ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE

(AUTONOMOUS)

CUDDALORE-1

PG & RESEARCH DEPARTMENT OF PHYSICS

B.Sc (Physics)

SYLLABUS 2016-2017

P.G. and Research Department of Physics
B.Sc Physics
Curriculum Template
First Year

Semester	Part	Subject Code	Subject Title	Hours	Credits
I	**I**	LT101S	Tamil– I / Hindi – I / French - I	4	3
	II	LE101S	English – I	4	3
	III	PH101	Properties of matter & Acoustics	8	6
	III	PHP01	Main Practical - I	3	2
	III	AMT101S	Allied – (Maths)	8	6
	IV	ECL101	Skill Based Courses	3	2
	Total			**30**	**22**
	IV		Extra Curricular Courses		3
	Grand Total Credits				**25**
II	**I**	LT202	Tami I – II / Hindi – II / French -II	4	3
	II	LE202	English – II	4	3
	III	PH202	Thermal and Statistical Physics	8	6
	III	PHP02	Main Practical - II	3	2
	III	ACS201	Allied – (Computer Science)	5	4
	III	ACSP01	Computer Science Practical	3	2
	IV	EPD201	Skill Based Courses	3	2
	Total			**30**	**22**
	IV		Extra Curricular Courses		3
	Grand Total Credits				**25**

Second Year

Semester	Part	Subject Code	Subject Title	Hours	Credits
III	**I**	LT303	Tamil– III / Hindi – III / French -III	4	3
	II	LE303	English – III	4	3
	III	PH303	Basics of Newtonian and Classical Mechanics	8	6
	III	PHP03	Main Practical - III	3	2
	III	ACH301	Allied – (Chemistry)	5	4
	III	ACHP01	Chemistry Practical	3	2
	IV	APCM301	Skill Based Courses	3	2
	Total			**30**	**22**
	IV		Extra Curricular Courses		3
	Grand Total Credits				**25**
IV	**I**	LT401	Tamil– IV / Hindi – IV / French -IV	4	3
	II	LE402	English – IV	4	3
	III	PH404	Electricity & Magnetism	8	6
	III	PHP04	Main Practical – IV	3	2
	III	IBC401	Inter Disciplinary Course (IDC)*	5	4
	III		Practical (IDC)*	3	2
	IV	EVS401	Skill Based Courses	3	2
	Total			**30**	**22**
	IV		Extra Curricular Courses		3
	Grand Total Credits				**25**

* **IDC:** Students should select any one paper offered by other than Physics Department.

(IDC)* = Bio Physics Elective Subject (Department of Bio Chemistry)

Third Year

Semester	Part	Subject code	Subject title	Hours	Credits
V	III	PH 501	Optics & spectroscopy	**5**	**4**
	III	PH 502	Atomic physics	**5**	**4**
	III	PH 503	Solid state physics	**5**	**4**
	III	PH 504	Basic electronics	**5**	**4**
	III	EPH 505	Core elective-i	**4**	**2**
	III	PHP05	Main practicals-v	**6**	**4**
	Total			**30**	**22**
	IV		Extra curricular courses		**3**
	Total credits				**25**
VI	III	PH 601	Relativity, Quantum Mechanics and Mathematical Methods	**5**	**4**
	III	PH 602	Nuclear and Radiation Physics	**5**	**4**
	III	PH 603	Laser and Fiber Optic Communication	**5**	**4**
	III	PH 604	Applied Electronics	**5**	**4**
	III	EPH 605	Core elective-ii	**4**	**2**
	III	PHP06	Electronics Practicals-vi	**6**	**4**
	Total			**30**	**22**
	IV	JPH601	Electronics Project		**3**
	Total credits				**25**

THIRD YEAR

SEMESTER – V (ELECTIVE-I)

A. DIGITAL ELECTRONICS
B. MATERIAL S SCIENCE

SEMESTER – VI (ELECTIVE –II)

A. NUMERICAL METHODS & COMPUTER PROGRAMMING
B. ENERGY PHYSICS

M.Sc., PHYSICS

Course Structure
First Year
SEMESTER WISE PAPERS

Sem	Code	Title	Hours/Week	Credits
I	PPH701	Statistical Mechanics	5	4
	PPH702	Classical & wave mechanics	5	4
	PPH703	Mathematical Physics	5	4
	EPPH704	Electronic Devices & Applications	5	4
	PPHG01	General Practical-I	4	4
	PPHE02	Electronics Practical - I	4	4
		Seminar / Paper Presentation	2	1
	Total		**30**	**25**

Sem	Code	Title	Hours/Week	Credits
II	PPH805	Electromagnetic theory	5	4
	PPH806	Nuclear and Particle Physics	5	4
	PPH807	Quantum mechanics -I	5	4
	EPPH808	Molecular Physics	5	4
	PPHG03	General Practical – II	4	4
	PPHE04	Electronics Practical – II	4	4
		Seminar / Paper Presentation	2	1
	Total		**30**	**25**

Second Year

Sem	Code	Title	Hours/Week	Credits
III	PPH909	Quantum mechanics -II	5	4
	PPH910	Condensed Matter Physics	5	4
	EPH911	Elective I	5	4
	EPH912	Elective II	5	4
	PPHG05	General Practical – III	4	4
	PPHE06	Microprocessor Practical - III	4	4
		Human Rights	2	1
	Total		30	25

Elective I:

A. Microprocessor and Microcontroller
B. LASER Physics

Elective II:
A. Physics of Nano materials
B. Medical Physics

Sem	Code	Title	Hours/Week	Credits
IV	**PPH1013**	Research Methodology, Computation Methods & Programming	5	4
	EPPH1014	Elective III	5	4
	EPPH1015	Elective IV	5	4
	PPHPR01	Project	15	8
	PPHGP01	Guide Paper	-	4
		Skill Based Subject (Scientific Analysis)		1
	Total		30	25

Elective III:
A. Communication Physics
B. Materials Science

Elective IV:
A. Electronic Instrumentation
B. Astronomy and Astrophysics

YEAR – I	PROPERTIES OF MATTER & ACOUSTICS	PH101
SEMESTER - I		HRS/WK - 8
CORE - 1		CREDIT - 4

Objectives

- To study the basics of elasticity and its importance in beams
- To study the concepts of viscosity and surface tension and the various methods to determine the parameters experimentally
- To understand the nature of sound waves and its properties
- To study Ultrasonic and its application in various field
- To study and apply the knowledge of Acoustics aspects of halls and auditorium.

UNIT- I: ELASTICITY-I (24 Hours)

Hooke's law – stress – strain diagram – Modulus of elasticity - Relation between elastic constants – Poisson's ratio- Expressions for Poisson's ration in terms of elastic constants – work done in stretching and twisting a wire – Twisting couple on a cylinder –– Torsional pendulum with and without masses– Rigidity modulus and moment of inertia – Rigidity modulus by static torsion - q, n and σ by Searle's method .

UNIT- II: BENDING OF BEAMS (24 Hours)

Cantilever – Expression for bending moment – Expression for depression – Cantilever (static & dynamic methods)– Expression for time period and Experiment to determine Young's Modulus – Non-Uniform bending – Uniform bending – expressions - Experiment to determine Young's modulus using pin & microscope and optic lever – Experiment to determine Young's modulus by Koenig's method (Non-Uniform bending).

UNIT- III: FLUIDS (24 Hours)

Surface Tension – Molecular Interpretation - dimensions of surface tension – Excess of pressure over curved surfaces – Application to spherical and cylindrical drops and bubbles – Variation of surface tension with temperature – Jaegar's method

Viscosity: Co-efficient of viscosity and its dimensions – Rate of flow of liquid in a capillary tube – Poiseuille's formula – Experiment to determine co-efficient of viscosity of a liquid – variation of viscosity of a liquid with temperature and pressure –Viscosity of a gas – Rankine's method Applications of viscosity.

UNIT-IV: WAVES AND OSCILLATIONS (24 Hours)

Transverse and longitudinal waves – Equation of wave motion – Plane Progressive wave – velocity of transverse wave on a string - Superposition of waves – Interference, reflection and transmission of waves – Resonance - intensity and loudness of sound - sound level – Decibel –Beats - stationary waves – organ pipes – Doppler effect.

UNIT-V: ULTRASONICS & ACOUSTICS (24 Hours)

Ultrasonic - Piezo electric effect - Piezo electric crystal generator – Magnetostriction effect – Magnetostriction generator – Applications – Acoustics of buildings – Reverberation and time of reverberation & measurement – Sabine's formula – Absorption co-efficient – Acoustic aspects of halls and auditorium.

TEXT BOOKS:-

1. Murugeshan .R, 2006., Properties of Matter and Acoustics, New Delhi, S. Chand & Co.
2. Mathur D.S., 2006, *Properties of matter*, New Delhi: S. Chand & Co.
3. Brij Lal & Subrahmanyam, *Text Book of Sound*, New Delhi: N. Vikas Publishing House.

REFERENCE BOOKS:-

1. Baldevraj, *Science & Technology of Ultrasonic*, Narosa.
2. Bajaj N.K.,Physics of Waves&Oscillations,Tata McGraw Hill.

YEAR – I	Practical - I	PHP01
SEMESTER - I		HRS/WK - 3
CORE – PRACTICAL - 1		CREDIT - 1

(Any nine out of the given 12 experiments**)**

1. Young's Modulus by Non-Uniform Bending – Pin and Microscope
2. Young's Modulus by Non-Uniform Bending – Optic Lever.
3. Rigidity modulus- Torsional Pendulum – n of a wire (without masses)
4. Rigidity modulus -Torsional Pendulum – n (with masses)
5. Sonometer – Determination of Frequency.
6. Sonometer – Determination of Specific Gravity of Solid and Liquid.
7. Surface tension by drop weight and Interfacial liquid
8. Comparison of Viscosity of two liquids
9. Focal Length and Refractive Index of Convex Lens (u-v method and conjugate foci methods for 'f' and Boyle's method for R).
10. Spectrometer – μ of Solid Prism or Liquid Prism
11. Potentiometer – Calibration of low range voltmeter.
12. Rigidity modulus by Static Torsion (mirror and telescope method).

YEAR – I	THERMAL PHYSICS	PH202
SEMESTER - II		HRS/WK - 7
CORE - 2		CREDIT - 4

Objectives

- To acquire knowledge of transmission of heat and the laws associated with them
- To understand the nature and the kinetic theory of gases
- To study the concepts of gases at low temperature
- To study the laws of thermodynamics and understand their applications
- To study the basics of Maxwell's thermo-dynamical relations and their importance
- To understand the concepts of statistical thermodynamics and its applications.

UNIT- I: TRANSMISSION OF HEAT (24 Hours)

Thermal conductivity – good & bad conductors – Forbe's method - Lee's disc method– relationship between thermal and electrical conductivities - Wiedman Franz's law - Radiation- Prevost's theory of heat exchanges - law of cooling – Black body radiation - Kirchhoff's law - Wien's laws of energy distribution in black body radiation - Wien's displacement law- Rayleigh-Jean's law -Plank's law – pyrometry - solar constant – sources of solar energy & applications.

UNIT- II: KINETIC THEORY (24 Hours)

Expression for pressure **-** Transport phenomenon – expression for mean free path - thermal conductivity and diffusion of gases - distribution of molecular velocities – energy distribution function - Degrees of freedom - equipartition law of energy - C_P , C_V and γ of a gas - theory of Brownian motion – Langevin's theory.

UNIT- III: GASSES AND LOW TEMPERATURE PHYSICS (24 Hours)

Molar heat capacities – Mayer's relation reversible adiabatic and isothermal changes– equations – Clement and Desormers method of determining C_p / C_v – Andrew's work on Co_2– regenerative cooling – the Linde process – Liquid air, oxygen, hydrogen and Helium – He I and He II – super fluidity - practical applications of low temperatures – refrigerating machines– electroflux refrigerator – Frigidaire – air conditioning machines – effects of CF_2 and Cl_2 on Ozone layer.

UNIT- IV: THERMODYNAMICS (24 Hours)

Intensive and extensive variables – I & II laws of thermodynamics – reversible and irreversible processes – Heat engines – Otto and diesel engines – thermodynamic scale of temperature - entropy - change of entropy in reversible and irreversible processes – T-S diagram– entropy for a perfect gas - third law of thermodynamics.

UNIT- V: STATISTICAL THERMODYNAMICS (24 Hours)

First Latent heat equation (Clausius – Clapeyron equation), effect of pressure on melting and boiling point – second Latent heat equation - Maxwell's Thermodynamical relations– derivations .Phase space – microstates and macrostates.

TEXT BOOKS:-

1. Murugeshan.R.,2009., Thermal Physics., S. Chand & Co.,
2. Brijlal and Subramanyam, 2000, *Heat and Thermodynamics*, S. Chand and Co.
3. Gupta and Kumar, *Elements of Statistical Mechanics*, Meerut: Pragathi Prakashan.

REFERENCE BOOKS:-

1. Nelkon Parker, *Advanced Level Physics*, (Vol.V), Arnold Publication, Berkely Series .
2. Dr.Ilangovan and Dr.D.Jayaraman, Thermal Physics., S. Chand & Co.,

YEAR – I	Practical - II	PHP02
SEMESTER - II		HRS/WK - 3
CORE – PRACTICAL - 1		CREDIT - 1

(Any nine out of the given 12 experiments**)**

1. Young's Modulus by Uniform Bending – Pin and Microscope
2. Young's Modulus by Uniform Bending – Optic Lever.
3. To find thermal conductivity – Lee's Disc Method.
4. Specific heat capacity of liquid by method of mixtures (Half-time Correction).
5. Specific heat capacity of liquid by Newton's Law of cooling.
6. Spectrometer i–d Curve.
7. Focal Length R & μ of a concave lens.
8. Potentiometer – Calibration of an Ammeter.
9. Sonometer – Relative density of solid and liquid.
10. Air wedge thickness of a wire
11. M and B_H – TanC – Deflection and vibration Magnetometer.
12. Figure of merit of a table galvanometer.

YEAR – II	BASICS OF NEWTONIAN &CLASSICAL MECHANICS For the students admitted in the year 2014.	PH301
SEMESTER – III		HRS/WK - 8
CORE - 3		CREDIT - 6

Objectives

- To make the students to understand the basic ideas of mechanics in the field of dynamics, Statics, hydrostatics, hydrodynamics.
- To understand concepts of projectiles and friction
- To study the concepts space science
- To acquire knowledge of classical physics

UNIT-I (24 hours)

Statics: Centre of gravity- Centre of gravity of a solid and hollow cone- Solid and hollow hemisphere-Thrust-Centre of pressure- Vertical rectangular lamina.
Hydrostatics: Law of floatation- Metacenter- Metacentric height of a ship.
Hydrodynamics: Equation of continuity of flow- Energy of the fluid- Euler's Equation of unidirectional flow -Bernoulli's theorem.

UNIT-II (24hours)

Dynamics: Rigid body- Moment of inertia- Radius of gyration- moment of inertia of a solid cylinder, cylindrical shell, solid sphere, spherical shell, hollow sphere with external and internal radii- Bifilar pendulum- Compound pendulum- Determination of g and k.

UNIT-III (24 hours)

Projectile: Projectile motion- Range of a projectile, maximum height reached and angle of projection for maximum height- Resultant velocity at a given instant(Definitions only)- Projectile on an inclined plane
Friction: Laws of friction- Sliding friction - Angle of friction- Cone of friction- acceleration down an inclined plane- Rolling friction and stability.

UNIT IV (24 hours)

Space Science: Rockets and satellites- Basic principles of rocket motion Rocket equation, Thrust and acceleration- Escape velocity of multistage rockets- Liquid, solid and cryogenic - Propellant rockets- Space shutter- Orbital velocity- Launching of satellites - Types of satellite Orbits.

UNIT-V **(24 hours)**

Classical Mechanics: Mechanics of a system of particles- Generalized Co-ordinates- transformation equations- configuration space- principle of Virtual work- D' Alembert's principle- Lagrange's equations and its applications- Compound pendulum - Atwood's machine.

TEXT BOOKS:-

1. Narayana moorti and Nagarathnam, 1997, Statics, Hydrostatics and Hydrodynamics,III Edition
2. Murugeshan, 2005, Mechanics and mathematical methods,S.Chand and Co
3. Gupta Kumar and sharma, 2001, classical Mechanics

Reference books:

1. MathurD.S., 2006 II Edition, Mechanics,S.Chand& co.
2. Feynmann R.P, Leighton R.B and Sands M, Ther feymann Lectures on Physics, Vols 1,2 and 3-Narosa, New Delhi.(1998)
4. Brijlal and Subramaniyam, Mechanics and Electrodynamics, Edition 2005
5. Bhatia V.B., Classical Mechanics, Tamil Nadu Book House

YEAR – II	Practical - III	PHP03
SEMESTER - III		HRS/WK - 3
CORE – PRACTICAL – III		CREDIT - 1

(Any nine out of the given 12 experiments**)**

1. Compound Pendulum
2. Bifilar Pendulum
3. Kater's pendulum
4. Young's modulus-cantilever- oscillations dynamic method-pin and microscope.
5. Young's modulus cantilever –scale and telescope
6. Sonometer ac frequency using steel wire
7. Sonometer ac frequency using brass wire
8. Spectrometer-grating-normal incidence method
9. Spectrometer-grating-minimum deviation method
10. Surface tension of liquid
11. Young's Modulus by Koenig's method(Non-Uniform Bending)
12. Potentiometer- Resistance- Specific Resistance of a wire

YEAR – II	ALLIED PHYSICS	APH301
SEMESTER – III		HRS/WK - 5
ALLIED		CREDIT - 4

UNIT- I: PROPERTIES OF MATTER & ACOUSTICS (15 hours)

Sound: Transverse vibrations of a stretched string- expression for the velocity of transverse wave – laws of transverse vibrations- A.C frequency measurement using sonometer- velocity of sound in a gas-Ultrasonics-production and uses.

UNIT- II: ELECTRICITY & MAGNETISM (15 hours)

Capacitor- energy of charged capacitors- loss of energy due to sharing of charges DC circuits – growth and decay of charge containing resistance and capacitor (RC) circuit & inductance and resistance (LR) circuit - potentiometer- measurement of internal resistance of a cell and unknown resistances - Moment and pole strength of a magnet

UNIT- III: OPTICS (15 hours)

Physical Optics: Interference in thin films- Coherent sources- Interference in wedge shaped film- Newton's rings- Measurement of wave length and radius of curvature with theory- Air wedge - Theory of plane transmission grating- determination of wavelength of Hg lines by normal incidence

UNIT- IV: RELATIVITY & QUANTUM MECHANICS (15 hours)

Elements of relativity and Postulates of theory of relativity- Lorentz transformation equations- derivation- length contraction- time dilation- mass energy equivalence.

Quantum mechanics: De Broglie's waves - Uncertainty principle- postulates of wave mechanics- - Schrodinger's equation (one dimensional) - application to a particle in a box.

UNIT- V: ELECTRONICS (15 hours)

Basic electronics: PN Junction diode- transistor-characteristics of CE mode- Zener diode-voltage regulator- LED

Digital electronics: Boolean algebra- - verification AND, OR, NOT gates- construction using diodes and transistors- NAND- verification of Demorgan's theorem - ICs – SSI, MSI, LSI and VLSI.

Text Books

1. Principle of physics-Brijlal Subramaniyam
2. Allied physics-R.Murugesan.
3. Text book of sound- Brijlal Subramaniyam
4. Principle of Electronics-V.K.Metha.

YEAR – II	ALLIED PRACTICAL	APHP301/401
SEMESTER – III & IV		HRS/WK - 3
ALLIED		CREDIT - 2

LIST OF PRACTICALS

(Any TEN out of the FOURTEEN experiments can be selected**)**

1. Determination of Young's modulus –non-uniform bending -Pin and microscope.
2. Determination of Rigidity modulus- Torsional pendulum (without masses).
3. Determination of Rigidity modulus – Static torsion
4. Sonometer – verification of laws and frequency of tuning fork.
5. Sonometer – A.C frequency - Steel and Brass wire.
6. Air wedge – thickness of a wire.
7. Newton's rings – Determination of Radius of curvature
8. Spectrometer – Grating-Determination of wavelength of Hg lines.
9. Potentiometer – Calibration of Low range voltmeter.
10. Figure of merit of a galvanometer (Table galvanometer).
11. Construction of AND, OR NOT gates using diodes and transistors.
12. NAND gate as a universal gate.
13. Zener diode - Voltage regulation characteristics.
14. Field along the axis of a circular coil-deflection magnetometer-B_H and M.

YEAR – II	ELECTRICITY AND MAGNETISM	PH401
SEMESTER - IV	For the students admitted in the year	HRS/WK - 8
CORE - 4	2014.	CREDIT - 6

OBJECTIVES:

- To Understand The Electrostatics Concept And The Laws Associated With Them
- To acquire knowledge of chemical effects of electric current
- To study the concepts of DC circuits
- To study the basics of AC
- To understand the concepts of magnetic materials

UNIT I ELECTROSTATICS (24 hours)

Coloumb's law – electric intensity and electric potential – electrical images(any four examples)- electric intensity and potential due to an earthed conducting sphere applying the principle of electrical images- electric dipole – potential and intensity due to a dipole – capacity – capacitance of a spherical and cylindrical capacitor – energy of a charged capacitor – loss of energy due to sharing of charges

UNIT II CHEMICAL EFFECTS OF ELECTRIC CURRENT (24 hours)

Faraday's laws of electrolysis – ionic velocities and mobility – calculation and experimental determination of ionic mobility – transport number- thermoelectricity- Peltier's coefficient – Thomson coefficient – application of thermodynamics to a thermocouple and connected relations- thermoelectric diagram and uses.

UNIT III DC CIRCUITS (24 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 a LCR circuit – condition for the discharge to be oscillatory – frequency of oscillation – network analysis – Thevenin's and Norton's theorems

UNIT IV A.C and Electromagnetic induction (24 hours)

Power in AC circuit – wattless current- choke coil construction and working of transformers- energy losses – AC motors – single phase, three phases – star and delta connection –electric fuses- circuit breakers.

Inductances in series and parallel-Self inductance of co-axial cylinders-energy stored in a magnetic field-time varying magnetic field-Single phase induction motor

UNIT V MAGNETIC PROPERTIES OF MATERIALS (24 hours)

Susceptibility- permeability- intensity of magnetization and the relation B= u(H+I), I-H and B-H curves for a magnetic material using magnetometer method and ballistic galvanometer method – Terrestrial magnetism – magnetic elements-dip circle.

TEXT BOOKS:

1. Murugeshan R, 2006, Electricity and magnetism,8th edition,New Delhi,S.Chand&co.
2. Brijlal and N.Subramanian, Electricity and magnetism,6th edition,Agra,Ratan&Prakash
3. Narayanamoorthy M&Nagarathnam N, Electricity and magnetism,4TH edition,Meerut,National publishing Co.
4. Tewari K K, 2001, Electricity and magnetism,3RD EDITION,new Delhi,S.Chand&co.

REFERENCE BOOK:

1. David J Griffith,1997,Introduction to electrodynamics,2ND EDITION,New delhi,Prentice Hall of India Pvt.Ltd.
2. Sehgal D.L. Chopra K L and Sehgal N K , Electricity and Magnetism,New Delhi,Sultan chand&co
3. Brij Lal,Subramanian N and Jivan Seshan,2005,Mechanics and Electromagnetics ,New Delhi, Eurasia Publishing House Pvt .Ltd

YEAR – II	Practical - IV	PHP04
SEMESTER – IV		HRS/WK - 3
CORE – PRACTICAL – IV		CREDIT - 1

(Any nine out of the given 12 experiments**)**

1. Potentiometer –comparison of EMF
2. Potentiometer- high range voltmeter
3. Spectrometer-dispersive power of a grating
4. Spectrometer-dispersive power of a prism
5. P.O.Box –resistance-temperature coefficient
6. Field along the axis of a circular coil .deflection magnetometer
7. Carry Fosters bridge- temperature Co-efficient of Resistance
8. Field along the axis of a circular coil vibrational magnetometer
9. Variation of resistance with temperature (thermistor)
10. LCR Studies- Two Resistors- Two Capacitors – Two Inductors

YEAR – II	ALLIED PHYSICS	APH401
SEMESTER – IV		HRS/WK - 5
ALLIED		CREDIT - 4

UNIT- I: PROPERTIES OF MATTER & ACOUSTICS (15 hours)

Sound: Transverse vibrations of a stretched string- expression for the velocity of transverse wave – laws of transverse vibrations- A.C frequency measurement using sonometer- velocity of sound in a gas-Ultrasonics-production and uses.

UNIT- II: ELECTRICITY & MAGNETISM (15 hours)

Capacitor- energy of charged capacitors- loss of energy due to sharing of charges DC circuits – growth and decay of charge containing resistance and capacitor (RC) circuit & inductance and resistance (LR) circuit - potentiometer- measurement of internal resistance of a cell and unknown resistances - Moment and pole strength of a magnet

UNIT- III: OPTICS (15 hours)

Physical Optics: Interference in thin films- Coherent sources- Interference in wedge shaped film- Newton's rings- Measurement of wave length and radius of curvature with theory- Air wedge - Theory of plane transmission grating- determination of wavelength of Hg lines by normal incidence

UNIT- IV: RELATIVITY & QUANTUM MECHANICS (15 hours)

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Quantum mechanics: De Broglie's waves - Uncertainty principle- postulates of wave mechanics- - Schrodinger's equation (one dimensional) - application to a particle in a box.

UNIT- V: ELECTRONICS (15 hours)

Basic electronics: PN Junction diode- transistor-characteristics of CE mode- Zener diode-voltage regulator- LED

Digital electronics: Boolean algebra- - verification AND, OR, NOT gates- construction using diodes and transistors- NAND- verification of Demorgan's theorem - ICs – SSI, MSI, LSI and VLSI.

Text Books

1. Principle of physics-Brijlal Subramaniyam
2. Allied physics-R.Murugesan.
3. Text book of sound- Brijlal Subramaniyam
4. Principle of Electronics-V.K.Metha.

YEAR – II	ALLIED PRACTICAL	APHP301/401
SEMESTER – III & IV		HRS/WK - 3
ALLIED		CREDIT - 2

LIST OF PRACTICALS

(Any TEN out of the FOURTEEN experiments can be selected**)**

1. Determination of Young's modulus –non-uniform bending -Pin and microscope.
2. Determination of Rigidity modulus- Torsional pendulum (without masses).
3. Determination of Rigidity modulus – Static torsion
4. Sonometer – verification of laws and frequency of tuning fork.
5. Sonometer – A.C frequency - Steel and Brass wire.
6. Air wedge – thickness of a wire.
7. Newton's rings – Determination of Radius of curvature
8. Spectrometer – Grating-Determination of wavelength of Hg lines.
9. Potentiometer – Calibration of Low range voltmeter.
10. Figure of merit of a galvanometer (Table galvanometer).
11. Construction of AND, OR NOT gates using diodes and transistors.
12. NAND gate as a universal gate.
13. Zener diode - Voltage regulation characteristics.
14. Field along the axis of a circular coil-deflection magnetometer-B_H and M.

YEAR- III	OPTICS AND SPECTROSCOPY	PH505
SEMESTER - V		HRS/WK-5
PH505		CREDIT-4

Unit – I: LENSES

Convex lens – Optic Centre – Cardinal Points – Principal foci and principal points – Optic centre of a lens – Spherical aberration and lenses – Methods of minimizing 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 contact and out of contact) – Coma - astigmatism – Curvature of the field, Ramsden and Huygens's eyepieces.– Velocity of light – Kerr cell method .

DISPERSION

Dispersion produced by a thin prism – Angular dispersion – Dispersive power – combination of prisms to produce dispersion without deviation – Deviation without dispersion – Achromatic prisms Direct vision spectroscope – Constant deviation spectrometer – calculation of characteristic wave number of spectral lines.

Unit – II: INTERFERENCE

Colours of thin films – Air wedge – Determination of diameter of a thin wire by air wedge – Test for optical flatness – Michelson's Interferometer – Theory – Applications - λ, thickness of thin transparent material and resolution of spectral lines – Brewster's fringes – Refractive index of gases – Jamin's & Rayleigh's Interferometers – Stationary waves in light.

UNIT III: DIFFRACTION

Fresnel diffraction – Diffraction at circular aperture , opaque circular disc, straight edge and narrow wire- Fraunhofer diffraction – single slit – double slit – plane diffraction grating – theory and experiment to determine wavelength – normal incidence – oblique incidence- Missing orders – Overlapping spectra Rayleigh's criteria – Resolving power of telescope, prism, microscope and grating.

UNIT – IV: POLARIZATION

Double refraction – Nicol prism – polarizer and analyzer – Huygens's explanation of double refraction in uniaxial crystals – Dichroism – polaroids and their uses – plane, circularly and elliptically polarized light – production and detection – Optical Activity – Fresnel's explanation of optical activity – Specific rotatory power – Determination using Laurent's half shade polarimeter – Kerr effect and Faraday effect.

UNIT - V: SPECTROSCOPY

Infrared spectroscopy – Techniques and Instrumentation (Outline) – Raman spectroscopy, Quantum theory and classical theory – Molecular structure. Basic concepts of Resonance spectroscopy, ESR, NMR, NQR and Mossbauer spectroscopy –experimental setup and applications. MASER, Semiconductor LASER – applications of LASER in communications.

Text Books

1) Optics by Subramaniam N & Brijlal, S Chand & Co. Pvt. Ltd., New Delhi, 1990.
2) Optics by Khanna D R & Gulati H R, R Chand & Co. Pvt. Ltd., New Delhi, 1979.
3) Optics and Spectroscopy by R. Murugesan, S. Chand & Co. Pvt. Ltd., New Delhi,2009,

Reference Books

1. Fundamentals of Optics by Jenkins A Francis and White E Harvey, McGraw Hill Inc., New Delhi, 1976.
2. Optical Physics by Lipson S G, Lipson H and Tannhauser D S, Cambridge University Press 1995.
3. Fundamentals of Optics by Raj M G, Anmol Publications Pvt Ltd, New Delhi, 1996.
4. Fundamentals of Physics, 6th Edition, by D Halliday, R Resnick and J Waler, Wiley NY 2001.
5. Physics, 4th Edition Vols I & II extended by D Halliday, Resnick and K. S. Krane, Wiley, Ny, 1994.
6. The Feynman Lectures on Physics, Vols.I , II and III by R P Feynman, R B Leighton and M Sands, Narosa, New Delhi 1998.
7. Spectroscopy, G.Aruldhas

YEAR- III	ATOMIC PHYSICS	PH506
SEMESTER - V		HRS/WK-5
CORE -6		CREDIT-4

UNIT I: DISCHARGE PHENOMENON THROUGH GASES

Motion of a charge in transverse electric and magnetic fields – specific charge of electron – Dunnington's method – Magnetron method – positive rays – Thompson parabola method – Aston and Dempster's mass spectrograph.

UNIT II: ATOMIC STRUCTURE

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 – spatial quantization – Bohr magnetron – Stern and Gerlach experiment.

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

UNIT III: IONISATION POTENTIAL AND SPLITTING OF ENERGY LEVELS

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

UNIT IV: PHOTOELECTRICITY

Photo electricity: Photoelectric emission laws – Lenard's experiment-Richardson and Compton experiment- Einstein photoelectric equation -experimental verification of Einstein's photoelectric equations by Millikan's experiment-photoelectric cells

UNIT V: X-RAYS

X-RAYS: Continuous and characteristic X-RAY spectra absorption of X-RAYS by matter- concept of reciprocal lattice, Compton effect-derivation of expression for change in wavelength-experimental verification

Books for study

1. Modern Physics by R. Murugeshan, S. Chand & Co., New Delhi – 2009
2. Atomic and Nuclear Physics by N. Subramanian and Brij Lal, S chand & Co. -
3. Atomic Physics by J B Rajam, S chand Publishing Co.

Books for Reference

1. Atomic Physics by A B Gupta and Dipak Ghosh – Books and Allied Publishers
2. Modern Physics by J H Hamilton and Yang, McGraw Hill Publication 1996.
3. Concepts of Modern Physics by A Beiser, Tata McGraw Hill, New Delhi 1997
4. Fundamentals of Physics, 6th edition, by D Halliday, R Resnick and J Walker, Willey NY 2001

YEAR- III	SOLID STATE PHYSICS	PH507
SEMESTER - V		HRS/WK-5
CORE -7		CREDIT-4

Unit I : **BONDS IN SOLIDS**

Crystal lattice- primitive and unit cell- seven classes of crystals – Bravais lattice- Miller indices- structure of crystals- simple cubic, Hexagonal close packed structure-Face centred cubic structure, Body centered cubic structure, Simple cubic structure-Sodium chloride structure, Zinc Blende structure, Diamond structure

Unit II: X-RAY DIFFRACTION

Diffraction of x-rays by crystals-Bragg's law in one dimension-Experimental method in x-ray diffraction-Laue method, Rotating crystal method-Powder photograph method-von Laue's equations-Point defects- Line defects- Surface defects- Volume defects-Effects of crystal imperfections

Unit III: MAGNETISM

Different type of magnetic materials- Classical theory of Diamagnetism(Langevin theory)-Langevin theory of Paramagnetism – Weiss theory of Paramagnetism-Qualitative explanation of Heisenberg's Internal Field and Quantum Theory of Ferromagnetism.

Unit IV: DIELECTRICS

Fundamentals definitions in dielectrics – different types of electric polarization-Frequency and Temperature Effects on Polarization – Dielectric loss – Local Field on internal field Clausius-Mosotti Relation- Determination of Dielectric Constant – Dielectric Breakdown – Properties of Different types of insulating materials

Unit V: SUPERCONDUCTIVITY

Introduction-Meissner effect-Limitation- Type I& II Superconductivity-Vortex states- BCS Theory(Qualitative treatment only)-Josephson's effect-Copper pair tunneling.

Books for study

1. An introduction to solid state physics (5th edition) C.Kitel.
2. Solid state physics Hall H.E,E.L.B.S Manchester physics series
3. Solid State Physics, Puri & Babber
4. Solid State Physics, Gupta Kumar
5. Solid State Physics, S.O.Pillai

Books for reference

1. Solid state physics, Dekker A.J.Mac million
2. Solid State Physics, Ascroft & Hermine

YEAR- III	BASIC ELECTRONICS For the students admitted in the year 2014.	EPH508
SEMESTER - V		HRS/WK-5
Elective - I		CREDIT-4

UNIT – I : SEMI CONDUCTOR DEVICES AND CHARACTERISTICS

Bonding, Band gap of semiconductors –Types of semiconductors-Elemental and Compound semiconductors-intrinsic and extrinsic semiconductors – effect of temperature on Fermi level – PN junction diode – Zener diode - photo diode – different modes of operation – transistor biasing – H-parameters-characteristics in CB & CE modes – α and β of a transistor.

UNIT –II : RECTIFIERS AND AMPLIFIERS

Half-wave , full-wave and bridge rectifier – expression for efficiency and ripple factor – choke input filter – capacitor input filter – π section filter – zener regulated power supply .

RC coupled amplifier – frequency response curve – analysis of mid-frequency region – classification of amplifiers – class A power amplifier – Push-pull, class B power amplifier – Emitter follower.

UNIT –III : OSCILLATORS

Voltage gain of a feedback amplifier – Barkhausen criterion – Hartley, Colpitt's, phase shift and Weinbridge oscillators – expression for frequency of oscillations and condition for sustained oscillations in each case – crystal oscillator – frequency stability.

UNIT –IV : WAVE SHAPING CIRCUITS AND MULTI VIBRATORS

Clipping and clamping circuit – biased clipper – integrating and differentiating circuits – RC time constants. Multivibrators – Astable – Mono stable and bi-stable multivibrators – Schmitt trigger

UNIT –V: RADIO COMMUNICATION AND TELEVISION

Principles of transmission and reception –types of modulation – amplitude modulation – frequency modulation and phase modulation –detector – AM detector – FM Discriminator – AM and FM transmitter and receiver – Block diagram of TV transmission and reception – Principle of color TV - Applications.

Text Books

1. Principles of electronics by V K Mehta, S Chand & Co., 5th edition 2001
2. Elements of electronics by Bagde and S P Singh
3. Functional electronics by Ramanan
4. Monochrome and Color TV by Gulati
5. Basic and applied electronics by M Arul Thalapathi, Comptek publishers, Chennai 2005.

References

1. Electronics principles by Malvino
2. Electronic devices and circuits by Allen Mottershed
3. Monochrome and colour TV Gulati
4. Basic Television and video systems by B Grob
5. Solid state electronics by Manna, Tata McGraw Hill
6. Basic electronics, 6th edition by B Grob, McGraw Hill, NY 1989.

YEAR- III	DIGITAL ELECTRONICS AND MICROPROCESSOR	EPH509
SEMESTER V	ELECTIVE –II	HRS/WK-4
Elective - II	For the students admitted in the year 2014.(Revised Syllabi)	CREDIT-2

UNIT– I Digitial Fundamentals

Number systems – decimal, binary, octal and hexadecimal systems – conversion from one number system to another Codes – BCD code – excess 3 code, Gray code – ASCII code – Binary arithmetic – Binary addition – subtraction – unsigned binary numbers – sign magnitude numbers – I's and 2's complement – Binary multiplication and division.

Logic gates and logic families

AND, OR circuits using diodes and transistors – NOT using transistors – NAND, NOR and EXOR – functions and truth tables. NAND & NOR as universal gates.

UNIT – II Boolean algebra and simplification of logic circuits

Laws and theorems of Boolean algebra – De Morgan's theorems and their circuit implications – Duality theorem, simplification of Boolean equations – Karnaugh map – pairs, quads, octets – 2,3 and 4 variables –SOP method – NAND – NAND circuits – POS method – NOR – NOR circuits.

UNIT - III Arithmetic circuits and Sequential logic circuits

Arithmetic building blocks – Half adder – Full adder – parallel binary adder – Half subtractor – Full subtractor – The adder- subtractor – digital comparator – parity checker/generator. Flip-flops –JK flip – flop – JK master slave flip-flop –Flip flop applications. Shift register functions- Shift right-shift left-Shift register applications.

UNIT – IV: D/A and A/D Converters

Introduction – variable resistor network – binary ladder – D/A converter – D/A accuracy and resolution – A/D converter – simultaneous conversion – A/D accuracy and resolution.

UNIT – V: Introduction to Microprocessor 8085

Basics of semiconductor memory- RAM ROM, PROM and EPROM. Microcomputer organization-8085 Microprocessor-pin functions-architecture-machine and assembly language-programmer's model of 8085-8085 addressing modes.

Text Books

1. Malvino and Leech, Digital Principles and Application, 4th edition, Tata Mcgraw Hill, New Delhi, (2000)
2. Millman and Halkias, Integrated Electronics, International edition, McGraw Hill, New Delhi, (1972).
3. Arul Thalapapathi, Fundamentals of digital comuters, Comptek publishers, Chennai, 1995.
4. Vijayendran,Fundamentals of Microprocessor8085, S.Viswanathan Pvt.Ltd,2006.

References

1. Computer architecture and logic design by T C Bartee, McGraw Hill, 1991.
2. Solid state electronics by I. Agarwal and Anit Agarwal.
3. Digital integrated electronics by Herbert Taub and Donald Schilling, McGraw Hill
4. Anokh Singh and A K Chhabra, Fundamentals of Digital Electronics and Microprocessors, 2nd revised and enlarged Ed., 2. Chand & Co. Ltd., New Delhi,(2005).
5. Digital fundamentals – Floyd – Pearson Education 8th Edition S. Chand Publications, (2004).

YEAR- III	MATERIALS SCIENCE ELECTIVE -II	EPH 505
SEMESTER V		HRS/WK-4
CORE -3		CREDIT-2

Unit I: CLASSIFICATION OF MATERIALS

Material Science: - Engineering requirements of materials- Material structure- Types of Bonds and their energies – Bond formation mechanism- Ionic bond- covalent bond examples-ceramics- thermal and electrical properties – uses- Metallic bond- comparison of bond (dispersion bonds, dipole bonds and hydrogen bonds)-Crystal imperfection –Types of imperfections- Thermal vibrations – point, line and surface imperfections- Frank –Read source.

Unit II: PHASE DIAGRAM

Basic terms- solid solutions- Hume – Rothery's rules- intermediate phase- Gibb's Phase rules- Time – temperatures cooling curves- construction of phase diagrams- the Lever rule- eutectic systems- eutecoid
Systems- peritectic and peritectoid system-Ternary equilibrium diagrams.

Unit-III: **PHASE TRANSFORMATION**

Rate of transformation- nucleation (homogeneous and heterogeneous)- nucleation and growth –applications of phase transformations –micro constituent of iron – carbon system –the allotropy of iron – Iron-Carbon equilibrium diagram- formation of Austenite- TTT diagram- transformation Austenite upon continuous cooling.

Unit-IV: ELECTRON THEORY OF METALS

Fundamental theories of electrons (Drude and Lorentz theory and Sommerfield free electron theory) –electron energies in a metal- Zone theory of solids- energy gaps – density of states – Zones in conductors, insulators and semiconductors- factors affecting electrical resistance of materials.

Unit V: ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS

Resistivity- conductivity- semiconductors –classsification of semiconductors on the basis of Fermi energy and Fermi levels- insulators –dielectrics –ferro electricity –electro strict ion- Piezo electricity –uses of dielectrics –capacitors dielectric strength- magnetic properties of materials –magneto strict ion- magnetic domain –soft and hard magnetic magnetic materials

Text Books

1. Raghavan.V – Materials science and Engineering a first course, III Ed., Presences Hall of India(pact)ltd, 1990.
2. Structural M., materials Science, Anuradha agencies & publishers, 1990.

References

1. Kittel C., Introduction to Solid State Physics, V11Ed, Wiley Eastern
2. Manchandra VK., A text book of Materials Science, New India Publishing House, 1992.

YEAR- III	PRACTICAL (GENERAL)	PHP505
SEMESTER V		HRS/WK-6
Practical -5		CREDIT-4

(Any Ten of the Following)

1. Youngs modulus – Koenig's method – non uniform bending
2. Newtons rings – R1, R2 and μ of a convex lens
3. Spectrometer i – i' curve
4. Spectrometer – narrow angled prism – angle of deviation – normal incidence and normal emergence.
5. Spectrometer – Cauchy's constant
6. Spectrometer- grating –Rydberg's constant
7. Field along the axis of circular coil – deflection magnetometer – M and B.
8. Field along the axis of circular coil – Vibration magnetic needle – Bи
9. EMF of a thermocouple – mirror galvanometer (or) table galvanometer
10. Potentiometer – emf of a thermocouple.
11. Potentiometer – calibration of high range voltmeter.
12. Potentiometer - Conversion of galvanometer into voltmeter
13. BG – quantity sensitiveness
14. BG – comparison of capacitances BG – absolute capacitance of a capacitor
15. BG – comparison of emfs
16. Transistor characteristics – CE mode
17. Construction of a low range power pack Basic Logic gates using diode- AND, OR & NOT gates using transistor.

YEAR- III	RELATIVITY, QUANTUM MECHANICS AND MATHEMATICAL PHYSICS For the students admitted in the year 2014.	PH610
SEMESTER - VI		HRS/WK-5
CORE - 8		CREDIT-4

UNIT - I : Relativity

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

UNIT - II Wave Mechanics

Matter Waves – de Brogile wavelength – wave velocity and group velocity – Heisenberg's Uncertainty principle – proof of Uncertainty principle for one dimensional wave packet – postulates of wave mechanics – properties of wave function – operator formalism – eigen functions – eigen values – expectation values.

UNIT - III : Schrodinger equations and its applications

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

UNIT - IV : Mathematical Physics

Gauss divergence theorem – stokes theorem – Greens theorem – applications of vectors to hydrodynamics.

Spherical polar coordinates – expressions for gradient, div in Cartesian & spherical coordinates.

UNIT - V : Special Functions

Beta and gamma functions– relation between them – harmonics-Bessel's differential equations – Legendre's differential equations – Hermite's differential equations – Laguerre's differential equations – series solutions.

Text Books

1. Quantum Mechanics by V. Devanathan, Narosa, Chennai, 2005.
2. Modern physics by R. Murugeshan, Kiruthigs, Sivaprasath S Chand & Co. (2007)
3. Quantum Mechanics by V K Thangappan, Wiley Eastern
4. A Text Book of Quantum Mechanics by P M Mathews and Venkatesan, McGraw Hill
5. Mathematical Physics by Sathya Prakash
6. Mechanics and mathematical methods by Murugeshan, S Chand Publishing & Co.

References

1. Mathematical physics by B D Gupta
2. Quantum mechanics by Ghatak and Loganathan, McMillan
3. Basic Quantum mechanics by A Ghatak, McMillan India (2002)
4. Introduction to boundary value problems by Murray Spiegal (Scahaum's series)

YEAR- III	NUCLEAR AND RADIATION PHYSICS	PH611
SEMESTER - VI		HRS/WK-5
CORE -9		CREDIT-4

UNIT - 1 : NUCLEAR STRUCTURE

Nuclear spin – determination of magnetic dipole moment, electric quadruple moment, parity of nuclei, isospin, theories of nuclear composition, proton and electron hypothesis, proton – neutron hypothesis, nuclear forces – meson theory of nuclear forces.

Liquid drop model – Bethe Weizacker's mass formula – application to alpha decay – Bohr – Wheeler theory – shell model – evidences – theory – energy level diagram – spin orbit interaction – magic numbers – nuclear stability.

UNIT - II : RADIOACTIVE DECAY

Radioactive disintegration – law of successive disintegration – transport and secular equilibrium – radioactive series – Geiger – Nuttal law – Age of earth – alpha particle disintegration energy – alpha particle spectra – theory of alpha decay (Qualitative treatment).

Beta ray spectra – origin – neutrino theory of beta decay – electron capture – gamma rays – determination of wavelength by Diamond – crystal spectrometer – nuclear isomerism.

UNIT - III : PARTICLE ACCELERATORS AND DETECTORS

Cyclotron – synchrocyclotron – Betatron – electron synchrotron – proton synchrotron (Bevatron)-GM counter – ionization chamber – bubble chamber – scintillation counter – photographic emulsion techniques.

UNIT - IV : REACTORS AND RADIATION PHYSICS

Nuclear fission – Chain reaction – four-factor formula – reactor theory – critical size of a reactor – general aspect of reactor design – reactor shielding – reactor control – classification of reactors – pressurized heavy water reactor – fast breeder reactor-Introduction to recent rectors.

Radiation hazards – biological effects of radiation - radiation sickness – radiation units and operational limits radiation survey meters – pocket dosimeter –control of radiation hazards – radiation therapy – radioisotopes used for therapy – nuclear medicine – industrial applications – food preservatives.

UNIT - V : ELEMENTARY PARTICLES

Classification – types of interaction – symmetry and conservation laws – hadrons – leptons – baryons – mesons – strangeness – hyperons – antiparticles – antimatter – basic ideas about quarks – types of quarks.

Text Books

1. Modern physics by R. Murugeshan, S.Chand & Co.2009
2. Introduction to Modern Physics by Rich Meyer, Kennard, Coop Tata McGraw Hill Publishing Co.
3. Atomic and nuclear physics by Littlefield & Thorley
4. Modern physics by R. Murugeshan & Kiruthiga, Sivaprasath S.Chand & Co. (2009)

References

1. Nuclear physics S N Ghoshal – S Chand & Co. Edition 2003
2. Nuclear Physics D C Tayal – Himalayan Publishing House
3. Elements of Nuclear physics – M L Pandya & R P S Yadav Kedar Nath Ram Nath (2000)
4. Nuclear Physics – Irving Keplan
5. Nuclear Physics – J B Rajam, S chand Publishing Co.

YEAR- III	LASER AND FIBER OPTIC COMMUNICATION	PH612S
SEMESTER - VI		HRS/WK-5
CORE -10		CREDIT-4

UNIT - I : LASER Physics

Basic Principle of Laser – Einstein Coefficients – condition for light amplification – Population Inversion – Threshold Condition – Line shape function – Optical Resonators – Three level and four level systems.

UNIT - II : Types of lasers and output modulation methods

Solid State lasers – Gas lasers – He-Ne and CO_2 lasers – semiconductor lasers – Heterojunction lasers - Argon ion and Eximer Laser– Q switching and mode locking.

UNIT - III : Applications of laser

Application of laser in industry – cutting and welding – Drilling – surface Hardening – Medical applications - laser as diagnostic and therapeutic tool – Holography – Theory of recording and reconstruction – application of Holography.

UNIT - IV : Optic fibers

Fiber optic revolution – basic characteristics of optical fiber – acceptance angle – numerical aperture – propagation of light through optical fiber – theory of mode formation – classification of fibers – step index and graded index fibers – single mode and multi mode fibers – losses in fibers – fabrication techniques of fibers.

UNIT - V : Fiber Optic Communication

Source and detectors for fiber optic communication – Laser and LED – Analog and digital modulation methods – principle of optical detection – pin and APD photo detectors – Noise – Design consideration of a fiber optic communication system.

Text Books

1. Laser theory and applications by K. Thyagarajan and Ajoy Ghatak, Cambridge University Press, 1999.
2. An Introduction to laser : Theory and Applications by M N Avadhanulu, S. Chand & Co., New Delhi 2001.
3. Introduction to Fiber optics by K. Thyagarajan and Ajoy Ghatak, Cambridge University Press, 1999.

References

1. Optical Fiber communications by john M. Senior, Cambridge University Press, 1996.
2. Fiber – Optic communication systems, Govind p. Agrawal, John- Willey & Sons.
3. P K Palanisamy, Physics for engineering, Scitech publishing pvt Ltd., Chennai.

YEAR- III	APPLIED ELECTRONICS	EPH613
SEMESTER VI		HRS/WK-5
Elective - 3		CREDIT-4

UNIT - I : SPECIAL DEVICES AND APPLICATIONS

FET _ Characteristics – parameter FET as amplifier – FET as VVR – MOSFET – Depletion and enhancement – UJT characteristics – UJT as relaxation oscillator – SCR characteristics.

UNIT - II : LINEAR OPERATIONAL AMPLIFIER CIRCUITS

OPAMP – Parameters – inverting and Non-inverting amplifier – gain – Miller effect – Virtual ground – offset voltage – offset current – PSRR - CMRR.

OPAMP – Sign and scale changer – adder, subtractor and averager – integrator and differentiator – voltage follower – solving simultaneous linear equation.

UNIT – III : APPLICATIONS OF OPAMP

OP AMP logarithmic amplifer – antilogarthmic amplifer – Logarithmic multiplier – Logarithmic divider.

Comparator – Schmitt trigger – Astable multivibrator – Monostable multivibrator – Bistable multivibrator – Wein Bridge oscillator – phase shift oscillator.

UNIT - IV : 555 TIMER AND PLL

555 Timer block diagram - Monostable operation – Astable operation – Schmitt trigger.Phase – Locked Loops (PLL): Basic principles – phase Detector- Analog phase detector – Digital phase detector – voltage controlled oscillator (VCO).

UNIT - V : D / A and A / D Converter

Weighted resistor D/A converter – 4bit R-2R ladder DAC – Analog to Digital converter – Stair case ADC– Successive approximation ADC.

Text Books

1. Basic and Applied Electronics by M. Arul Thalapathi – Cometak Publisher Chennai, 2005.
2. Digital principles and applications – Malvino Leach – 4th Edn., - Tata McGraw Hill 1992.
3. Integrated Electronics by Jacob Millman and Christos C. Halkias – McGraw Hill International 1971.
4. Linear Integrated Circuits by D. Roy Choudhury and Shall Jain – New age International (p) Ltd.
5. OP–AMPS and linear integrated circuits – by Ramakant A. Gayaward - Printice Hall of India 1994.

References

1. Digital Computer electronics by Albert paul Malvino–TMH Edition 1992
2. Electronics – Analog and Digital – I J Jagrath – Prentice – Hall of India – New Delhi – 1999.
3. Operational amplifier and linear integrated circuits – Prentice Hall Inc. N.J. 1977.

YEAR- III	NUMERICAL METHODS & BASIC COMPUTER PROGRAMMING ELECTIVE-II	EPH614S
SEMESTER VI		HRS/WK-4
Elective - 4		CREDIT-2

Unit 1: SOLUTION OF EQUATION

Eigen values, Eigen vectors, Cayley Hamilton ; characteristic equation of a matrix –Solution of simultaneous equations – Gauss elimination method – Gauss-Jordan method.

Unit 2: INTERPOLATION

Linear and Lagrange interpolation – Newton's forward & backward interpolation polynomial equation & determination of roots – Newton-Raphson method.

Unit 3: NUMERICAL INTEGRATION AND DIFFERENTIATION

Trapezoidal rule – Simpson rule 1/3 & 3/8 – Solution of first & second order differential equation: Taylor series – Euler's method (Improved & Modified) – Solutions of forth order Runge-Kutta method.

Unit 4: DATA TYPE OPERATORS

History & Features of C Language - Variable name – data type and sizes – declaration – arithmetic, relational and logical operators – perecedence and order of evaluation.

Unit 5: CONTROL STATEMENTS

Unconditional control statements – GOTO and labels – Conditional control statements – simple IF, IF..ELSE, nested IF..ELSE, ELSE IF ladder – switch case – break – continue statement. Looping statement – while – do..while – for – nested for loop – (**Basic Programs - Qualitative studies only)**

Books for study

1. Mathematical physics: Satya Prakash – 4th ed. Sultan chand & sons publication, New Delhi.
2. Numerical methods: A. Singaravelu – 1st ed. Meenakshi publication, Tamil Nadu.
3. Let us 'C' : Yeshwant kanitkar.
4. Numerical methods and computers: Kuo-Addison-Wesely London, 1966
5. Computer oriented numerical methods: Rajaram-3rd ed.prentice hall, New Delhi

YEAR- III	ENERGY PHYSICS ELECTIVE-II	EPH 605
SEMESTER VI		HRS/WK-4
CORE -3		CREDIT-2

Unit I

Conventional Energy Sources: World's reserve of commercial energy sources and their availability-various forms of energy- renewable and conventional energy systems- comparison and natural gas – availability –statistical details-applications- merits and demerits

Unit II

Non-Conventional Energy Sources: Renewable energy sources- solar energy-nature of solar radiation- components-solar heaters- crop dryers- space cooling-solar ponds-solar cookers-water desalination- photovoltaic generation basics-merits and demerits of solar energy

Unit III

Biomass energy-classification- photosynthesis- biomass conversion process-gobar gas plants- wood gasification- ethanol from wood- advantages and disadvantages of biomass as energy source

Unit IV

Geothermal energy- wind energy- ocean thermal energy conversion(OTEC)-energy from waves and tides(basic ideas, nature, applications, merits and demerits)

Unit V

Energy storage and impacts of Non-conventional energy: Conversion of energy-patterns of energy consumption in domestic, industrial, transpotation, agricultural sectors- conservation principles in these sectors- energy crisis and possible solutions- energy options for the developing countries- energy storage and hydrogen as a fuel (basics)-impact due to non-conventional energy sources-global warming

Text Books

Cyclostyled text

References

Sukhatme

YEAR- III	PRACTICAL (ELECTRONICS)	PHP606
SEMESTER - VI		HRS/WK-6
Practical - 6		CREDIT-4

1. Bridge rectifier – Zener diode regulated power supply
2. Construction of a full wave rectifier-solid state using two diodes
3. 5V – Ic regulated power supply – characteristics
4. Single stage amplifier – gain and frequency response using transistor
5. Amplifier with feed back
6. RC-coupled amplifier using transistor(voltage gain and variation with load)
7. Hartley oscillator
8. Colpitt's oscillator
9. Differentiating and intergrating circuits
10. Transistor – Astable multivibrator
11. NAND, NOR universal gates
12. Half adder and Full adder – mixture of gates
13. Half subtractor and Full subtractor
14. Multiplexer and demultiplexer
15. Microprocessor programming I-Data transfer operations and exchange
16. Microprocessor programming II- Arithmetic operations
17. RS, T flip flop using NAND gates only
18. Four bit ripple counter
19. Shift registers
20. Verification of De Morgan's theorem.
21. Basic logic gates using transistor –AND, OR & NOT gates.

Question Paper Pattern -UG
THEORY EXAMINATION

Continuous internal assessment (CIA) UG (25 marks)

- Two internal Examinations 15 marks
- Assignment / Seminar 5 marks
- Attendance 5 marks

Total 25 marks

External Examination (75 marks)

Time: 3 Hours **Max. Marks: 75**

Section – A (10 x 2 = 20)

(Two questions from each Unit)

Section – B (5 X 5 = 25)

(Answer all the questions)

Section C (3 X 10 = 30)

(Answer any Three Questions out of five)

PRACTICAL EXAMINATION

Continuous internal assessment (CIA) (40 marks)

Based on the periodical evaluation of record &

Experiments assessed by the staff in charge - 20 marks

Model Practical - 20 marks

External Examination (60 marks)

3 Hrs. Exam

Total Marks: 60

Experiment 50 Marks

Record 10 Marks