GURU NANAK COLLEGE
(AUTONOMOUS)

VELACHERY ROAD, CHENNAI – 600042

(Re-accredited at 'A-Grade' by NAAC) Affiliated to University of Madras

B.Sc (Physics)

(SEMESTER PATTERN WITH CHOICE BASED CREDIT SYSTEM)

SYLLABUS

(For the candidates admitted for the Academic year 2022-23 and thereafter)

PREAMBLE

Study of physics is very important for a student of science. Physics, a core discipline is the fundamental and foremost to all natural sciences. It is that branch of science that provides answers to the questions largely depending on the behavior of non-living things in nature. Starting from producing fire by rubbing two stones to the theory of relativity, is a vast ocean of knowledge. In every appliance, we come across in everyday life, starting from a small pin to a rocket, basic principles of physics are used. A pin is based on the principle of wedge and the ascent of a rocket is based on the principle of newtons third law of motion. Physics provides the base for a deeper understanding of nature and enable to follow new development not only in basic science but also in applied technology. Physics interact with the society and other discipline such as Medicine ,Chemistry , Agriculture , Engineering etc.. in many important ways. The physics education is to provide the student with a broad understanding of the physical principles of the universe, to help them develop critical thinking and quantitative reasoning skills to empower them to think creatively. Elective courses focus on overall professional development by inculcating leadership and communication skills. The curriculum for B.sc degree in physics based on learning outcome based curriculum of framework (LOCF) model covers a fascinating range of fundamental topics. The learning outcome of the subject are intended to provide a deeper understanding of principles of physics combined with developing the required practical skills. As the curriculum framed is based on the syllabus of the national level entrance examinations like Joint Admission Test for masters (JAM)and Joint Entrance screening test(JEST),it will support the students to complete in competitive examinations for their post graduation studies. They can enrich their knowledge in the field of their choice by taking up IDE paper. This program gives the provision to the students to undergo an internship program during the course of the study. Students in turn can each academic credits. This program provides entrepreneurship required for building their career in the appropriate fields of interest.

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK
From the Academic Year (2022-23) and thereafter

VISION

1. Inculcate the conceptual knowledge in Physics and make them skillful using "State of Art" teaching methodology.
2. Provide a transformative learning and research ambiance with the inclusion of all the weaker sections of the society by igniting and nurturing enthusiasm, interests and passion in the study of physics to generate new knowledge and to serve the globe.
3. Igniting the spirit of learning to gain scientific skills and keep up with ongoing scientific development and exploring its area of research, thriving towards excellency ascribed with ethical values.

MISSION

1. To impart quality education in theoretical as well as experimental physics with special emphasis on 'learning by doing' to promote Science and technology.
2. To kindle the young minds to be the champions of physics and discover their talents through dedication to teaching commitment towards students and innovative instructional methods like PowerPoint presentations and visual aids.
3. To provide an exciting learning opportunity for non-physics and non-science programme that provides a basic understanding of physics and problem-solving skills.
4. To organize outreach activities to promote scientific culture.

PROGRAMME OUTCOME

PO 1: Interpret the motion and behavior of matter through space and time, using related concepts.

PO 2: Establishes the "validity of Physical theories in a Scientific Method".

PO 3: Develop a methodical approach to compare the implications of a theory with the conclusions drawn from its related experiments.

PO 4: Analyse the Observations to test the validity of a theory in a logical, unbiased, and repeatable way.

PO 5: Update the students to the need of the hour through Integrated electronics and Microprocessors and Microcontrollers

PROGRAMME SPECIFIC OUTCOME

The students at the time of graduation will be able to

PSO1: Prepare the students for higher studies and Research through Numerical analysis and mathematical methods involved in physics

PSO2 : Subject wisdom gained for multitasking that is required for facing challenges in the competitive world

B.Sc., DEGREE COURSE IN PHYSICS
Course structure for 2020– 2023 batch

Semester	Part	Course Component	Subject Code	Subject Name	Credits	Hours	Max. Marks		
							CIA	ESE	Total
Semester I	I	LANGUAGE - I		TAMIL - I	3	6	50	50	100
				HINDI - I					
	II	ENGLISH		ENGLISH I	3	4	50	50	100
	III	CORE – 1		MECHANICS AND PROPERTIES OF MATTER	4	5	50	50	100
		CORE PRACTICAL - I		PRACTICAL GENERAL I	*	3	*	*	*
		ALLIED - I		ALLIED CHEMISTRY -I	4	5	50	50	100
		ALLIED PRACTICAL- I		ALLIED CHEMISTRY PRACTICAL-I	*	3	*	*	*
	IV	NME**		BASIC TAMIL - I	2	2	-	100	100
				BASIC HINDI - I					
				ASTRO PHYSICS**					
		SOFT SKILL		INTRODUCTION TO STUDY SKILLS	3	2	-	100	100
	CREDIT TOTAL = 19; TOTAL HOURS =30								
Semester II	I	LANGUAGE -II		TAMIL – II	3	6	50	50	100
				HINDI - II					
	II	ENGLISH		ENGLISH - II	3	4	50	50	100
	III	CORE THEORY - 2		THERMAL PHYSICS & ACOUSTICS	4	5	50	50	100
		CORE PRACTICAL - I		PRACTICAL GENERAL I	4	3	50	50	100
		ALLIED - II		ALLIED CHEMISTRY – II	4	5	50	50	100
		ALLIED PRACTICAL-I		ALLIED CHEMISTRY PRACTICAL -II	2	3	50	50	100
	IV	NME**		BASIC TAMIL - II	2	2	-	100	100
				BASIC HINDI - II					
				**NON-CONVENTIONAL ENERGY SOURCES					
		SOFT SKILL		LIFE SKILLS	3	2	50	50	100
	CREDIT TOTAL = 25; TOTAL HOURS =30								
Semester III	I	LANGUAGE - III		TAMIL - III	3	6	50	50	100
				HINDI - III					
	II	ENGLISH		ENGLISH - III	3	4	50	50	100
	III	CORE THEORY - 3		OPTICS AND SPECTROSCOPY	4	5	50	50	100
		CORE PRACTICAL - 2		PRACTICAL GENERAL - II	*	3	*	*	*
		ALLIED –II		MATHEMATICS - I	5	8	50	50	100
	IV	SOFT SKILL		JOB ORIENTED SKILLS	3	2	50	50	100
		EVS		ENVIRONMENTAL STUDIES	*	2	*	*	*
	CREDIT TOTAL = 18; TOTAL HOURS = 30								

Semester	Part	Course Component	Subject Code	Subject Name	Credits	Hours	Max. Marks		
							CIA	ESE	Total
Semester IV	I	LANGUAGE -IV		TAMIL - IV	3	6	50	50	100
				HINDI - IV					
	II	ENGLISH		ENGLISH - IV	3	4	50	50	100
	III	CORE THEORY - 4		ELECTRICITY AND ELECTROMAGNETISM	4	5	50	50	100
		CORE PRACTICAL- 2		PRACTICAL GENERAL - II	4	3	50	50	100
		ALLIED - II		MATHEMATICS - II	5	8	50	50	100
	IV	EVS		ENVIRONMENTAL STUDIES	2	2	-	100	100
		SOFT SKILL		COMPUTING SKILL	3	2	50	50	100
		CREDIT TOTAL = 24; TOTAL HOURS = 30							
Semester V	III	CORE THEORY - 5		ATOMIC PHYSICS	4	5	50	50	100
		CORE THEORY - 6		NUCLEAR PHYSICS AND PARTICLE PHYSICS	4	5	50	50	100
		CORE THEORY - 7		SOLID STATE PHYSICS AND ELECTRONICS	4	5	50	50	100
		Inter-Disciplinary Elective (IDE)		INTRODUCTION TO INTEGRATED ELECTRONICS	5	5	50	50	100
		CORE PRACTICAL- 3		PRACTICAL GENERAL - III	*	2	*	*	*
		CORE PRACTICAL - 4		PRACTICAL ELECTRONICS - I	*	2	*	*	*
		CORE PRACTICAL - 5		MICRO PROCESSOR AND INTEGRATED ELECTRONICS - PRACTICAL	*	2	*	*	*
		ELECTIVE - 1		NUMERICAL METHODS ***	4	4	50	50	100
	IV			VALUE EDUCATION	2		50	50	100
				INTERNSHIP	2				
		CREDIT TOTAL = 25; TOTAL HOURS = 30							
Semester VI	III	CORE THEORY - 8		RELATIVITY AND QUANTUM MECHANICS	5	6	50	50	100
		CORE THEORY- 9		MATHEMATICAL METHODS IN PHYSICS	5	6	50	50	100
		ELECTIVE – 2		INTEGRATED ELECTRONICS ***	5	6	50	50	100
		ELECTIVE - 3		MICROPROCESSOR FUNDAMENTALS***	5	6	50	50	100
		CORE PRACTICAL - 3		PRACTICAL GENERAL - III	4	2	50	50	100
		CORE PRACTICAL - 4		PRACTICAL ELECTRONICS - I	4	2	50	50	100
		CORE PRACTICAL- 5		MICRO PROCESSOR AND INTEGRATED ELECTRONICS – PRACTICAL	2	2	50	50	100
	IV			EXTENSION ACTIVITIES	1				
		CREDIT TOTAL = 31; TOTAL HOURS = 30							
		OVERALL CREDIT TOTAL = 142 / OVERALL HOURS TOTAL = 180							

* The Practical Examinations will be conducted at the end of even semester.

** The Students must choose one NME paper in semester – I and one NME paper in semester – II offered by Physics Programme.

NME Courses offered by the department of Physics to other departments:

1. Astrophysics
2. Everyday Physics
3. Basic Physics
4. Non-Conventional Energy Sources

*** The student must choose one Elective paper in Semester – V and Two Elective papers in Semester - VI from the list of offered electives.

SEMESTER - I

CORE THEORY –1: MECHANICS AND PROPERTIES OF MATTER

SUBJECTCODE:	THEORY	MARKS: 100
SEMESTER: I	CREDITS: 4	TOTAL HOURS: 75

COURSE FRAMEWORK:

To make the students understand dynamics behind collisions and oscillations

COURSE OUTCOME:

Learning outcome: On completion of the course, the student will be able to

1: Understand the basic mechanism behind collisions and material properties.

2: Identify the materials suitable for construction of buildings, based on the moduli of elasticity.

3: Analyse the materials strength in terms of their size and shape.

4: Detail fluid dynamics that give the fundamental knowledge over many practical applications

5: Calculate the dynamic properties of materials experimentally.

UNIT 1 : Impulse and Impact (15 Hours)

Impulse – impact – Laws of impact – direct impact and oblique impact between two smooth spheres – loss of kinetic energy – motion of two interacting bodies – reduced mass.

Rigid body dynamics

Compound pendulum – theory – equivalent simple pendulum – reversibility of centres of oscillation and suspension – determination of g and k – centre of mass – velocity and acceleration of centre of mass – determination of motion of individual particle – system of variable mass.

UNIT 2 : Centre of gravity and centre of pressure (15 Hours)

Centre of gravity of solid tetrahedron, solid and hollow hemisphere – Centre of pressure – vertical rectangular lamina – vertical triangular lamina.

Hydrodynamics

Equation of continuity of flow – Venturimeter – Euler's equation of unidirectional flow – Torricelli's theorem – Bernoulli's theorem and its applications.

UNIT 3: Elasticity (15 Hours)

Hooke's Law – Stress – Strain - Elastic constants – Expressions for Poisson's ratio in terms of elastic constants – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion – torsional pendulum – rigidity modulus and moment of inertia.

UNIT 4: Bending of beams (15 Hours)

Cantilever – expression for bending moment – expression for depression – cantilever oscillations – Expression for time period – Experiment to find Young's modulus – Non uniform bending – Experiment to determine Young's modulus by Koenig's method – uniform bending – expression for elevation – experiment to determine Young's modulus using microscope.

UNIT 5: Fluid dynamics (15 Hours)

Surface tension: Definition – Excess of pressure over curved surface – Application to spherical and cylindrical drops and bubbles – variation of surface tension with temperature – Jaeger's method

Viscosity: Definition – Coefficient of viscosity – Rate of flow of liquid in a capillary tube – Poiseuille's formula – variation of viscosity of a liquid with temperature – Application.

BOOKS FOR STUDY

1. Mechanics – Part I and II by Narayanamoorthy, National Publishing Company.
2. Mechanics by D.S.Mathur, S.Chand & Co., 2nd Edition (2001).
3. Mechanics by P. Duraipandian, Laxmi Duraipandian, Muthamizh Jayapragasam, S.Chand & Co., New Delhi (1988).
4. Properties of Matter by Brij Lal and N.Subramaniam, S. Chand & Co., New Delhi (1994).
5. Properties of Matter by R.Murugeshan, S. Chand & Co., New Delhi (2001).

BOOKS FOR REFERENCE

1. General Properties of Matter by C.J. Smith, Orient Longman Publishers (1960).
2. Fundamentals of Physics by D. Halliday, R.Rensick and J. Walker, 6th edition, Wiley, NY (2001).
3. Mechanics and General Properties of Matter by P.K. Chakrabarthy, Books and Allied (P) Ltd. (2001).
4. Fundamentals of General Properties of Matter by H.R.Gulati, S. Chand & Co., New Delhi (1982).

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

SEMESTER - II

CORE THEORY –1: THERMAL PHYSICS AND ACOUSTICS

SUBJECTCODE:	**THEORY**	**MARKS: 100**
SEMESTER: II	**CREDITS: 4**	**TOTAL HOURS: 75**

COURSE FRAMEWORK:
To enlighten the students on thermodynamics and transmission of heat

COURSE OUTCOME:
Learning outcome: On completion of the course, the student will be able to

1: Understand different measurement techniques in thermometry, laws of thermodynamics and heat engines.

2: Calculate Transmission of heat through different media.

3: Understand the basic oscillatory motion

4: Measure the intensity of sound and hence can analyse the Acoustics of buildings.

5: Produce ultrasonics experimentally in different ways

UNIT 1: Thermometry and Calorimetry (15 Hours)

Platinum resistance thermometer – Calendar and Griffith's bridge – Thermistor – Specific heat capacity – Specific heat capacity of solids – Dulong and Petit's law – Specific heat capacity of liquid – method of mixtures – Barton's correction – Specific heat capacity of gases – C_p and C_v by Regnault's and Callendar & Barne's methods.

Low temperature physics:

Joule-Kelvin effect – porous plug experiment – liquefaction of gases – Linde's method of liquefying air

UNIT 2: Thermodynamics (15 Hours)

Thermodynamic equilibrium – zeroth law of thermodynamics – first law of thermodynamics – Reversible and irreversible processes – second law of thermodynamics-Heat engine – Carnot's engine – Carnot's theorem – Internal combustion engines – petrol and diesel engines – thermodynamics scale of temperature- Entropy – entropy and available energy – temperature – entropy diagram for Carnot's cycle - III Law of thermodynamics – Nernst's heat theorem.

UNIT 3: Conduction and Radiation (15 Hours)

Thermal conductivity – rectilinear flow of heat – thermal conductivity of a good conductor – Forbe's method – thermal conductivity of a bad conductor – Lee's disc method – radiation – blackbody radiation – Wien's law – Stefan's law – Newton's law of cooling from Stefan's law – Solar constant – Pyrometer – Pyroheliometer.

UNIT 4: Waves and oscillations **(15 Hours)**

Simple harmonic motion - combination of two SHMs in a straight line – at right angles – Lissajous's figures – free, damped, forced oscillations and resonance – intensity and loudness of sound – intensity level – decibel – noise pollution.

UNIT 5: Ultrasonics

Ultrasonics – production – piezo electric crystal method – magnetostriction method – applications.

Acoustics of buildings – reverberation – Absorption coefficient – Sabine's formula – Acoustics aspects of halls and auditoriums.

BOOKS FOR STUDY

1. Heat and Thermodynamics by D.S.Mathur, 3rd edition Sulthan Chand & Sons, New Delhi (1978).
2. Heat and Thermodynamics by Brijlal and N. Subramanyam, S.Chand & Co, New Delhi (2000).
3. Heat by Narayanamoorthy and KrishnaRao, Triveni Publishers, Madras (1969).
4. Text book of Sound by V.R.Khanna and R.S.Bedi, 1st edition, Kedharnaath Publish & Co, Meerut (1998).
5. Waves and Oscillations by Brijlal and N. Subramanyam, Vikas Publishing house, New Delhi (2001).
6. Text book of Sound by Ghosh, S.Chand & Co, New Delhi (1996).

BOOKS FOR REFERENCE

1. Heat and Thermodynamics by Zemansky, McGraw – Hill Book Co. Inc., New York.
2. Fundamentals of Physics by Resnick Halliday and Walker, 6th edition, , John Willey and Sons, Asia Pvt.Ltd., Singapore.
3. Fundamentals of Thermodynamics by Carroll M.Leonard, Prentice-Hall of India (P) Ltd., New Delhi (1965).
4. Heat and Thermodynamics by J.B.Rajam and C.L.Arora, 8th edition, S.Chand & Co. Ltd., New Delhi (1976).
5. Principles of Thermodynamics by Jin Sheng Hsieh, 1st edition, McGraw – Hill Kogakusha Ltd., Tokyo (1975).
6. Thermodynamics by Warren Giedt, 1st edition, Van Nostrand Reinhold Company, NewYork (1971)

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

CORE Practical – I: PRACTICAL GENERAL - I PHYSICS

SUBJECTCODE:	**PRACTICAL**	**MARKS: 100**
SEMESTER: II	**CREDITS: 4**	**TOTAL HOURS: 75**

COURSE FRAMEWORK:

To make the students skillful in experimentally analysing the physical concepts through practical

COURSE OUTCOME:

1: A working knowledge of fundamental physics and basic mechanics principles.

2: The ability to identify, formulates, and solve physics problems.

3: The ability to formulate, conduct, analyzes and interprets experiments in physics.

4: Have the ability to plan, design, carry out and interpret their findings in scientific experiment.

5: To understand theoretical principles of optics in the experimental method through

1. Young's modulus – Non-uniform bending – Pin & microscope
2. Young's modulus – Uniform bending – Optic lever
3. Rigidity modulus – Torsional pendulum (without identical masses)
4. Rigidity modulus and moment of inertia – Torsional pendulum (With identical masses)
5. Surface tension and interfacial surface tension – drop weight method
6. Coefficient of viscosity of liquid – Graduated burette (radius of capillary tube by Mercury pellet method)
7. Sonometer – Verification of laws and frequency of tuning fork
8. Sonometer – Relative Density of a solid and liquid
9. Specific heat capacity of a liquid – Newton's law of cooling
10. Specific heat capacity of liquid – Method of mixtures (Half-time correction)
11. Focal length, Power, R and refractive index of a long focus convex lens
12. Focal length, Power, R and refractive index of a concave lens
13. Spectrometer – refractive index of a liquid
14. P.O. Box – Temperature coefficient of resistance
15. Potentiometer – Internal resistance

B.Sc. Physics (NON-MAJOR ELECTIVE PAPERS)

Out of the following four elective papers two electives are to be chosen, one each for I & II semester.

1. Astrophysics
2. Everyday Physics
3. Basic Physics
4. Non-conventional Energy Sources

NME : 1. ASTROPHYSICS

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: I	CREDITS: 2	NO.OF HOURS PER WEEK: 2

COURSE FRAMEWORK:

To employ the methods and principles of physics in the study of astronomical objects and phenomena .

COURSE OUTCOME:

1 : Complete study of astronomical instruments

2 : Detailed learning of Solar system

3 : Knowledge on members of the Solar system

4 : Understanding of evolution of stars

5 :To know the basic theories of universe and galaxy

UNIT 1: Astronomical instruments

Optical telescopes-refracting telescope-reflecting telescope- types of reflecting telescopes – detectors and image processing.

UNIT 2: Solar system

The Sun- physical and orbital data-photosphere-chromosphere-corona-solar prominences – sunspot - solar flare- mass of the sun- solar constant- temperature of the sun- sources of solar energy-solar wind.

UNIT 3: Members of the solar system

Mercury – Venus- Earth – Mars – Jupiter- Saturn- Uranus- Neptune- Pluto- Moon – Bode's law – asteroids- comets – meteors.

UNIT 4: Stellar evolution

Birth and death of a star –brightness of a star – stellar distance- Chandrasekar limit- white dwarfs- Neutron stars – black holes- Supernovae.

UNIT 5: Theories of the Universe and Galaxies

Origin of the Universe - the big bang theory- the steady state theory- the oscillating universe theory – Huble's law. Galaxies – types of galaxies- Milky way

BOOKS FOR STUDY :

1. Astrophysics - a modern perspective by K.S.Krishnaswamy, New Age International (P) Ltd, New Delhi (2002).
2. An introduction to Astro physics by Baidyanath Basu, second printing, Prentice – Hall of India (P) Ltd, New Delhi (2001).

BOOKS FOR REFERENCE:

1. Modern Physics by R.Murugeshan, 11th edition, S.Chand & Company Ltd, New Delhi (2003).
2. Astronomy by S.Kumaravelu, Janki Calendar Corporation, Sivakasi (1993).
3. Astronomy by Baker and Fredrick, 9th edition, Van Nostrand reinhold Co, New York (1964).
4. Illustrated World of Science Encyclopedia –Vol I to VIII, Creative World Publications, Chicago
5. Modern Physics by Kenneth S.Krane, John Wiley & Sons Inc., NY (1983).

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 5 out of 08 questions	1 – 08	20	**100**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	1	
	Unit – 2	2	
	Unit – 3	2	
	Unit – 4	1	
	Unit – 5	2	

NME : 2. EVERYDAY PHYSICS

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: I	CREDITS: 2	NO. OF HOURS PER WEEK: 2

COURSE FRAMEWORK:
To make the students understand physics in day to day appliances .

COURSE OUTCOME:

UNIT 1

Physics behind Home appliances – Light bulb – Fan – Hair drier – Television – Air Conditioners – microwave ovens – Vacuum cleaners – Dishwasher – Washing machines

UNIT 2

Basic principles – Tape recorder – Taps – Lifts – Submarines – Jet planes – Helicopters – Rockets – fax machines – Pagers – Cellular phones

UNIT 3

Demonstration – making a switch board with multiple points – wiring – one lamp controlled by one switch/Two switches – fixing a fuse – soldering – P.C.B Preparation

UNIT 4

Study of resistors, chokes, Capacitors and Transformers – multimeter – Basic principles – measurement of resistance, Voltage AC & DC

UNIT 5

Servicing of domestic appliances – iron box – mixie – grinder – motor – emergency lamp

BOOKS FOR STUDY

1. The Learner's series – Everyday science – Published by INFINITY BOOKS, New Delhi
2. The Hindu speaks on Science, Vol I & II, Kasturi Ranga Publishers, Chennai

BOOKS FOR REFERENCE

1. Fundamentals of Physics by D. Halliday, R.Rensick and J. Walker, 6^{th} edition, Wiley, NY (2001).
2. Physics, Vols I, II, III by D.Halliday, R.Resnick and K.S.Krane, 4^{th} Edition, Wiley,New York (1994).
3. The Feymann Lectures on Physics Vols I, II, III by R.P. Feynmann, R.B. Leighton & M. Sands, Narosa, New Delhi (1998).

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 5 out of 08 questions	1 – 08	20	**100**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	1	
	Unit – 2	2	
	Unit – 3	2	
	Unit – 4	1	
	Unit – 5	2	

NME : 3. BASIC PHYSICS

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: I	CREDITS: 2	NO. OF HOURS PER WEEK: 2

COURSE FRAMEWORK:
To consolidate the basic concepts of physics in an elementary way.

COURSE OUTCOME:

UNIT 1 : Mechanics

Force – Weight – Work – Energy – Power – Horsepower – Centrifuge – Washing machine

UNIT 2 : Heat

Variation of boiling point with pressure – Pressure cooker – Refrigerator – Air conditioner – Principle and their capacities – Bernoulli principle – Aero plane

UNIT 3 : Sound and Optics

Sound waves – Doppler effect – Power of lens – Long sight and short sight – Microscope – Telescope – Binocular – Camera

UNIT 4 : GeoPhysics and Medical Physics

Earthquake – Richter scale – thunder and lightning – Lightning arrestors – Cosmic showers – X-rays – Ultrasound scan – CT scan – MRI scan

UNIT 5 : Space science and Communication

Newton's law of gravitaion – Weather forecasting and communication satellites – Indian satellites – Electromagnetic spectrum – Radio waves – AM and FM transmission and reception

BOOKS FOR STUDY

1. The Learner's series – Everyday science – Published by INFINITY BOOKS, New Delhi
2. The Hindu speaks on Science, Vol I & II, Kasturi & Sons, Chennai.

BOOKS FOR REFERENCE

1. Fundamentals of Physics by D. Halliday, R.Rensick and J. Walker, 6th edition, Wiley, NY (2001).
2. Physics, Vols I, II, III by D.Halliday, R.Resnick and K.S.Krane, 4th Edition, Wiley, New York (2001).
3. The Feymann Lectures on Physics Vols I, II, III by R.P. Feynmann, R.B. Leighton & M. Sands,Narosa, New Delhi(1998).

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 5 out of 08 questions	1 – 08	20	**100**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	1	
	Unit – 2	2	
	Unit – 3	2	
	Unit – 4	1	
	Unit – 5	2	

NME: 4. NON-CONVENTIONAL ENERGY SOURCES

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: II	CREDITS: 2	NO. OF HOURS PER WEEK: 2

COURSE FRAMEWORK:
To emphasize the need for alternate energy sources and their applications.

COURSE OUTCOME:

1 : Enlightened about the energy crisis.

2 : Overall view of different energy sources.

3 : To study the application of solar energy.

4 : Detailed leaning of Solar energy, wind energy and oceanic energy.

5 : Mechanism of storing energy in modern day.

UNIT 1 : Solar energy

Conventional Energy sources – Renewable Energy sources- solar energy – solar radiation and its measurements- solar energy collectors- parabolic collector- storage of solar energy.

UNIT 2 : Applications of solar energy

Solar water heater- solar driers- solar cells- solar electric power generation- solar distillation- solar pumping – solar cooking.

Unit 3: Wind energy

Basic principles of wind energy conversion- power in the wind – forces in the Blades- wind energy conversion- Advantages and disadvantages of wind energy conversion systems (WECS) Energy storage- Applications of wind energy.

Unit 4: Oceanic energy

Energy from the oceans- Energy utilization- Energy from tides- Basic principle of tidal power – Utilization of tidal energy.

Unit 5 : Energy from other sources

Chemical energy – Nuclear energy - Energy storage and distribution.

BOOKS FOR STUDY

1. Non-conventional sources of energy by G.D. Rai, 4th edition, Khanna Publishers, New Delhi (1996).
2. Solar Energy, Principles of thermal collection and storage by S.P.Sukhatme 2nd edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi (1997).

BOOK FOR REFERENCE

1. Energy Technology by S.Rao and Dr. Parulekar

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 5 out of 08 questions	1 – 08	20	**100**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit – 1	1	
	Unit – 2	2	
	Unit – 3	2	
	Unit – 4	1	
	Unit – 5	2	

SEMESTER - III

CORE THEORY –3: OPTICS AND SPECTROSCOPY

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: III	CREDITS: 4	TOTAL HOURS: 75

COURSE FRAMEWORK:

To make the students understand the particle and wave aspects of light and the defects of lenses

COURSE OUTCOME:

Learning outcome: On completion of the course, the student will be able to

1: Distinguish Geometrical and Physical aspects of light.
2: Construct optical instruments
3: Understand the defects associated with the lens and correcting methods
4: Analyse the UV-IR spectrums
5: Get the knowledge of Spectroscopy that helps to extract the dynamic information about the molecule

UNIT I: GEOMETRICAL OPTICS (15 Hours)

Spherical aberration in lenses - Methods of minimising Spherical aberration– Condition for minimum Spherical aberration in the case of two lenses separated by a distance - Chromatic aberration in lenses – Condition for Achromatism of two thin lenses (in and out of contact) - Dispersion produced by a thin prism -Achromatic prism- Combination of prisms to produce - Dispersion without deviation - Deviation without dispersion.

UNIT II: INTERFERENCE (15 Hours)

Analytical treatment of interference – expression for intensity – condition for maxima and minima in terms of phase and path difference - Air wedge- principle and construction – determination of diameter of thin wire – test for optical flatness - Michelson's Interferometer Theory and its applications – determination of wavelength; thickness of thin transparent material and resolution of interferometer.

UNIT III: DIFFRACTION (15 Hours)

Fresnel's diffraction –Fraunhoffer diffraction - single slit, double slit (simple theory). Plane diffraction grating - Determination of wavelengths using grating - normal incidence - Dispersive power of a grating. Rayleigh's criterion for resolution – limit of resolution of the eye – resolving power of microscope - resolving power of a grating – difference between resolving power and dispersive power.

UNIT IV: POLARISATION (15 Hours)

Double Refraction - Nicol prism – polarizer and analyser – Polaroids and their uses - Quarter wave plate- Half wave plate – plane, circularly and elliptically polarized light - Half wave plate production and detection of plane, circularly and elliptically polarized light. Optical activity - Specific rotatory power – determination using Laurent's half shade polarimeter.

UNIT V: SPECTROSCOPY (15 Hours)

Electromagnetic spectrum – Characterization of electromagnetic radiation – Classification of Molecules: Microwave spectroscopy - rotational energy levels of rigid diatomic molecule - selection rules - Infrared spectroscopy - vibrational spectra of diatomic molecule- vibrational spectra of simple polyatomic molecules - selection rules for IR spectra – Raman Effect: stokes and antistokes lines with necessary theory - Experimental study of Raman Effect - Application of Raman effect in molecular structure. Laser: Ruby laser – He-Ne.

BOOKS FOR STUDY:

1. Textbook of OpticsbyBrijlal and Subramanian - R.Murugesan, S. Chand & Co., New Delhi - Modern Physics
2. Optics & Spectroscopy by R. Murugeshan-, S. Chand & Co., New Delhi
3. Optics by Khanna D.R & Gulati H.R., S. Chand & Co., New Delhi (1979).
4. Molecular structure, and spectroscopy by Aruldhas, Prentice Hall of India Pvt. Ltd., New Delhi (2005).
5. Fundamentals of Spectroscopy by C.N. Banwell and M.C. Cash - T M H Publishers.

BOOKS FOR REFERENCE:

1. Fundamentals of Physics by D. Halliday, R.Resnick and J. Walker –6th Edition, New York (2001)
2. CRC Handbook of Physics & Chemistry, 80th Ed., CRS Press, NY, 1999.
3. Optics by Ajay Ghatak, Tata McGraw- Hill publishing Co. Ltd., New Delhi (1998).

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

SEMESTER - IV

CORE THEORY –4: ELECTRICITY AND ELECTROMAGNETISM

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: IV	CREDITS: 4	TOTAL HOURS: 75

COURSE FRAMEWORK:

To make them understand the nature of Direct and Alternating current through different active and passive elements.

COURSE OUTCOME:

Learning Outcome: On the completion of the course students will be able to: Understand fundamental laws of electricity and magnetism

1: Know more about Electrolysis and thermoelectricity

2: Analyse the DC and AC circuits with different components like resistors and reactors (Inductor and Capacitor)

3: Basic properties of ferro magnetic substances

4: Discuss the elements of earth's magnetic field

5: Solve the problems related to magnetic effects of electric current

UNIT 1: DC Circuits (15 Hours)

Growth and decay of current in a circuit containing resistance and inductance - growth and decay of charge in a circuit containing resistance and capacitor - growth and decay of charge in an LCR circuit - condition for the discharge to be oscillatory - frequency of oscillation.

Unit II: AC Circuits (15 Hours)

AC Voltage and current - Power factor and current values in and AC circuit containing LCR circuit - series and Parallel resonant circuits - AC motors - single phase, three phase - star and delta connections - electric fuses - circuit breakers - Induction Motors.

UNIT III: Magnetic effect of electric Current: (15 Hours)

Magnetic field around a current carrying conductor. Biot and Savart's law - Magnetic field intensity at a point on the axis of a circular coil carrying current - magnetic field intensity due to a solenoid carrying current - effect of iron core in a solenoid - moving coil ballistic galvanometer - theory - damping correction. Determination of the absolute capacity of a condenser using B.G.

UNIT IV Electromagnetic Induction: (15 Hours)

Faraday's experiments on electromagnetism - Faraday's laws of Electromagnetic Induction - Lenz's law - Deduction of Faraday's law from Lorentz force - vector potential. Eddy currents - inductors and inductance - determination of self-inductance of a coil using Anderson method - mutual inductance - experimental determination of absolute mutual inductance - coefficient of coupling.

UNIT V Applications of Electromagnetic induction: (15 Hours)

Earth inductor - uses of earth inductor - measurement of horizontal component of the earth's magnetic field - measurement of vertical component of earth's magnetic field- calibration of B.G. - measurement of intense magnetic field using search coil and BG - induction coil and its uses.

BOOKS FOR STUDY :

1. Electricity & Magnetism by M.Narayanamurthy & N.Nagarathnam, NPC pub., Revised edition.
2. Electricity and Magnetism by Brijlal and Subrahmanyam; S.Chand & Co., New Delhi, (2000).
3. Electricity & Magnetism by D.Chattopadhyay and P.C. Rakshit, Books and Allied (P) Ltd.(2001).
4. Fundamentals of electricity and magnetism by B.D. Dugal and C.L. Chhabra, Shobanlal Nagin, S. Chand & Co., 5th edition, New Delhi(2005).
5. Electricity and Magnetism by R. Murugeshan, S.Chand & Co., New Delhi, (2008).

BOOKS FOR REFERENCE:

1. Electricity & Magnetism by K.K.Tewari, S.Chand & Co., New Delhi (2002).
2. Introduction to Electrodynamics by D.J.Griffiths, Printice Hall of India Pvt. Ltd., 3rd Edition, New Delhi(2003).
3. Fundamentals of Physics, D.Halliday, R.Resnick and J.walker, Wiley, 6th Edition, New York (2001).

WEB SITE:

http://www2.warwick.ac.uk/fac/sci/physics/teach/ module-home/px207.
www.core.org.cn/ocw web/physics/8-311 spring 2004/lecture notes.

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

CORE Practical 2: PRACTICAL GENERAL – II

SUBJECT CODE:	PRACTICAL	MARKS: 100
SEMESTER: IV	CREDITS: 4	TOTAL HOURS: 75

COURSE FRAMEWORK:

To make the students skillful in experimentally analyzing the physical concepts through practical.

COURSE OUTCOME:

1: Understand physical characteristics of SHM and obtaining solution of the oscillator using experiment.

2: Study the elastic modulus and behavior of the materials

3: Analyze the specific heat capacity, refractive index, as per the standard procedure

4: Understand the knowledge in electrical devices such as ammeter and voltmeter.

5: To understand theoretical principles of optics in the experimental method through plane transmission grating, prism.

1. Young's modulus - cantilever - depression - (Static method)-(Scale and telescope)
2. Young's modulus - cantilever oscillations - (Dynamic method)
3. Rigidity modulus - Static torsion
4. Compound pendulum - g and k
5. Sonometer - A.C. Frequency – Steel wire with Electromagnet and Brass wire with permanent magnet.
6. Melde's string - frequency, Relative Density of a solid and liquid
7. Thermal conductivity of a bad conductor - Lee's disc method
8. Spectrometer - μ of a glass prism - i-d Curve
9. Spectrometer - Grating N and λ - normal incidence method
10. Spectrometer - Grating N and λ - minimum deviation method
11. Air wedge - Thickness of a wire
12. m and B_H - deflection magnetometer Tan C position and vibration magnetometer
13. Carey Foster bridge - Temperature coefficient of resistance of a coil
14. Potentiometer - Calibration of low range voltmeter
15. Potentiometer - Ammeter calibration.
16. Figure of merit of galvanometer (Mirror Galvanometer Or Table Galvanometer)
17. * C.R.O. Study of wave forms - Lissajou's figures - frequency determination
18. * Study of resistors, Choke, capacitors and transformer
19. * Construction of battery eliminator - various voltages - with filter circuit and IC voltage regulator.
20. * Two transistor Radio receiver

* Not for Examination

SEMESTER - V

CORE THEORY –5: ATOMIC PHYSICS

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: V	CREDITS: 4	TOTAL HOURS: 75

COURSE FRAMEWORK:

To detail the particle photon interaction and thereby inculcating the knowledge of atoms and molecules

COURSE OUTCOME:

Learning Outcomes: On completion of the course the students will have

1: The knowledge to measure the specific charge of electron by different methods
2: A Complete study of atomic structure and emission of spectral lines
3: A detailed learning of "Photon to Electron" and "Electron to Photon" through Photo electric effect and X rays
4: Good knowledge on X ray spectroscopy
5: Detailed learning about the splitting of spectral lines

UNIT-I: DISCHARGE PHENOMENON THROUGH GASES (15 Hours)

Specific charge of an electron – Dunnington's method – Positive rays – Aston's, Dempster's mass spectrographs.

UNIT-II: PHOTO ELECTRIC EFFECT (15 Hours)

Richardson and Compton experiment – Laws of photo electric emission – Einstein photo electric equation – Millikan's experiment – Verification of photoelectric equation – photo electric cells –photo emissive cells – photo voltaic cells – photo conducting cell – photomultiplier.

UNIT-III: ATOMIC STRUCTURE (15 Hours)

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

UNIT-IV: IONISATION POTENTIAL AND SPLITTING OF ENERGY LEVELS (15 Hours)

Excitation and ionization potential – Frank and Hertz's experiment – selection rules – intensity rule and interval rule – 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 – Stark effect (qualitative study only).

UNIT-V: X-RAYS (15 Hours)

Bragg's Law – X ray spectroscopy – characteristic X ray spectra – Satellite and Auger effect – continuous X ray spectra – Moseley's Law – uses of X rays – Compton effect – experimental verification of Compton effect.

BOOKS FOR STUDY:

1. Modern Physics by D.L.Sehgal, K.L.Chopra and N.K.Sehgal. Sultan Chand & Sons Publication, 7th Edition, New Delhi (1991)
2. Modern Physics by R. Murugeshan, KiruthigaSivaprasanth, S. Chand & Co., New Delhi(2008).
3. Atomic and Nuclear Physics by N. Subramanyam and BrijLal, S. Chand & Co. 5th Edition, New Delhi (2000)

BOOKS FOR REFERENCE:

1. Concepts of Modern Physics by A.Beiser, Tata McGraw-Hill, New Delhi (1997)
2. Modern Physics by J.H. Hamilton and Yang, McGraw-Hill Publication, (1996)
3. Fundamentals of Physics by D. Halliday, R.Resnick and J. Walker, Willey., 6th Edition, New York (2001).

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	2	
	Unit – 2	3	
	Unit – 3	3	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	1	
	Unit – 2	2	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

CORE THEORY –6: NUCLEAR PHYSICS AND PARTICLE PHYSICS

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: V	CREDITS: 4	TOTAL HOURS: 75

COURSE FRAMEWORK:
Facilitating the students to understand nuclear reactions based on nuclear models

COURSE OUTCOME:
Learning Outcomes: On completion of the course the students will have a

1: Detailed learning of Nucleus with their empirical models
2: Overall view of Nuclear reactions and nuclear reactors with radioactive laws and radiation measuring techniques
3: Sound knowledge in elementary particles and their conservation laws
4: Knowledge about particle- antiparticle, decay processes and their outcomes.
5: Basic idea of interaction between fundamental particles.

UNIT-I: GENERAL PROPERTIES OF NUCLEI (15 Hours)
Nuclear size, charge, mass, mass defect and binding energy – packing fraction – Nuclear Spin – Magnetic dipole moment – electric quadrupole moment- nuclear models – liquid drop model – Weizacker semi empirical mass formula – Shell model and magic numbers.

UNIT-II: RADIO ACTIVITY (15 Hours)
Natural radioactivity – Law of disintegration – half time and mean life period – units of radio activity - transient and secular equilibrium –radio carbon dating – age of earth – Geiger nuttal law – α ray spectra – Gamow's theory of α decay (qualitative study only) - Radio Activity- Neutrino theory of Beta decay.

UNIT-III: RADIATION DETECTORS AND PARTICLE ACCELERATORS (15 Hours)
Ionisation chamber – G.M. counter – quenching and resolving time – Scintillation counter - Linear accelerator – Cyclotron – Synchrocyclotron – Betatron.

UNIT-IV: NUCLEAR REACTIONS (15 Hours)
Conservation laws – nuclear reaction – kinematics – Q value – threshold energy – artificial radio activity – radio isotopes and its uses – nuclear fission – chain reaction – nuclear reactor – nuclear fusion – thermonuclear reactions – sources of stellar energy.

UNIT-V: ELEMENTARY PARTICLES (15 Hours)
Classification of elementary particles – elementary particle quantum numbers – isospin and strangeness – conservation laws.

BOOKS FOR STUDY:

1. Modern Physics by R. Murugeshan, S. Chand & Co., New Delhi, Revised Edition.
2. Atomic and Nuclear Physics by N. Subramanyam and Brijlal, S. Chand & Co, New Delhi (1996)
3. Nuclear Physics by Tayal D.C., Himalaya Publishing House, Mumbai (2006).
4. Nuclear Physics by R.C. Sharma, K.Nath& Co. Meerut (2000).

BOOKS FOR REFERENCE:

1. Nuclear physics by R.R.Roy and B.P. Nigam, New Age International (p) Ltd., New Delhi (1997)
2. Fundamentals of Elementary Particles Physics by Longo, Mc Graw- hill
3. Elements of Nuclear Physics by ML.Pandya and RPS Yadav, KedarnathRamnath, Meerut.

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

CORE THEORY –7: SOLID STATE PHYSICS AND ELECTRONICS

SUBJECTCODE:	**THEORY**	**MARKS: 100**
SEMESTER: V	**CREDITS: 4**	**TOTAL HOURS: 75**

COURSE FRAMEWORK:

- **To make the students understand the crystal structure and defects omit.**
- **To provide the students with theoretical knowledge on semiconductors to handle electronic components with ease.**

COURSE OUTCOME:

Learning Outcomes: On completion of the course the students will be able to:

1: Detail the Crystal structure and associated defects.
2: Complete the study of Dielectrics and Semiconductors
3: Understand of Semiconductor devices and their applications
4: understand the functioning of a transistor as an amplifier.
5: Explain the behaviour of solids with their magnetic properties.

Unit I : Crystal Structure (15 Hours)

Crystal lattice – primitive and unit cell – seven classes of crystal – Bravais Lattice – Miller Indices – Structure of crystals – simple cubic, hexagonal close packed structure, face centred cubic structure, body centred cubic structure – Sodium chloride structure, Zinc Blende structure, Diamond structure.

Unit II : Defects in Solids (15 Hours)

X ray diffraction – Bragg's law in one dimension – Experimental methods – Laue Method, powder crystal method and rotating crystal method.

Defects in solids - Point defects - Frenkel and Schottky defects - Equilibrium concentrations - Line defects - Edge dislocation and screw dislocation - Surface defects - Grain boundary - Effects of Crystal imperfections.

Unit III: Dielectric Properties (15 Hours)

Dielectric materials - Polarization, susceptibility and dielectric constant - Local field or internal field - Clausius - Mossoti relation - Sources of polarizability - Electronic polarizability - lonic polarizability - Orientational polarizability - Frequency and temperature effects on polarization - Dielectric breakdown – Dielectric Properties, Dielectric loss.

UNIT-IV: SEMICONDUCTORS (15 Hours)

Bonds in semiconductor – Energy levels – Energy bands – Valence and conduction bands – Band gap – Forbidden energy gap – classification of solids in terms of forbidden energy gap - Fermi level – Pure semiconductor – - PN junction barrier voltage across the junction – Biasing of PN junction - Law of mass action, Impurity in semiconductors

UNIT-V: SPECIAL SEMICONDUCTOR DEVICES AND APPLICATIONS (15 Hours)

Field Effect Transistor (FET) – characteristics – Uni-junction transistor (UJT) – characteristics – relaxation oscillator – Frequency of oscillation – SCR characteristics – SCR as a switch – SCR rectifier.

BOOKS FOR STUDY

1. Materials Science by M.Arumugam, Anuradha Agencies Publishers.(2002)
2. Solid State Physics by R L Singhal, Kedarnath Ram Nath & Co., Meerut (2003)
3. Introduction to Solid State Physics by Kittel, Willey Eastern Ltd(2003).
4. Materials Science and Engineering by V. Raghavan, Prentice Hall of India Private Limited, New Delhi(2004).
5. Electronics by M. Arul Thalapathi, Comptek Publication (2005)
6. Hand Book of Electronics by Gupta and Kumar – PragathiPrakashan – Meerut (2002)
7. Applied Electronics by A. Subramanyam – National Publishing Co. (1997)
8. Principles of Electronics by V.K. Mehta, Rohit Mehta S. Chand & Co. (2006).

BOOKS FOR REFERENCE:

1. Basic Electranics by B.L Theraja, S. Chand & Co., (2008)
2. Electronic Devices by Mittal.G.K. Pubishers Pvt. Ltd., (1993)
3. Solid state Electronics by Ambrose and Vincent Devaraj, Meera Publication.
4. Modern Physics by R. Murugeshan and KiruthigaSivaprasath, S. Chand & Co,. (2008)
5. Applied Electronics byR.S.Sedha, S. Chand & Co,. (1990)
6. Solid State Physics by S.O.Pillai, New Age International (P) Ltd.,(2002).
7. Solid State Physics by A. J.Dekker, Macmillan India(1985).
8. Solid State Physics by HC Gupta, Vikas Publishing House Pvt. Ltd., New Delhi (2001).

WEB SITE

1. http://folk.uio.no//dragos//solid/fys230-Exerciser.html.
2. http://www.physics.brocku.ca/courses/4p7d.

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

IDE –: INTRODUCTION TO INTEGRATED ELECTRONICS

SUBJECTCODE:	THEORY	MARKS: 100
SEMESTER: V	CREDITS: 5	TOTAL HOURS: 75

COURSE FRAMEWORK:
To Make non - Physics Student to understand intricacies of integrated electronics

COURSE OUTCOME:
1: List out various number system.
2: Simplification of logic circuits.
3: Create combination circuit like flip flop, counters and verify their truth tables.
4: Analyze analog electronic circuits using discrete components.
5: Understand and analyze the architectures of encoders, decoders, multiplexers and flipflops.

UNIT 1 : Fundamental Digital Electronics (15 Hours)
Number systems – binary – hexadecimal – Binary addition – subtraction (1's and 2's compliment method) – multiplication - division - BCD – Conversion – simplification of logic circuits - using (i) Boolean algebra, (ii) Karnaugh map – Demorgan's theorems - NAND and NOR as universal building blocks.

UNIT 2 : Combinational Logic Circuits (15 Hours)
Half adder, full adder, half subtractor and full subtractor – 4 bit adder/subtractor - decoder, encoder - multiplexer - demultiplexer.

UNIT 3 : Sequential Logic Circuits (15 Hours)
R.S flip flop, D flip flop and JK flip flops - synchronous and ripple counters - Up/Down counters - shift registers - serial and parallel registers - ring and twisted ring counter.

UNIT 4 : OP-AMP Basic Applications (15 Hours)
Characteristics parameters – differential gain – CMRR – Slew rate – bandwidth - applications – inverter, non-inverter, summing, difference and averaging amplifier - solving simultaneous equations - comparator - square wave generator.

UNIT 5 : Timer, DAC/ADC (15 Hours)
Timer 555 - Internal block diagram and working - astable multivibrator - schmitt trigger.
D/A converter - binary weighted method - A/D converter - successive approximation method.

BOOKS FOR STUDY

1. Digital Principles and Application by Malvino Leach, Tata McGraw Hill, 4th Edition(1992).
2. Digital Fundamentals by Thomas L. Floyd, Universal Book Stall, New Delhi(1998).
3. Introduction to Integrated Electronics by V.Vijayendran, S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai(2005).
4. OP - AMPs and Linear Integrated Circuits by Ramakant A. Gayakwad, Prentice Hall of India(1994).

BOOKS FOR REFERENCE

1. Digital Electronics by Practice Using Integrated Circuits - R.P.Jain - Tata McGraw Hill(1996).
2. Linear Integrated Circuits by D. Roy Choudhury and Shail Jain - New Age International (P) Ltd.(2003).
3. Electronics - Analog and Digital by I.J. Nagrath - Prentice - Hall of India, New Delhi(1999).
4. Integrated Electronics by J.Millman and C.Halkias, Tata McGraw Hill, New Delhi (2001)

WEB SITE

http://www.dear.harward.edu/courses/es154.

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

SEMESTER - VI

CORE THEORY –8: RELATIVITY AND QUANTUM MECHANICS

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: I	CREDITS: 5	TOTAL HOURS: 75

COURSE FRAMEWORK:

To make the students understand the transition from classical to quantum mechanics with applications

COURSE OUTCOME:

On completion of the course the students will be able to

1: understand the space - time concept through relativity

2: arrive at duality through matter waves

3: derive time dependent and independent Schrodinger equations

4: use different operators in solving quantum mechanical problems

5: find eigen values and eigen functions of free particle

UNIT-I: RELATIVITY (15 Hours)

Frames of reference – Galilean transformation – Michelson - Morley experiment – Postulates of special theory of relativity – Lorentz transformation – Length contraction – time dilation – addition of velocities – variation of mass with velocity – Mass energy relation.

UNIT-II: WAVE NATURE OF MATTER (15 Hours)

Phase and group velocity – relationship between phase and group velocity – expression of De-Broglie's wavelength – Davisson and Germer's experiment – G.P. Thomson experiment – Wave Nature of Matter- Heisenberg's uncertainity principle and its consequences of non - existence of electrons outside the nucleus existence of protons and neutrons inside the nucleus.

UNIT-III: SCHRODINGER EQUATION (15 Hours)

Postulates of wave mechanics – Schrodinger time independent wave equation – Schrodinger time dependent wave equation – properties of the wave function - significance of the wave functions. – Eigenfunctions and Eigenvalues.

UNIT-IV: OPERATIONS AND ANGULAR MOMENTUM IN QUANTUM MECHANICS (15 Hours)

Linear operators - Self adjust operators – commutativity and compatibility – orbital angular momentum operators and their commutation relations – Spin, Pauli's spin matrices for electron.

UNIT-V: SOLUTIONS OF SCHRODINGER EQUATION 15 Hours)

Free Particle solution – Particle in a box – Potential well of finite depth (one dimension) – Linear harmonic oscillator – rigid rotator.

BOOKS FOR STUDY:

1. Modern physics by R. Murugeshan and Kiruthigasivaprasath, S.Chand& Co (2008)
2. A Text Book of Quantum Mechanics by P.M. Mathews and S.Venkatesan, Tata McGraw – Gill, New Delhi (2005).
3. Quantum Mechanics by V.K. Thankappan, New Age International (P) Ltd Publisher, New Delhi (2003).
4. Quantum Mechanics by K.K. Chopra and G.C. Agarwal, Krishna Prakasam Media (P) Ltd, Meerut, first edition (1998).

BOOKS FOR REFERENCE:

1. Mechanics and Relativity by Brijlal and Subramanyam S. Chand & Co, New Delhi (1990)
2. Quantum Mechanics by A. Ghatak and Loganathan, Macmillan India (P) Ltd.
3. Concepts of Modern Phyics by A.Beiser, Tata McGraw – gill, 5th Edition, New Delhi (1997)

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

CORE THEORY –9: MATHEMATICAL METHODS IN PHYSICS

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: VI	CREDITS: 5	TOTAL HOURS: 75

COURSE FRAMEWORK:

To familiarize students with essential mathematical methods for solving advanced problems in theoretical physics.

COURSE OUTCOME:

Upon completion of the course, the student should be able:

1: To use advanced mathematical methods and theories on various mathematical and physics problems.

2: To develop the skill of problem-solving ability.

3: Use Matrices to solve simultaneous equations

4: Solve quantum mechanical problems using special functions and polynomials.

5: Understand the Fundamentals Classical mechanics and statistical mechanics for their higher studies

UNIT 1: Matrices and Special Functions (15 Hours)

Characteristic equation of a matrix - Eigenvalues and Eigenvectors - Hermition and Unitary matrices - Properties of their eigenvalues and eigenvectors - Diagonalisation of matrices.

Special functions - Gamma and Beta functions - Series solutions of Legendre, Bessel and Hermite equations

UNIT 2: Elementary Complex Analysis (15 Hours)

Functions of a Complex variable - Continuity and differentiability - single and multivalued functions - Analytic function - Cauchy - Riemann conditions (necessity and sufficiency). Cauchy - Riemann Conditions in the Polar (r,θ) coordinates.

UNIT 3: Vector Analysis (15 Hours)

Scalar and Vector fields - Gradient, Divergence and Curl - Equations of motion in the vector notation - Spherical, Cylindrical co-ordinates -transformation equation - equations of motion (components) in cartesian coordinates and spherical polar coordinates - equation of motion (components) in the polar coordinates.

UNIT 4 : Classical Mechanics (15 Hours)

Generalised coordinates - configuration space - Lagrange's equation - simple applications : to find equations of motion using a lagrangian; central potential and conservation of angular momentum - Hamilton function and Hamilton's equations - harmonic oscillator.

UNIT 5: Statistical Physics (15 Hours)

Quantum statistics of identical particles - Maxwell - Boltzmann, Bose - Einstein and Fermi - Dirac statistics - Derivation of Planck's radiation formula from Bose - Einstein statistics.

BOOKS FOR STUDY

1. Mathematical Physics by Sathya Prakash, Sultan Chand and Sons, New Delhi (1996)
2. Classical Mechanics by J.C. Upadhyaya, Himalaya Publishing House, Mumbai(2003).
3. Introduction to Statistical Mechanics by S.K. Sinha Narosa Publication(2007).
4. Heat Thermodynamics and Statistical Physics by Brijlal N.Subrahmanyam, P.S. Hemne S.Chand & Co., New Delhi.(2007).

BOOKS FOR REFERENCE

1. Mathematical Physics by B.D. Gupta, Vikas Publishing House Pvt. Ltd., New Delhi(1996).
2. Advanced Engineering Mathematics by E.Kreyszig, Eighth Edition, Wiley Publishers, New York(1989).
3. Classical Mechanics by H.Goldstein, Special Indian student edition, Narosa Publishing House, New Delhi(1985)

WEB SITE

http://phy.syr.edu/~trodden/courses/math methods.
http://www.mpipks_dresden.mpg.de/~jochen/methoden/outline/html.

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

CORE Practical - 3: PRACTICAL GENERAL – III

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: VI	CREDITS: 4	TOTAL HOURS: 75

COURSE FRAMEWORK:

To make the students skillful in experimentally analysing the physical concepts through practical.

COURSE OUTCOME:

1: Self-ability of carrying out the experimental procedures and correlate the outcomes with corresponding theoretical results based on mechanics, light.
2: To acquire the acknowledge in electrical devices such as ammeter, voltmeter and Ballistic galvanometer etc.,
3 : Observe and calculating the standard values of BH using deflection and vibrating magneto meter.
4: Analyze the applications of plane transmission grating and prism in calculating wavelength and refractive index.
5: understand the working of thermo couple in finding the thermo emf.

(Any Fifteen Experiments)

1. Young's modulus - Non uniform Bending - Koenig's method.
2. Kundt's Tube – Determination of velocity of sound in solid - Young's modulus.
3. Spectrometer - Small angled prism - Normal incidence and emergence refractive index of the material of prism.
4. Spectrometer - (i - i') curve - refractive index.
5. Spectrometer - Cauchy's constant.
6. Newton's rings - R_1, R_2 and μ of convex lens.
7. Newton's rings - Refractive index of liquid.
8. Field along axis of a circular coil - Deflection magnetometer - B_H and M.
9. Field along axis of a circular coil - vibration magnetic needle - B_H.
10. Potentiometer - Calibration of high range voltmeter
11. Potentiometer - Temp coeff. of resistance of a thermistor
12. Potentiometer - Emf of a thermo couple.
13. Thermo emf - Mirror galvanometer (or) spot galvanometer
14. B.G - Figure of merit (quantity of charge)
15. B.G - Comparison of EMFs
16. B.G - Comparison of capacitances
17. B.G - Internal resistance of a cell
18. B.G - High Resistance by leakage
19. B.G - Absolute capacitance
20. B.G - Comparison of mutual inductances
21. B.G - Absolute mutual inductance
22. B.G - Self inductance - Anderson method.

CORE Practical-4: **Practical electronics I**

SUBJECT CODE:	**PRACTICAL**	**MARKS: 100**
SEMESTER: VI	**CREDITS: 4**	**TOTAL HOURS: 75**

COURSE FRAMEWORK:

To make the students skillful in experimentally analysing the physical concepts through practical.

COURSE OUTCOME:

1: To indentify the basic electronic devices like diode, transistor, LED, UJT AND FET. To observe the characteristics of diodes like PN, Zener diode.

2: Ability to use IC in different applications like, to verify laws and theorems of Boolean algebra, to study basic combinational circuits

3: To analyze transistor amplifiers and their frequency responses.

4: Understand the need and requirements to obtain frequency response from a transistor

5 : designing the circuit and verifying the results for convertors and counters using IC.

(Any Fifteen Experiments)

1. A.C. Circuit – LCR – Series resonance
2. A.C. Circuit – LCR – Parallel resonance
3. Bridge rectifier - Zener regulated power supply - 9V characteristics.
4. R-C Coupled Single Stage Amplifier - Frequency Response
5. R-C Coupled Amplifier with feedback.
6. Emitter follower
7. Transistor - Phase Shift Oscillator
8. Transistor - Wien's Bridge Oscillator
9. FET characteristics
10. FET amplifier
11. UJT characteristics
12. UJT Relaxation oscillator
13. SCR characteristics
14. Transistor - Astable multivibrator
15. Transistor - Bistable multivibrator
16. NAND / NOR as universal gates.
17. Half Adder – Full adder – Ex-OR(7486)
18. Half Subtractor – Full subtractor – Ex - OR(7486)
19. 4 bit ripple counter using 7473/7476
20. 4 bit shift register using 7473/7476
21. Decode counter using 7490

CORE Practical - 5: Micro processor and integrated electronics

SUBJECT CODE:	PRACTICAL	MARKS: 100
SEMESTER: VI	CREDITS: 2	TOTAL HOURS: 75

COURSE FRAMEWORK:

To make the students skillful in experimentally analysing the physical concepts through practical.

COURSE OUTCOME:

1: Understanding of OP-AMP and 555 timer operations
2: Observing the basic operations of logics gates
3: Understand working and use of different IC.
4: Ability to use the microprocessor kit.
5 : develop the program writing skills for mathematical operations

(Any Fifteen Experiments)

1. Op amp 741 - Inverting , Non - Inverting amplifier, unity follower.
2. Op amp 741 - Summing and difference amplifier
3. Op amp 741 – Differentiator, integrator
4. OP amp 741 – Solving simultaneous equations
5. Op amp 741 – Wein's Bridge oscillator
6. Op amp 741 - Phase Shift oscillator
7. 555 - Timer - Schmitt Trigger
8. 555 - Timer - Astable operation
9. 555 - Timer - Monostable
10. D/A Converter – 4 bit, binary weighted resistor method
11. Microprocessor – 8085 – 8 bit Addition
12. Microprocessor – 8085 – 8 bit Subtraction
13. Microprocessor – 8085 – 8 bit Multiplication
14. Microprocessor – 8085 – 8 bit Division
15. Microprocessor – 8085 – Addition of N Number of single byte numbers
16. Microprocessor – 8085 – Sorting of given set of numbers in ascending order
17. Microprocessor – 8085 – Sorting of given set of numbers in descending order
18. Microprocessor – 8085 – Finding the largest no. in a given set of numbers.
19. Microprocessor– 8085–Finding the smallest no. in a given set of numbers.

BOOKS FOR THE STUDY & REFERENCE:

1. Practical Physics by D. Chattopadhyay, P.C. Rakshit, New Central Book Agency (p) Ltd. Kolkata(2007).
2. Practical Physics and Electronics by C.C.Ouseph, U.J.Rao and Vijayendran, S.Viswanathan (Printers & Publishers) Pvt., Ltd (2007).
3. Practical Physics by C L Arora, S. Chand & Co., New Delhi (2008).

CORE ELECTIVE –1: NUMERICAL METHODS

SUBJECT CODE:	THEORY & PROBLEM	MARKS: 100
SEMESTER: V	CREDITS: 4	TOTAL HOURS: 75

COURSE FRAMEWORK:

To make the students understand the basic concepts of computational mathematics

COURSE OUTCOME:

Learning Outcomes: On completion of the course the students will be able

1: To learn the methodology involved in computer computations.
2: To solve simultaneous equations using matrix method.
3: To understand statistics using curve fitting
4: To find the solution of an algebraic, transcendental and differential equations.
5: To do integration using interpolation techniques

UNIT 1: Simultaneous Linear Algebraic Equations (15 Hours)

Method of triangularisation - Gauss elimination method - Inverse of a matrix - Gauss - Jordan method

UNIT 2: Numerical Solution of Algebraic, Transcendental and Differential Equation (15 Hours)

Bisection method – Regula falsi method - Newton - Raphson method - - Horner's method - Solution of ordinary differential equation - Euler's method.

UNIT 3 : Interpolation (15 Hours)

Finite differences – operators Δ, ∇, δ, E, D – relation between operators –linear interpolation – interpolation with equal intervals – Newton forward interpolation formula – Newton backward interpolation formula.

UNIT 4 : Curve Fitting (15 Hours)

Principles of least squares - fitting a straight line - linear regression - fitting an exponential curve.

UNIT 5 : Numerical Integration (15 Hours)

Trapezoidal Rule - Simpson's 1/3 rule and 3/8 rule - Applications - Weddle's rule

BOOKS FOR STUDY

1. Numerical methods - M.K.Venkatraman, National Publishing Company, (1990).
2. Numerical methods by V. Rajaraman, Prentice - Hall India Pvt. Ltd., (2003).
3. Numerical methods by P. Kandasamy, K. Thilagavathy and K. Gunavathy, S. Chand & Co. (2002).

BOOKS FOR REFERENCES

1. Numerical methods for Scientific and Engineering computation by Jain Iyenger and Jain, New Age International (P) Ltd.,(2004).
2. Numerical methods by S.S.Sastry, Prentice Hall of India Pvt. Ltd., New Delhi(2003).

WEB SITE

http://www.sst.ph.ic.ac.uk/angur/lectures/compphys/compphys.html.
http://www.library.cornell.edu/nn/(Numerical receipier online book in C & Fortran).

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	1	1
	Unit – 2	2	1
	Unit – 3	1	1
	Unit – 4	2	1
	Unit – 5	2	
Section B	Unit – 1		2
	Unit – 2	1	1
	Unit – 3		1
	Unit – 4		1
	Unit – 5		1
Section C	Unit – 1		2
	Unit – 2		1
	Unit – 3		1
	Unit – 4		1
	Unit – 5		1

CORE ELECTIVE- 2: INTEGRATED ELECTRONICS

SUBJECTCODE:	**THEORY**	**MARKS: 100**
SEMESTER: VI	**CREDITS: 5**	**TOTAL HOURS: 75**

COURSE FRAMEWORK:

To make the students understand the working of different segments of computational system like memory, Arithmetic logic unit.

COURSE OUTCOME:

On completion of the course the students will have:

1: Through knowledge on different number systems and the skill to simplify the logics using Karnaugh map and Boolean algebra

2: Detailed knowledge in storing and retrieving a data through mux and demux

3: The skill to customize the counters to the need through serial and parallel counters

4: The ability to solve simultaneous equations and differential using Operational amplifier

5: The Understanding of digital to analog (DAC) and analog to digital (ADC)

UNIT 1 : Fundamental Digital Electronics (15 Hours)

Number systems – binary – hexadecimal – Binary addition – subtraction (1's and 2's compliment method) – multiplication - division - BCD – Conversion – simplification of logic circuits - using (i) Boolean algebra, (ii) Karnaugh map – Demorgan's theorems - NAND and NOR as universal building blocks.

UNIT 2 : Combinational Logic Circuits (15 Hours)

Half adder, full adder, half subtractor and full subtractor – 4 bit adder/subtractor - decoder, encoder - multiplexer - demultiplexer.

UNIT 3 : Sequential Logic Circuits (15 Hours)

R.S flip flop, D flip flop and JK flip flops - JK Master Slave flip flop - synchronous and ripple counters - BCD counter – Up/Down counters - shift registers - serial and parallel registers - ring and twisted ring counter.

UNIT 4 : OP-AMP Basic Applications (15 Hours)

Characteristics parameters – differential gain – CMRR – Slew rate – bandwidth - applications – inverter, non-inverter, integrator, differentiator, summing, difference and averaging amplifier - solving simultaneous equations - comparator - square wave generator - Wien's bridge oscillator - Schmitt trigger

UNIT 5 : Timer, DAC/ADC (15 Hours)

Timer 555 - Internal block diagram and working - astable multivibrator - schmitt trigger.
D/A converter - binary weighted method - A/D converter - successive approximation method.

BOOKS FOR STUDY

1. Digital Principles and Application by Malvino Leach, Tata McGraw Hill, 4th Edition(1992).
2. Digital Fundamentals by Thomas L. Floyd, Universal Book Stall, New Delhi(1998).
3. Introduction to Integrated Electronics by V.Vijayendran, S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai(2005).
4. OP - AMPs and Linear Integrated Circuits by Ramakant A. Gayakwad, Prentice Hall of India(1994).

BOOKS FOR REFERENCE

1. Digital Electronics by Practice Using Integrated Circuits - R.P.Jain - Tata McGraw Hill(1996).
2. Linear Integrated Circuits by D. Roy Choudhury and Shail Jain - New Age International (P) Ltd.(2003).
3. Electronics - Analog and Digital by I.J. Nagrath - Prentice - Hall of India, New Delhi(1999).
4. Integrated Electronics by J.Millman and C.Halkias, Tata McGraw Hill, New Delhi (2001)

WEB SITE

http://www.dear.harward.edu/courses/es154.
http://www.phys.ualberta.ca/~gingrich/phys395/notes/phys395.html.

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

CORE ELECTIVE- 3 : MICROPROCESSOR FUNDAMENTALS

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: VI	CREDITS: 5	TOTAL HOURS: 75

COURSE FRAMEWORK:

To study the architecture of the microprocessor 8085 and micro controller 8051
gain knowledge about the hardware and software of microcomputers and relate the functions of 8085 to the present generation computers and to develop their own software for specific tasks.

COURSE OUTCOME:

At the end of each chapter the students will be able to

1: Describe the functions of each pin and internal hardware of 8085 microprocessor
2: Write simple programs with different logics for specific tasks
3: Develop the knowledge of interfacing peripheral devices to 8085 microprocessor and the use of microcontrollers in the day to day applications
4: Distinguish the software of personal computers from 8085 microprocessor
5: Appreciate the use of interrupts and switching of program sequence to discharge specific tasks

UNIT-I: ARCHITECTURE (15 Hours)

Architecture of 8085 – registers, flags, ALU, address and data bus, demultiplexing address/databus - Control and status signals – Control bus, programmer's model of 8085 – pin out diagram – Functions of different pins

UNIT-II: PROGRAMMING TECHNIQUES (15 Hours)

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 and machine language – Programming techniques – addition, subtraction, multiplication, division, ascending descending order, largest and smallest (single Byte).

UNIT-III: INTERFACING MEMORY TO 8085 (15 Hours)

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

UNIT-IV: INTERFACING I/O PORTS TO 8085 (15 Hours)

Interfacing input port and output port to 8085 - Flashing LEDs

UNIT-V: INTERRUPTS (15 Hours)

Interrupts in 8085 - Hardware and Software interrupts – RIM, SIM instructions and priorities - Microcontroller 8051- Introduction, Pin configuration and its salient features.

BOOKS OF STUDY:

1. Fundamental of microprocessor 8085 by V.Vijayendran, S. Viswanathan publishers
2. Microprocessor Architecture Programming and application with 8085 by R.S.Gaonkar
3. Fundamental of microprocessor 8086 by V.Vijayendran, S. Viswanathan publishers

BOOKS FOR REFERENCE:

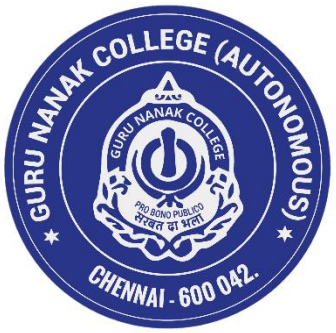
1. Introduction to microprocessor – Aditya Mathur

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	Problems
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	



ALLIED PHYSICS

(For B.Sc., Mathematics & Chemistry)

CORE THEORY-1: ALLIED PHYSICS PAPER -I

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: I	CREDITS: 3	TOTAL HOURS: 75

COURSE FRAMEWORK:

To make the students familiarise with physical concepts to have detailed learning in their core subjects.

COURSE OUTCOME:

1 : To understand the basis of SHM and ultrasonics
2 : Complete study of thermodynamics and entropy
3 : Basic idea of magnetic effects of current and AC circuits
4 : Over view of defects in lenses and corrective measures
5 : Understanding the basics on Geometrical optics

UNIT 1 : Waves and Oscillations (15 Hours)

Simple harmonic motion – composition of two simple harmonic motion at right angles (periods in the ratio 1:1) – Lissajou's figures – uses – laws of transverse vibrations of strings – Melde's string – transverse and longitudinal modes – determination of a.c frequency using sonometer (steel and brass wires) – ultrasonics – production – application and uses – reverberation – factors for good acoustics of hall and auditorium.

UNIT 2 : Properties of matter (15 Hours)

Elasticity : Elastic constants – bending of beam – Young's modulus by non- uniform bending – energy stored in a stretched wire – torsion in a wire – determination of rigidity modulus by torsional pendulum – static torsion.

Viscosity : Coefficient of viscosity – Poissuelle's formula – comparison of viscosities - burette method – Stoke's law – terminal velocity – viscosity of highly viscous liquid – lubrication.

Surface tension : Molecular theory of surface tension – excess of pressure inside a drop and bubble – variation of surface tension with temperature – Jaeger's method.

UNIT 3 : Thermal Physics (15 Hours)

Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory and application – liquefaction of gasses – Linde's process – Helium I and II – adiabatic demagnetization. Thermodynamic equilibrium – laws of thermodynamics – entropy change of entropy in reversible and irreversible processes.

UNIT 4 : Electricity and Magnetism (15 Hours)

Capacitor – energy of a charged capacitor - loss of energy due to sharing of charges – magnetic field due to a current carrying conductor – Biot Savart's Law – Field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an ac circuit – circuit control and protective devices – switch and its types – fuses circuit breaker and relays.

UNIT 5 : Geometrical optics (15 Hours)

Refraction – Refractive index by microscopy – air cell – refraction at grazing incidence and grazing emergence in prisms – combination of two small angled prisms to produce dispersion without deviation and deviation without dispersion – direct vision prism – constant deviation prism – defects of images – coma – distortion – spherical and chromatic aberration in lenses.

BOOKS FOR STUDY

1. Allied Physics by R. Murugesan, S.Chand & Co, New Delhi(2008).
2. Waves and Oscillations by Brijlal and N. Subramanyam, Vikas Publishing house,New Delhi.
3. Properties of Matter by Brij Lal and N.Subramaniam, S. Chand & Co., New Delhi(1994).
4. Heat and Thermodynamics by J.B.Rajam and C.L.Arora, S.Chand & Co., 8th edition, New Delhi(1976).
5. Optics and Spectroscopy by R. Murugesan, S.Chand & Co, New Delhi (2005).

BOOKS FOR REFERENCE

1. Fundamentals of Physics by Resnick Halliday and Walker, John Willey and Sons, Asia Pvt.Ltd., 6th edition, Singapore.
2. Text book of Sound by V.R.Khanna and R.S.Bedi, Kedharnaath Publish & Co, 1st edition, Meerut (1998).
3. Electricity and Magnetism by N.S. Khare and S.S. Srivastava, Atma Ram & Sons, 10th Edition, New Delhi (1983).
4. Optics by D.R. Khanna and H.R. Gulati, S. Chand & Co., New Delhi (1979).

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

CORE THEORY –1: ALLIED PHYSICS – PAPER II

SUBJECT CODE:	THEORY	MARKS: 100
SEMESTER: II	CREDITS: 3	TOTAL HOURS: 75

COURSE FRAMEWORK:

To make the students familiarise with physical concepts to have detailed learning in their core subjects

COURSE OUTCOME:

1 : Overall view of Physical optics and optical instruments
2 : Basic study of atomic and nuclear aspects
3 : Understanding of Nuclear model and nuclear reaction.
4 : Basic idea of relativity and quantum mechanics
5 : Introduction to electronics and Digital electronics

UNIT 1 : Physical Optics (15 Hours)

Velocity of light – Michelson's method. Interference : Colours of thin films –air wedge – determination of diameter of a thin wire by air wedge – test for optical flatness – Diffraction – Fresnel's explanation of rectilinear propagation of light – theory of transmission grating – Normal incidence – polarization – double refraction - optical activity – polarimeter.

UNIT 2 : Atomic Physics (15 Hours)

Atom model – vector atom model – electron, spin, quantum numbers – Pauli's exclusion principle – electronic configuration of elements and periodic classification of elements – various quantum numbers – magnetic dipole moment of electron due to orbital and spin motion – Bohr magneton – spatial quantisation – Stern and Gerlach experiment.

UNIT 3 : Nuclear Physics (15 Hours)

Nuclear model – liquid drop model – magic numbers - shell model – nuclear energy – mass defect – binding energy. Radiation detectors – ionization chambers – GM Counter – Fission Controlled and Uncontrolled chain reaction – nuclear reactor – thermonuclear reactions – stellar energy.

UNIT 4 : Elements of relativity and quantum mechanics (15 Hours)

Postulates of theory of relativity – Lorentz transformation equations – derivation – length contraction – time dilation – mass energy equivalence – uncertainty principle – postulates of wave mechanics – Schrodinger's equation – application to a particle in a box.

UNIT 5 : Electronics (15 Hours)

Basic Electronics: Zener diode – voltage regulator – LED – Transistor RC coupled amplifier – feedback principle – condition for oscillation – phase shift oscillator – Wein's bridge oscillator.
Digital Electronics : NAND and NOR gates – Universal building blocks – Boolean algebra – Demorgan's theorem – verification – elementary ideas of ICs – SSI , MSI, LSI and VLSI – Half adder, Full adder, Half Subtractor and Full subtractor.

BOOKS FOR STUDY

1. Allied Physics by R. Murugesan, S.Chand & Co, New Delhi(2008).
2. Allied Physics by K. Thangaraj and D. Jayaraman, Popular Book Depot, Chennai(2004).
3. Text book of Optics by Brijlal and N. Subramanyam, S.Chand & Co, New Delhi(2002).
4. Modern Physics by R. Murugesan, S.Chand & Co, New Delhi (2005).
5. Applied Electronics by A. Subramaniyam, National Publishing Co., 2nd Edition, Chennai(2001).

BOOKS FOR REFERENCE

1. Fundamentals of Physics by Resnick Halliday and Walker, John Willey and Sons, Asia Pvt.Ltd., 6th Edition, Singapore.
2. Optics by D.R. Khanna and H.R. Gulati, S. Chand & Co., New Delhi (1979).
3. Concepts of Modern Physics by A.Beiser, Tata McGraw Hill Publication, New Delhi(1997).
4. Digital Fundamentals by Thomas L.Floyd, Universal Book Stall – New Delhi (1998).

QUESTION PAPER PATTERN:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	3	**30**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	6	**30**
Section C	**Essay** Answer any 4 out of 6questions	20– 25	10	**40**
TOTAL MARKS				**100**

DISTRIBUTION OF QUESTIONS:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit – 1	3	
	Unit – 2	3	
	Unit – 3	2	
	Unit – 4	2	
	Unit – 5	2	
Section B	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	2	
	Unit – 5	1	
Section C	Unit – 1	2	
	Unit – 2	1	
	Unit – 3	1	
	Unit – 4	1	
	Unit – 5	1	

ALLIED PRACTICALS: ALLIED PHYSICS – PRACTICALS

SUBJECT CODE:	PRACTICALS	MARKS: 100
SEMESTER: II	CREDITS: 4	TOTAL HOURS: 75

COURSE FRAMEWORK:

To make the students skillful in experimentally analysing the physical concepts through practical.

COURSE OUTCOME:

1**:** The ability to formulate, conduct, analyze and interpret experiments in physics.
2**:** A working knowledge of fundamental physics and basic mechanics principles.
3: Understand physical characteristics of SHM and obtaining solution of the oscillator using experiment.
4: Study the elastic modulus and behavior of the materials
5: Analyze the specific heat capacity, refractive index, as per the standard procedure
6: Understand the knowledge in electrical devices such as ammeter and voltmeter.

(Practical Examination at the end of even semester)

1. Young's Modulus by Non-uniform bending using Pin and Microscope
2. Young's Modulus by Non-uniform bending using Optic lever – Scale and telescope
3. Rigidity modulus by Static torsion method
4. Rigidity modulus by torsional oscillations without mass
5. Surface tension and interfacial tension – Drop Weight method
6. Comparison of viscosities of two liquids – Burette method
7. Specific heat Capacity of a liquid – Half time correction
8. Sonometer – Determination of a.c frequency
9. Newton's rings - Radius of curvature
10. Air wedge – Thickness of a wire
11. Spectrometer – Grating – Wavelength of Mercury lines – Normal Incidence
12. Potentiometer – Voltmeter Calibration
13. P.O. Box – Specific resistance
14. Table Galvanometer – Figure of merit
15. Construction of AND, OR, NOT gates – using diodes and Transistor
16. Zener Diode – Characteristics
17. NAND gate as a universal gate

Note : Use of Digital Balance Permitted

BOOKS FOR STUDY AND REFERENCE :

1. Practical Physics by M.N.Srinivasan S. Chand & Co.,
2. Practical Physics by M.Arul Thalapathy Comptek Publishers.

****