of yoga
b) Myths and misconceptions about yoga
c) Different yoga traditions and their Impacts
d) Yoga as a preventive, Primitive and curative
method e) Yoga as a tool for healthy; lifestyle

Total: 35 hours

Project work / practical 40
marks
Preparation of research project report.

SYLLABUS
LANGUAGE COURSES

15LTA001 தமிழ் மொழி, இலக்கிய வரலாறு – அறிமுகம் - 5004

நோக்கம்: தமிழ்மொழி மற்றும் இலக்கியத்தின் வரலாற்றை அறிமுகம் செய்யும் நோக்கில் இப்பாடம் வடிவமைக்கப்பட்டுள்ளது. தமிழ்மொழியின் வரலாற்றை அறிவியல் கண்ணோட்டத்துடனும் மொழிக்குடும்பங்களின் அடிப்படையிலும்விளக்குகிறது. சங்க இலக்கியம் தொடங்கி, இக்கால இலக்கியம் வரையிலான தமிழிலக்கிய வரலாற்றை இலக்கிய வரலாறு அறிமுகப்படுத்துகின்றது. அரசு வேலை வாய்ப்பிற்கான போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையிலும் இப்பாடம் அமைந்துள்ளது.

அலகு 1தமிழ் மொழி வரலாறு 13 மணி நேரம்

மொழிக்குடும்பம் - இந்திய மொழிக்குடும்பங்கள் - இந்திய ஆட்சி மொழிகள் - திராவிட மொழிக்குடும்பங்கள் - திராவிட மொழிகளின் வகைகள் –திராவிட மொழிகளின் சிறப்புகள் - திராவிட மொழிகளின் வழங்கிடங்கள் - திராவிட மொழிகளுள் தமிழின் இடம் - தமிழ்மொழியின் சிறப்புகள் - தமிழ் பிறமொழித் தொடர்புகள்.

அலகு 2சங்க இலக்கியம் 12 மணி நேரம்

சங்க இலக்கியம் - எட்டுத்தொகை - நற்றிணை - குறுந்தொகை - ஐங்குறுநூறு - பதிற்றுப்பத்து - பரிபாடல் - கலித்தொகை - அகநானூறு - புறநானூறு - பத்துப்பாட்டு – திருமுருகாற்றுப்படை – சிறுபாணாற்றுப்படை – பெரும்பாணாற்றுப்படை – பொருநராற்றுப்படை – மலைபடுகடாம் – குறிஞ்சிப்பாட்டு, முல்லைப்பாட்டு, பட்டினப்பாலை –நெடுநல்வாடை – மதுரைக்காஞ்சி.

அலகு 3அற இலக்கியங்களும் காப்பியங்களும் 11 மணி நேரம்

களப்பிரர் காலம் விளக்கம் – நீதி இலக்கியத்தின் சமூகத்தேவை - பதினெண்கீழ்க்கணக்கு நூல்கள் அறிமுகம் - திருக்குறள், நாலடியார்.

காப்பியங்கள் – ஐம்பெருங்காப்பியங்கள் மற்றும் ஐஞ்சிறுங்காப்பியங்கள் அறிமுகம்–காப்பிய இலக்கணம் - சிலப்பதிகாரம் – மணிமேகலை – சீவகசிந்தாமணி – வளையாபதி – குண்டலகேசி.

அலகு 4பக்தி இலக்கியங்களும் சிற்றிலக்கியங்களும் 11 மணி நேரம்

தமிழகப் பக்தி இயக்கங்கள் - பக்தி இலக்கியங்கள் - சைவ இலக்கியம் - நாயன்மார்கள் அறுபத்து மூவர் - சமயக்குரவர் நால்வர் - வைணவ இலக்கியம் - பன்னிரு ஆழ்வார்கள் - முதல் மூன்று ஆழ்வார்கள்.

சிற்றிலக்கியக் காலம் - சிற்றிலக்கியங்கள் - வகைகள் - பரணி - கலிங்கத்துப்பரணி - குறவஞ்சி - குற்றாலக் குறவஞ்சி - பிள்ளைத்தமிழ் - மீனாட்சியம்மைப் பிள்ளைத்தமிழ் - தூது - தமிழ்விடு தூது - கலம்பகம் - நந்திக்கலம்பகம் - பள்ளு - முக்கூடற்பள்ளு.

அலகு 5இக்கால இலக்கியங்கள் 13 மணி நேரம்

நவீன காலம் – நவீன இலக்கியம் – உள்ளடக்கம் - புதுக்கவிதை - தோற்றமும் வளர்ச்சியும்- நாவல் - முதல் மூன்று நாவல்கள் – நாவலின் வகைகள் - பொழுது போக்கு நாவல்கள் - வரலாற்று நாவல்கள் - சமூக நாவல்கள் - இக்கால நாவல்கள் - மொழிபெயர்ப்பு நாவல்கள் - சிறுகதை –வகைகளும் வளர்ச்சியும் – நாடகம் –காலந்தோறும் நாடகங்கள் - புராண இதிகாச நாடகங்கள் - சமூக நாடகங்கள் - வரலாற்று நாடகங்கள் – மொழிபெயர்ப்பு நாடகங்கள் - நகைச்சுவை நாடகங்கள்.

மொத்தம்: 60 மணி நேரம்

கல்வித்திட்டப் பயன்கள் (Programme Outcome): தமிழிலக்கிய வரலாற்றை முழுவதும் அறிமுக நிலையில் அறிந்துகொள்ளும் வகையில் இப்பாடத்திட்டம் பயனுடையதாக அமைகிறது. அரசுத் தேர்வுகள், பொது அறிவுப் போட்டிகள் போன்ற தமிழ் சார்ந்த இயங்குதளங்களில் இந்தப் பாடத்திட்டம் பயன்பாடுடையதாக அமையும்.

பார்வை நூல்கள்

1. அகத்தியலிங்கம். ச., “திராவிடமொழிகள் தொகுதி 1”, மணிவாசகர் பதிப்பகம், முதற்பதிப்பு, 1978.
2. சக்திவேல். சு., “தமிழ்மொழி வரலாறு”, மணிவாசகர் பதிப்பகம், முதற்பதிப்பு 1998.
3. பூவண்ணன், “ தமிழ் இலக்கிய வரலாறு”, சைவசித்தாந்த நூற்பதிப்புக் கழகம், முதற்பதிப்பு, 1998.
4. வரதராசன். மு., ”இலக்கிய வரலாறு”,சாகித்ய அகாதெமி, ஒன்பதாம் பதிப்பு, 1994.
5. விமலானந்தம். மது.ச., “இலக்கிய வரலாறு”, பாரி நிலையம், மறுபதிப்பு, 2008.

15LTA002 தமிழிலக்கியம் -5004

நோக்கம்: சங்க காலம் தொடங்கி தற்காலம் வரையிலும் தமிழில் உள்ள படைப்பிலக்கியங்களை இப்பாடம் அறிமுகம் செய்கின்றது. தமிழ் இலக்கியத்தில் தேர்ந்தெடுக்கப்பட்ட மிக முக்கியமான செய்யுட்கள், கவிதைகள், கதைகள், உரைநடை ஆகியவற்றைக்கொண்டு இப்பாடம் கட்டமைக்கப்பட்டுள்ளது. மாணாக்கரிடம் இலக்கியத் தேடலை உருவாக்குவதும், தற்சார்புடைய அறிவை மேம்படுத்துவதும் இப்பாடத்தின் நோக்கமாகும்.

அலகு 1 செவ்வியல் இலக்கியங்கள் 12 மணி நேரம்

திருக்குறள்- அன்புடைமை, ஒழுக்கமுடைமை, பெரியாரைத்துணைக்கோடல் –மூன்று அதிகாரங்கள் முழுமையும்.

புறநானூறு- பாடல் எண்: 18, 55, 182, 183, 192 –ஐந்து பாடல்கள்.

குறுந்தொகை- பாடல் எண்: 2, 167, 27, 202, 184 - ஐந்து பாடல்கள்.

அலகு 2 காப்பியங்கள் 12 மணி நேரம்

சிலப்பதிகாரம்- கனாத்திறம் உரைத்தக் காதை முழுவதும்.

மணிமேகலை- பவத்திறம் அறுக எனப் பாவை நோற்ற காதை முழுவதும்.

கம்பராமாயணம் - மந்தரைச் சூழ்ச்சிப்படலம் (தேர்ந்தெடுக்கப்பட்ட ஒன்பது பாடல்கள்).

அலகு 3 கவிதையும் புதுக்கவிதையும் 11 மணிநேரம்

பாரதிதாசனின் ‘தமிழியக்கம்’ -(i) நெஞ்சு பதைக்கும் நிலை - (ii) இருப்பதைவிட இறப்பது நன்று - இரண்டு கவிதைகள்.

ஈரோடு தமிழன்பனின், “அந்த நந்தனை எரித்த நெருப்பின் மிச்சம்” என்னும் தொகுதியில் இடம்பெற்றுள்ள ‘விடிகிறது’ என்னும் புதுக்கவிதை.

அலகு 4 சிறுகதைகள் 12 மணி நேரம்

தி. ஜானகிராமனின் ‘சக்தி வைத்தியம்’

கி. ராஜநாராயணனின்‘கதவு’ - இரண்டு கதைகள்

அலகு 5 உரைநடை 13 மணி நேரம்

வைரமுத்து எழுதிய ‘சிற்பியே உன்னைச் செதுக்குகிறேன்’ முழுவதும்

மொத்தம்: 60 மணி நேரம்

கல்வித்திட்டப் பயன்கள் (Programme Outcome): சங்க இலக்கியம் தொடங்கி இக்கால இலக்கியம் வரையில் அமைந்த இலக்கியங்களின் அறிமுகமாக ஒருசில இலக்கியங்களில் இருந்து பாடப்பகுதிகள் தேர்வு செய்யப்பட்டு தமிழிலக்கியம் என்ற தலைப்பில் மாணவர்களுக்குக் கற்பிக்கப்படுகிறது. இவை இலக்கிய வெளிப்பாட்டுத் தன்மையை உணர்த்துவதாக அமைகிறது.

பாட நூல்கள்

1. இரவிச்சந்திரன். சு. (ப.ஆ), “செய்யுள் திரட்டு”, வேல்ஸ் பல்கலைக்கழகம், முதற்பதிப்பு, 2008.
2. வைரமுத்து. இரா., “சிற்பியே உன்னைச் செதுக்குகிறேன்”, திருமகள் நிலையம், பதினேழாம் பதிப்பு, 2007.

பார்வை நூல்கள்

1. பாலச்சந்திரன்.சு., “இலக்கியத் திறனாய்வு”, நியூ செஞ்சுரி புக் ஹவுஸ், பத்தாம் பதிப்பு, 2007.
2. மாதையன்.பெ., “தமிழ்ச் செவ்வியல் படைப்புகள்”, நியூ செஞ்சுரி புக் ஹவுஸ், முதல் பதிப்பு, 2009.
3. வரதராசன்.மு., “குறள் காட்டும் காதலர்”, பாரி நிலையம், மறுபதிப்பு, 2005.

15LTA003 பயன்பாட்டுத் தமிழ் -5004

நோக்கம்: தற்கால அன்றாடத்தேவைக்குரிய வகையில் தமிழ்மொழியைச் செம்மையாகப் பயன்படுத்த வேண்டும் என்னும் நோக்கில் இப்பாடம் உருவாக்கப்பட்டுள்ளது. மாணாக்கரின் வேலைவாய்ப்பு நேர்காணல்கள் மற்றும் குழு உரையாடல்களை எதிர்கொள்வதற்கேற்ற பேச்சுத்திறன் மேம்பாடு, செய்தித்தாள்களை நுட்பமாக அணுகும்விதம், சிறந்த கடிதங்களை எழுதுவதற்கான பயிற்சி போன்ற பயன்பாடு சார்ந்த மொழிப்பயிற்சியை இப்பாடம் அளிக்கின்றது.

அலகு 1 மொழி 11 மணி நேரம்

பிழை நீக்கி எழுதுதல் - ஒற்றுப்பிழை நீக்கி எழுதுதல் - தொடர்பிழை நீக்கி எழுதுதல் - ஒற்று மிகும் இடங்கள் - ஒற்று மிகா இடங்கள் - பிற மொழிச் சொற்களை நீக்கி எழுதுதல் – பயிற்சிகள்.

அலகு 2 பேச்சு 13 மணி நேரம்

பேச்சுத்திறன் – விளக்கம் – பேச்சுத்திறனின் அடிப்படைகள் - வகைகள் – மேடைப்பேச்சு - உரையாடல் - குழுவாக உரையாடல் – பயிற்சிகள்.

தலைவர்களின் மேடைப் பேச்சுகள் - பெரியார் - அண்ணா - கலைஞர்.

அலகு 3 எழுதுதிறன் 12 மணி நேரம்

கலைச்சொல்லாக்கம் - தேவைகள் - கலைச்சொற்களின் பண்புகள் - கலைச்சொல்லாக்கத்தில் தவிர்க்க வேண்டியவை - அறிவியல் கலைச்சொற்கள்.

கடிதம் - வகைகள் - அலுவலகக் கடிதங்கள் - பயிற்சி - அறிஞர்களின் கடிதங்கள் - கடிதங்களின் வழி கற்பித்தல் - சில அறிஞர்களின் கடிதங்கள் - நேரு...,

அலகு 4 மொழிபெயர்ப்பு 13 மணி நேரம்

மொழிபெயர்ப்பு அடிப்படைக் கோட்பாடுகள் - மொழிபெயர்ப்பு முறைகள் - மொழிபெயர்ப்பாளரின் தகுதிகள்.

மொழிபெயர்ப்பு வகைகள் - சொல்லுக்குச் சொல் மொழிபெயர்த்தல் - தழுவல் - கட்டற்ற மொழிபெயர்ப்பு - மொழியாக்கப்படைப்பு - இயந்திர மொழிபெயர்ப்பு - கருத்துப்பெயர்ப்பு - மொழிபெயர்ப்பு நடை - மொழிபெயர்ப்பு சிக்கல்களும் தீர்வுகளும்.

பயிற்சி: அலுவலகக் கடிதங்களை மொழிபெயர்த்தல் (ஆங்கிலத்திலிருந்து தமிழுக்கு).

அலகு 5 இதழியல் பயிற்சி 11 மணி நேரம்

இதழ்களுக்குத் தலையங்கம் எழுதுதல் - நூல் மதிப்புரை எழுதுதல் - சாதனையாளரை நேர்காணல் - நிகழ்ச்சியைச் செய்தியாக மாற்றுதல்.

மொத்தம்: 60 மணி நேரம்

கல்வித்திட்டப் பயன்கள் (Programme Outcome): நவீனக் காலத்திற்கும் தேவைக்கும் ஏற்றவாறு மொழியின் தேவையை மாணவர்கள் சரிவர அறிந்து கொள்ள வேண்டும் என்ற நோக்கில் பயன்பாட்டுத் தமிழ் என்ற பாடப்பகுதி அமைக்கப்பட்டுள்ளது. தவறின்றித் தமிழ் எழுதவும் அறிவியல் கலைச் சொற்களை உருவாக்கவும் பேச்சுத் திறனை வளர்ப்பதற்காகவும் மொழிபெயர்ப்பு, இதழியல் சார்ந்த அறிவினைப் பெறுவதற்கும் அந்தந்த துறை சார்ந்த பணிகளில் வேலை வாய்ப்பு பெறுவதற்கும் இப்பாடத்திட்டம் பயன்படுகிறது.

பார்வை நூல்கள்

1. ஈஸ்வரன்.ச., சபாபதி.இரா., "இதழியல்", பாவை பப்ளிகேஷன்ஸ், முதற்பதிப்பு, 2004.

2. ஈஸ்வரன்.ச., "மொழிபெயர்ப்பியல்", பாவை பப்ளிகேஷன்ஸ், முதற்பதிப்பு, 2005.

3. எட்கர் தார்ப், ஷோவிக் தார்ப், "நேர்முகத் தேர்வில் வெற்றிபெற", கிழக்குப் பதிப்பகம், இரண்டாம் பதிப்பு, 2009.

4. சுப்பிரமணியன்.பா.ரா., ஞானசுந்தரம்.வ., (ப.ஆ)"தமிழ்நடைக் கையேடு", இந்தியமொழிகளின் நடுவண் நிறுவனம், மைசூர் மொழி அறக்கட்டளை மற்றும் தஞ்சைத்தமிழ்ப் பல்கலைக்கழகம் - வெளியீடு, நான்காம் மீள்பதிப்பு, 2010.

5. சுப்புரெட்டியார்.ந., "தமிழ் பயிற்றும் முறை", மெய்யப்பன் பதிப்பகம், ஐந்தாம் பதிப்பு, 2006.

15LTA004 தமிழர் நாகரிகமும் பண்பாடும் - 5004

நோக்கம்: பண்டைத் தமிழரின் வாழ்வியல் நெறிகள் இயல்பானதும் இயற்கையோடு இணங்கிச் செல்வதுமாகும்; மிகவும் பழமையானதும் பண்பட்டதுமாகும். அன்பான அக வாழ்க்கையைக்கூட செம்மையாகத் திட்டமிட்டுள்ளனர். பொழுதுபோக்கு, போர்முறைகள், கலை, சமயம், அரசியல், அறிவியல் என அனைத்திலும் தமிழர் சிறந்து விளங்குவதை விளக்கும் பாடமாக இது அமைந்துள்ளது. அரசு வேலை வாய்ப்பிற்கான போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையிலும் இப்பாடம் அமைந்துள்ளது.

அலகு 1 நாகரிகம், பண்பாடு 12 மணி நேரம்

சொற்பொருள் விளக்கம் - பண்டைத் தமிழர் வாழ்வியல் - அகம் - களவு - கற்பு - குடும்பம் - விருந்தோம்பல் - உறவு முறைகள் - சடங்குகள் - நம்பிக்கைகள் - பொழுதுபோக்கு - புறம் - போர் முறைகள் - நடுகல் வழிபாடு - கொடைப்பண்பு.

அலகு 2 கலைகள் 12 மணி நேரம்

சிற்பம் - ஓவியம் - இசை - கூத்து - ஒப்பனை - ஆடை அணிகலன்கள்.

அலகு 3 சமயம் 12 மணி நேரம்

சைவம் - வைணவம் - சமணம், பௌத்தம் வெளிப்படுத்தும் பண்பாடு.

அலகு 4 அரசியல் 12 மணி நேரம்

அரசு அமைப்பு - ஆட்சி முறை - உள்நாட்டு வணிகம் - வெளிநாட்டு வணிகம் - வரி வகைகள் - நாணயங்கள் - நீதி முறை.

அலகு 5 அறிவியல் 12 மணி நேரம்

கல்வி - வேளாண்மை - வானியல் அறிவு - மருத்துவம் - கட்டிடக்கலை.

மொத்தம்: 60 மணி நேரம்

கல்வித்திட்டப் பயன்கள் (P rogramme Outcome): தமிழர்களின் வாழ்வியல் முறைகள், தொன்மை, நாகரிகம், பண்பாட்டு முறைகளைப் பற்றி இலக்கியங்களின் வழித் தெரிந்துகொள்ளும் நோக்கில் இப்பாடத்திட்டம் உருவாக்கப்பட்டுள்ளது. அரசுப் பணி சார்ந்த தேர்வுகளுக்கும், போட்டித் தேர்வுகளுக்கும் இப்பாடப்பகுதி உறுதுணையாக அமையும்.

பார்வை நூல்கள்

1. கே.கே. பிள்ளை, "தமிழக வரலாறு: மக்களும் பண்பாடும்", உலகத் தமிழாராய்ச்சி நிறுவனம், மீள்பதிப்பு, 2009.

2. பக்தவச்சல பாரதி, "தமிழர் மானிடவியல்", அடையாளம், இரண்டாம் பதிப்பு, 2008.

3.தட்சிணாமூர்த்தி. அ., "தமிழர் நாகரிகமும் பண்பாடும்",யாழ் வெளியீடு, மறுபதிப்பு, 2011.

4. தேவநேயப்பாவாணர். ஞா., "பழந்தமிழர் நாகரிகமும் பண்பாடும்", தமிழ்மண் பதிப்பகம், சென்னை.

5. வானமாமலை.நா., "தமிழர் வரலாறும் பண்பாடும்", நியூ செஞ்சுரி புக் ஹவுஸ், ஆறாம் பதிப்பு, 2007.