GURU NANAK COLLEGE (AUTONOMOUS)

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

Velachery Main Road, Velachery, Chennai – 600042.

B.Sc. Physics

(SEMESTER PATTERN WITH CHOICE BASED CREDIT SYSTEM)

Syllabus

(For the candidates admitted in the Academic year 2017-18 and thereafter)

VISION

To inculcate the conceptual knowledge in Physics and making them skillful using "State of Art" teaching methodology.

MISSION

The physics department is committed to impart quality education in theoretical as well as experimental physics with special emphasis on 'learning by doing' to promote Science and technology

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 2017– 2020 batch

Semester	Part	Course Component	Subject Code	Subject Name	Credits	Hours	Max. Marks		
							CIA	ESE	Total
Semester I	I	LANGUAGE - I	17UTAMF01	TAMIL - I	3	6	50	50	100
			16UHINF01	HINDI - I					
	II	ENGLISH	16UENGF41	ENGLISH - I	3	4	50	50	100
	III	CORE – 1	16UPHYC01	MECHANICS AND PROPERTIES OF MATTER	4	5	50	50	100
		CORE PRACTICAL - I	16UPHYC02P	PRACTICAL GENERAL - I	*	3	*	*	*
		ALLIED - I	16UCHEA11	CHEMISTRY - I	4	5	50	50	100
		ALLIED PRACTICAL- I	16UCHEA12P	CHEMISTRY - PRACTICAL	*	3	*	*	*
	IV	NME	16UNME01D	BASIC PHYSICS	2	2	-	100	100
			16UBAT401	BASIC TAMIL - I					
			17UBAH401	BASIC HINDI - I					
		SOFT SKILL	17UGSLS01	LISTENING AND SPEAKING SKILLS	3	2	-	100	100
	CREDIT TOTAL = 19; TOTAL HOURS =30								
Semester II	I	LANGUAGE -II	17UTAMF02	TAMIL - II	3	6	50	50	100
			16UHINF02	HINDI - II					
	II	ENGLISH	16UENGF42	ENGLISH - II	3	4	50	50	100
	III	CORE THEORY - 2	16UPHYC03	THERMAL PHYSICS AND ACOUSTICS	4	5	50	50	100
		CORE PRACTICAL - I	16UPHYC02P	PRACTICAL GENERAL - I	4	3	50	50	100
		ALLIED - II	16UCHEA13	CHEMISTRY - II	4	5	50	50	100
		ALLIED PRACTICAL-I	16UCHEA12P	CHEMISTRY - PRACTICAL	2	3	50	50	100
	IV	NME	16UADT402	ADVANCED TAMIL - II	2	2	-	100	100
			16UBAT402	BASIC TAMIL - II					
			16UNME02D	NON-CONVENTIONAL ENERGY SOURCES					
			17UBAH402	BASIC HINDI - II					
		SOFT SKILL	17UGSLS02	READING AND WRITING SKILLS	3	2	50	50	100
	CREDIT TOTAL = 25; TOTAL HOURS =30								
Semester III	I	LANGUAGE - III	16UTAMF03	TAMIL - III	3	6	50	50	100
			16UHINF03	HINDI - III					
	II	ENGLISH	16UENGF43	ENGLISH - III	3	4	50	50	100
	III	CORE THEORY - 3	16UPHYC04	OPTICS AND SPECTROSCOPY	4	5	50	50	100
		CORE PRACTICAL - 2	16UPHYC05P	PRACTICAL GENERAL - II	*	3	*	*	*
		ALLIED –II	17UMATA12	MATHEMATICS - I	5	8	50	50	100
	IV	SOFT SKILL	16UGSLS03	PERSONALITY ENRICHMENT	3	2	50	50	100
		NME	16UEVS401	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	16UTAMF04	TAMIL - IV	3	6	50	50	100
			16UHINF04	HINDI - IV					
	II	ENGLISH	16UENGF44	ENGLISH - IV	3	4	50	50	100
	III	CORE THEORY - 4	16UPHYC06	ELECTRICITY AND MAGNETISM	4	5	50	50	100
		CORE PRACTICAL- 2	16UPHYC05P	PRACTICAL GENERAL - II	4	3	50	50	100
		ALLIED - II	17UMATA15	MATHEMATICS - II	5	8	50	50	100
	IV	NME	16UEVS401	ENVIRONMENTAL STUDIES	2	2	-	100	100
		SOFT SKILL	16UGSLS04	COMPUTING SKILL	3	2	50	50	100
		CREDIT TOTAL = 24; TOTAL HOURS = 30							
Semester V	III	CORE THEORY - 5	16UPHYC07	ATOMIC PHYSICS	4	5	50	50	100
		CORE THEORY - 6	16UPHYC08	NUCLEAR PHYSICS AND PARTICLE PHYSICS	4	5	50	50	100
		CORE THEORY - 7	16UPHYC09	SOLID STATE PHYSICS AND ELECTRONICS	4	5	50	50	100
		CORE THEORY - 8	16UPHYC10	ELECTROMAGNETISM	5	5	50	50	100
		CORE PRACTICAL- 3	16UPHYC11P	PRACTICAL GENERAL - III	*	2	*	*	*
		CORE PRACTICAL - 4	16UPHYC12P	ELECTRONICS - I - PRACTICAL	*	2	*	*	*
		CORE PRACTICAL - 5	16UPHYC13P	MICRO PROCESSOR AND INTEGRATED ELECTRONICS - PRACTICAL	*	2	*	*	*
		ELECTIVE - 1	16UPHYE01	NUMERICAL METHODS ***	5	4	50	50	100
	IV		16UVED401	VALUE EDUCATION	2		50	50	100
		CREDIT TOTAL = 24; TOTAL HOURS = 30							
Semester VI	III	CORE THEORY - 9	16UPHYC14	RELATIVITY AND QUANTUM MECHANICS	5	6	50	50	100
		CORE THEORY- 10	16UPHYC15	MATHEMATICAL METHODS IN PHYSICS	5	6	50	50	100
		ELECTIVE – 2	16UPHYE02	INTEGRATED ELECTRONICS ***	5	6	50	50	100
		ELECTIVE - 3	16UPHYE03	MICROPROCESSOR FUNDAMENTALS***	5	6	50	50	100
		CORE PRACTICAL - 3	16UPHYC11P	PRACTICAL GENERAL - III	4	2	50	50	100
		CORE PRACTICAL - 4	16UPHYC12P	ELECTRONICS - I - PRACTICAL	4	2	50	50	100
		CORE PRACTICAL- 5	16UPHYC13P	MICRO PROCESSOR AND INTEGRATED ELECTRONICS - PRACTICAL	2	2	50	50	100
		CREDIT TOTAL = 30; TOTAL HOURS = 30							
		OVERALL CREDIT TOTAL = 140 / 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 insemester – II.

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

SEMESTER - I

CORE THEORY –1: MECHANICS AND PROPERTIES OF MATTER

SUBJECT CODE: 16UPHYC01	THEORY	MARKS: 100
SEMESTER: I	CREDITS: 4	TOTAL HOURS: 75

Objectives:
Course Objective: To make the students understand dynamics behind collisions and oscillations

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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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

SUBJECT CODE: 16UPHYC03	THEORY	MARKS: 100
SEMESTER: II	CREDITS: 4	TOTAL HOURS: 75

Course Objective: To enlighten the students on thermodynamics and transmission of heat

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 – variation of specific heat capacity of diatomic gases

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 (15 Hours)

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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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: GENERAL PRACTICALS **I**

SUBJECT CODE: 16UPHYC02P	**PRACTICAL**	**MARKS: 100**
SEMESTER: II	**CREDITS: 4**	**TOTAL HOURS: 75**

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

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:	**PRACTICAL**	**MARKS: 100**
SEMESTER: II	**CREDITS: 4**	**NO.OF HOURS PER WEEK: 2**

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 Objective: To make the students understand physics in day to day appliances

Unit 1

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

Unit 2

How things work – 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: 16UNME01D	**THEORY**	**MARKS: 100**
SEMESTER: II	**CREDITS: 2**	**NO.OF HOURS PER WEEK: 2**

Course Objective: To consolidate the basic concepts of physics in an elementary way.

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, 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 (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: 16UNME02D	**THEORY**	**MARKS: 100**
SEMESTER: II	**CREDITS: 2**	**NO.OF HOURS PER WEEK: 2**

Course Objective: To emphasize the need for alternate energy sources and their applications

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: 16UPHYC04	**THEORY**	**MARKS: 100**
SEMESTER: III	**CREDITS: 4**	**TOTAL HOURS: 75**

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

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 – 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. 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 - Experimental study of Raman Effect - Application of Raman effect in molecular structure. Laser: Ruby laser – He-Ne, CO_2 laser construction and working – Application of Laser.

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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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 MAGNETISM

SUBJECT CODE: 16UPHYC06	**THEORY**	**MARKS: 100**
SEMESTER: IV	**CREDITS: 4**	**TOTAL HOURS: 75**

Course Objectives:

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

Unit 1: Chemical Effects of Electric Current (15 Hours)

Faraday's laws of Electrolysis - ionic velocities and mobilities. Calculation and experimental determination of ionic mobilities - transport number. Thermoelectricity- Peltier effect - Experimental determination of Peltier coefficient - Thomson coefficient - experimental determination of Thomson coefficient - application of thermodynamics to a thermocouple and connected relations - thermoelectric diagram and uses.

Unit 2: Current electricity and Network analysis (15 Hours)

Ohms law – variation of Resistance with temperature – temperature coefficient of resistance – Wheatstone's network – application – metre bridge. Thevenin's theorem – Norton's theorem – simple solutions using the theorems.

Unit 3: 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 4: 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.

Unit 5: Magnetic Properties of materials (15 Hours)

Susceptibility – permeability – intensity of magnetization – relationship connecting intensity of magnetization and magnetic induction $B = \mu_0(H + I_m)$ – (I – H) curve and B-H curves for a magnetic material using magnetometer method and ballistic galvanometer method. Terrestrial magnetism – magnetic elements – dip circle.

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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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: 16UPHYC05P	**PRACTICAL**	**MARKS: 100**
SEMESTER: IV	**CREDITS: 4**	**TOTAL HOURS: 75**

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

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 mangetometer 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 (Miror 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

.

ENVIRONMENTAL STUDIES

SUBJECT CODE: 16UEVS401	**THEORY**	**MARKS: 100**
SEMESTER: IV	**CREDITS: 2**	**NO.OF HOURS PER WEEK: 2**

Course Objective: To make the students understand the ecosystem and its surveillance

Unit – I

Environment Concept: Introduction, concept of biosphere – lithosphere, hydrosphere, atmosphere, Natural resources – their need and types: Principle and scope of Ecology, concepts of ecosystem, population, community, biotic interactions, biomes, ecological succession.

Atmosphere: Parts of atmosphere, components of air, pollution, pollutatns, their sources, permissible limits, risks and possible control measures.

Hydrosphere: Types of aquatic system. Major sources (including ground water) and uses of water, problems of the hydrosphere, fresh water shortage: Pollution and pollutants of water, permissible limits, risks and possible control measures.

Lithosphere: Earth crust, Soil – a life support system, its texture, types, components, pollution and pollutants, reasons of soil erosion and possible control measures.

Unit – II

Forests: Concepts of forests and plantations, types of vegetation and forests, factors governing vegetation, Role of trees and forests in environment, various forestry programmes of the Govt. of India, Urban forests, Chipko Andolan.

Conservation and Environment: The concepts of conservation and sustainable development, Why to conserve, aims and objectives of conservation; conservation of life support systems – soil, water, air, wildlife and forests.

Unit – III

Management of Solid Waste: Merits and demerits of different ways of solid waste management – open, dumping, landfill, incineration, resource reduction, recycling and reuse, vermicomposting and vermiculture, organic farming.

Indoor Environment: Pollutants and contaminants of the in-house environment; problems of the environment linked to urban and rural lifestyles; possible adulterants of the food; uses and harms of plastics and polythene; hazardous chemicals, solvents and cosmetics.

Unit – IV

Global Environmental Issues: Global concern, creation of UNEP; Conventions on climate change, convention on biodiversity; Stratospheric ozone depletion, dangers associated and possible solutions.

Indian Laws on Environment: Indian laws pertaining to Environmental Protection: Environmetn (Protection) Act, 1986; General information about laws regarding relating to control of air, water and noise pollution. What to do seek redressal.

Unit – V

Biodiversity: What is biodiversity, levels and types of biodiversity, importance of biodiversity, causes of its loss, how to check its loss; Hotspot zones of the world and India, Biodiversity Act 2002.

Noise and Microbial Pollution: Pollution due to noise and microbes and their effects.

Human Population and Environment: Population growth and family welfare programme, Human Health, HIV/AIDS, Human rights.

Social Issues: Environmental Ethics: Issues and possible solutions, problems related to lifestyle, sustainable development, Consumerisms and waste generation.

Local Environmental Issues: Environmental problems in rural and urban areas, Problems of Congress grass and other weeds, problems arising from the use of pesticides and weedicides, smoking, etc.

Practical

Visit to vermicomposting units or any other such non-polluting eco-friendly site or planting/caring of vegetation/ trees could be taken.

Reference books:

a) Environmental Studies - S.N. Chary
b) A text book on Ecology and Environmental Science – M. Prasanthrajan

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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 - V

CORE THEORY –5: **ATOMIC PHYSICS**

SUBJECT CODE: 16UPHYC07	**THEORY**	**MARKS: 100**
SEMESTER: V	**CREDITS: 4**	**TOTAL HOURS: 75**

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

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

Specific charge of an electron – Dunnington's method – Magnetron 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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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 –6**: NUCLEAR PHYSICS AND PARTICLE PHYSICS**

SUBJECT CODE: 16UPHYC08	**THEORY**	**MARKS: 100**
SEMESTER: V	**CREDITS: 4**	**TOTAL HOURS: 75**

Course Objective: Facilitating the students to understand nuclear reactions based on nuclear models

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).

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 – fundamental interactions – 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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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

SUBJECT CODE: 16UPHYC09	**THEORY**	**MARKS: 100**
SEMESTER: V	**CREDITS: 4**	**TOTAL HOURS: 75**

Course objective: 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.

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 – Properties of different types of insulating materials.

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 http://folk.uio.no//dragos//solid/fys230-Exerciser.html.

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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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 –8: **Electromagnetism**

SUBJECT CODE: 16UPHYC10	**THEORY**	**MARKS: 100**
SEMESTER: V	**CREDITS: 4**	**TOTAL HOURS: 75**

Course Objective: To understand the basics behind the electromagnetic machines

Unit I 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 II 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 - coeficient of coupling.

Unit III 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.

Unit IV Electromagnetic Machines (15 Hours)

AC generator – Distribution of three phase ac – star and delta connections – Dc Motor – Back emf - serial wound – shunt wound – compound wound motors – induction motor

Unit V Maxwell's Equations and Electromagnetic Theory: (15 Hours)

Basic equations - types of currents - vacuum displacement current - Maxwell's equations - Maxwell's equations in free space - electromagnetic waves in free space - energy density of e.m wave - Poynting's theorem - energy per unit volume.

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).

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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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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	

VALUE EDUCATION

SUBJECT CODE: 16UVED401	**THEORY**	**MARKS: 100**
SEMESTER: IV	**CREDITS: 2**	**NO.OF HOURS PER WEEK: 2**

Course Objective:

Values are socially accepted norms to evaluate objects, persons, and situations that form part and parcel of sociality. A value system is a set of consistent values and measures. Knowledge of the values are inculcated through education. It contributes in forming true human being, who are able to face life and make it meaningful. There are different kinds of values like ethical or moral values, doctrinal or ideological values, social values and aesthetic values. Values can be defined as brad preferences concerning appropriate course of action or outcomes. As such, values like, "Equal rights for all", "Excellence deserves admiration", "People should be treated with respect and dignity". Values tend to influence attitudes and behavior and help to solve common human problems. Values are related to the norms of a culture.

Unit – I **(15 Hours)**

Value education – its purpose and significance in the present world – Value system. The role of culture and civilization – Holistic living – Balancing the outer and inner Body, Mind, and Intellectual level – Duties and responsibilities.

Unit – II **(15 Hours)**

Salient values for life – Truth, Commitment, Honesty and Integrity, Forgiveness and Love, Empathy and Ability to Sacrifice, Care, Unity, and Inclusiveness, Self esteem and Self confidence, Punctuality – Time, task and resource management – problem solving and decision making skills – Interpersonal and Intrapersonal relationship – Team work – Positive and Creative writing.

Unit – III **(15 Hours)**

Human Rights – University Declaration of Human Rights – Human Rights Violations – national Integration – Peace and Non-Violence – Dr. A.P.J. Kalam's ten points for enlightened citizenship – Social values and Welfare of the Citizen – The role of media in value building.

Unit – IV **(15 Hours)**

Environment and Ecological balance – interdependence of all beings – Living and Non-living . The binding of man and nature. Environment conservation and enrichment.

Unit – V **(15 Hours)**

Social Evils – Corruption, Cyber crime, Terrorism – Alcoholism, Drug addiction – Dowry – Domestic violence – Untouchability Female infanticide – Atrocities against women – How to tackle them.

Books for Reference:

1. M.G. Chitakra. Education and Human Values, A.P.H. Publishing Corporation, New Delhi.
2. Chakravarthy, S.K. Values and Ethics for Organizations. Theory and Practice, Oxford Delhi.
3. Satchindananda, Mk. Ethics, Education, Indian Unity and Culture, Ajantha Publications.
4. Das, MS & Gupta, V.K. Social Values and Young adults. A changing Scenario, MD.
5. Bandiste, D.D.(1998). Humanist Values. A Source Book, B.R. Publishing Corporation, Delhi.
6. Ruhela, S.P. (1986). Human Values and Education, Sterling Publications, New Delhi.
7. Kaul, G.N. Values and Education in Independent Indian, Associated Publishers, Mumbai.
8. NCERT, (1992). Education in Values, New Delhi.
9. Swami Budhananda (1983). How to Build Character. A Primer. Ramakrishna Mission New Delhi.
10. A Cultural Heritage of India (4 Vols.) Bharatiya Vidya Bhavan, Bombay. (Selected Chapters
11. For Life, For the future. Reserves and Remains. UNESCO Publication.

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition / Principles** Answer any 10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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 –9: RELATIVITY AND QUANTUM MECHANICS

SUBJECT CODE: 16UPHYC14	**THEORY**	**MARKS: 100**
SEMESTER: V	**CREDITS: 5**	**TOTAL HOURS: 75**

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

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 – Heisenberg's uncertainity principle and its equivalence.

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 – 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.

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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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 –10: MATHEMATICAL METHODS IN PHYSICS

SUBJECT CODE: 16UPHYC15	**THEORY AND PROBLEM**	**MARKS: 100**
SEMESTER: VI	**CREDITS: 5**	**TOTAL HOURS: 75**

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

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 - 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 - Degenerate Fermi gas.

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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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: 16UPHYC11P	**PRACTICAL**	**MARKS: 100**
SEMESTER: VI	**CREDITS: 4**	**TOTAL HOURS: 75**

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

(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: 16UPHYC12P	**PRACTICAL**	**MARKS: 100**
SEMESTER: VI	**CREDITS: 4**	**TOTAL HOURS: 75**

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

(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: 16UPHYC13P	**PRACTICAL**	**MARKS: 100**
SEMESTER: VI	**CREDITS: 2**	**TOTAL HOURS: 75**

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

(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: 16UPHYE01	**THEORY AND PROBLEM**	**MARKS: 100**
SEMESTER: V	**CREDITS: 5**	**TOTAL HOURS: 75**

Course Objective: To make the students understand the basic concepts of computational mathematics

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 □,∇,□,□,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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

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

SUBJECT CODE: 16UPHYE02	**THEORY**	**MARKS: 100**
SEMESTER: VI	**CREDITS: 5**	**TOTAL HOURS: 75**

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

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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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: 16UPHYE03	**THEORY**	**MARKS: 100**
SEMESTER: VI	**CREDITS: 5**	**TOTAL HOURS: 75**

Course Objective:

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

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 - Programmable peripheral interface 8255-Flashing LEDs

UNIT-V: INTERRUPTS **(15 Hours)**

Interrupts in 8085 - Hardware and Software interrupts – RIM, SIM instructions and priorities – simple polled and interrupt controlled data transfer- 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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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 – I**

SUBJECT CODE: 16UPHYA13	**THEORY**	**MARKS: 100**
SEMESTER: I	**CREDITS: 3**	**TOTAL HOURS: 75**

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

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.
5. 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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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: 16UPHYA15	**THEORY**	**MARKS: 100**
SEMESTER: II	**CREDITS: 3**	**TOTAL HOURS: 75**

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

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	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13–19	8	**40**
Section C	**Essay** Answer any 2 out of 4questions	20– 23	20	**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: 16UPHYA14P	**PRACTICAL**	**MARKS: 100**
SEMESTER: II	**CREDITS: 4**	**TOTAL HOURS: 75**

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

(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

The following procedure is to be followed for internal marks(40 marks)

Attendance : 5 marks

Practical test – best 2 out of 3 : 30 marks

Record : 5 marks

Books for Study and Reference :

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

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