

DEPARTMENT OF PHYSICS

SYLLABI FOR B.Sc PHYSICS

CURRICULAM AND SCHEME OF EXAMINATIONS (CBCS)
(Applicable to students admitted during the academic year 2014-2015 and onwards)



KONGUNADU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
COIMBATORE -641029

2014- 2015

UPH1

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS) COIMBATORE-641 029

B.Sc., PHYSICS

Curriculum and Scheme of Examination under CBCS

(APPLICABLE TO STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2014 –2015 AND ONWARDS)

Semester	Part	Subject code	Title of the Paper	Instruction hours / cycle	Exam. Marks			Duration of Exam. Hrs.	Credit
					CIA	ESE	Total		
I	I	13TML103 [@]	LAN –Tamil I/Hindi I/ French I / Malayalam I / Sanskrit I	6	25	75	100	3	3
	II	14ENG101	LAN–English I	6	25	75	100	3	3
	III	12UPH101	C.P.1– Properties of Matter and Sound	6	25	75	100	3	5
		14UPH2CL	C.Pr.1– Practical I	3	-	-	-	-	-
		13UMA1A1	Allied Subject I Mathematics – I	7	25	75	100	3	5
	IV	12EVS101	Environmental Studies**	2	-	50	50	3	2
II	I	13TML202 [@]	LAN- Tamil II / Hindi II/ French II /Malayalam II / Sanskrit III	6	25	75	100	3	3
	II	14ENG202	LAN- English II	6	25	75	100	3	3
	III	12UPH202	C.P.2 – Heat and Thermodynamics	6	25	75	100	3	5
		14UPH2CL	C.Pr.1-Practical I	3	40	60	100	3	2
		13UMA2A2	Allied Subject I Mathematics –II	7	25	75	100	3	5
	IV	13VED201	Value Education Moral and Ethics**	2	50		50	3	2
III	I	13TML303 [@]	LAN - Tamil III/Hindi III/ French III / Malayalam III / Sanskrit III	6	25	75	100	3	3
	II	14ENG303	LAN –English III	6	25	75	100	3	3
	III	12UPH303	C.P.3 – Mechanics	4	25	75	100	3	5
		12UPH4CM	C.Pr.2 Practical II	3	-	-	-	-	-
		14UCH3A3	Allied Subject II Chemistry –I	4	20	55	75	3	4
		14UCH4AL	Allied Practical Chemistry Practical	3	-	-	-	-	-
	IV	14UGA3S1	Skill based Subject1– General Awareness	2	25	75	100	3	3
	IV	13TBT301/ 13TAT301/ 12UHR3N1	Basic Tamil*/Advanced Tamil** / Non Major Elective-I**	2	75		75	3	2

UPH2

IV	I	13TML404 [@]	LAN – Tamil IV/Hindi IV/ French IV / Malayalam IV / Sanskrit IV	6	25	75	100	3	3
	II	14ENG404	LAN – English IV	6	25	75	100	3	3
	III	12UPH404	C.P.4 – Electricity and Magnetism	4	25	75	100	3	5
		12UPH4CM	C.Pr.2 – Practical II	3	40	60	100	3	2
		14UCH4A4	Allied Subject II Chemistry –II	4	20	55	75	3	4
		14UCH4AL	Allied Practical Chemistry Practical	3	20	30	50	3	2
	IV	12UPH4S2	Skill based Subject –2 Programming in C	2	25	75	100	3	3
		13TBT402/ 13TAT402/ 12UWR4N2	Basic Tamil* / Advanced Tamil** / Non Major Elective- II**	2	-	75	75	3	2
V	III	14UPH505	C.P.5 – Optics and Laser Physics	5	25	75	100	3	4
		14UPH506	C.P.6 – Principles of Electronic Devices and Circuits	4	25	75	100	3	4
		12UPH507	C.P.7 – Quantum Mechanics and Relativity	5	25	75	100	3	5
		12UPH508	C.P.8 – Fundamentals of Digital Electronics	4	25	75	100	3	4
		14UPH5E1	Major Elective Paper –I Medical electronics/ Energy Sources	3	25	75	100	3	5
		14UPH6CN	C.Pr.3 – Practical III -General	3	-	-	-	-	-
		14UPH6CO	C.Pr.4 – Practical IV - Electronics, Digital Electronics and Microprocessors	2	-	-	-	-	-
		12UPH6CP	C.Pr.5 – Practical V Programming in C in C++	2	-	-	-	-	-
	IV	12UPH5S3	Skill Based Subject 3 – Object oriented programming in C++	2	25	75	100	3	3
VI	III	14UPH609	C.P.9 – Atomic and Solid State Physics	4	25	75	100	3	4
		14UPH610	C.P.10 – Principles of Communication Systems	5	25	75	100	3	4
		12UPH611	C.P.11 – Nuclear Physics	4	25	75	100	3	5
		14UPH6E2	Major Elective Paper–II Fundamentals of Microprocessors and Microcontrollers / Mathematical Physics	4	25	75	100	3	5
		14UPH6E3	Major Elective Paper–III Astrophysics / Electronic Instrumentation	4	25	75	100	3.10	5
		14UPH6CN	C.Pr.3 Practical III -General	3	40	60	100	3	2

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		14UPH6CO	C.Pr.4- Practical IV - Electronics , Digital Electronics and Microprocessors	2	40	60	100	3	2
		12UPH6CP	C.Pr.5- Practical V – Programming in C and C++	2	40	60	100	3	2
	IV	12UPH6S4	Skill Based Subject 4 – Introduction to Bio-Physics	2	25	75	100	3	3
	V	12NCC/NSS/YRC/PYE101\$\$	Extension Activities*	-	50	-	50	-	1
			Total	180			3800		140

@ Malayalam – 13MLM 101 - 404

@ Hindi/ French/ Sanskrit – 12HIN/FRN/SAN 101 - 404

* No End of Semester Examinations (ESE), only Continuous Internal Assessment (CIA)

** No Continuous Internal Assessment (CIA), only End of Semester Examinations (ESE)

Major Elective Papers

(3 papers are to be chosen from the following 6 papers)

1. Energy Sources
2. Medical Electronics
3. Fundamentals of Microprocessors and Microcontrollers
4. Mathematical Physics
5. Astrophysics
6. Electronic Instrumentation

Non - Major Elective papers

1. Human Rights
2. Women's Rights

Note:

In core/allied subjects no. of papers in both theory and practical are included wherever applicable. However the total credits and marks for core /allied subjects remain the same as stated below.

Tally Table

S. No	Part	Subject	Marks	Credits
1	I	Language- Tamil/Hindhi/Malayalam/French/ Sanskrit	400	12
2	II	English	400	12
3	III	Core- Theory / Practical's	1600	60
		Allied	400	20
		Electives	300	15
4	IV	Basic Tamil /Advanced Tamil /Non-Major Elective	150	4
		Skill Based Subjects	400	12
		Environmental Studies	50	2
		Value Education	50	2
	V	Extension Activities 1	50	1
Total			3800	140

Note:

- CBCS– CHOICE BASED CREDIT SYSTEM
- CIA– CONTINUOUS INTERNAL ASSESMENT
- ESE–END OF SEMESTER EXAMINATION

1. Break up Marks for CIA of Theory

CIA Exam	-	15
Assignment	-	5
Attendance	-	5

Total		25

2. Components of Practical :**Break up Marks for CIA of Practical**

CIA Practical Exam	-	25
Observation Notebook	-	10
Attendance	-	5

Total		40

Break up Marks for ESE of Practical

Experiment	-	50
Record	-	10

Total		60

Question Paper Pattern for CIA and ESE**Theory****Maximum Marks 75****Section A (10 x 1 =25 marks)****Q.No. 1 to 10: Multiple choice types alone with four distracters each****Section B (5x 5 =25 marks)****Q.No. 11 to 15: Either or / essay type question (one question 'a' or 'b' from each unit.)****Section C (5x 8 =40 marks)****Q. No. 16 to 20: Either or / essay type question (One question 'a' or 'b' from each unit.)**

SEMESTER I
CORE PAPER -1 PROPERTIES OF MATTER AND SOUND

12UPH101

Total Hours of Teaching: 60**Total Credits: 5****Objectives**

To enable the learners to

- i. Understand the basic concepts of gravitation.
- ii. Get exposure to the properties of liquids & solids.
- iii. Understand the properties of sound and applications

UNIT I**12 hrs****Gravitation fields and potentials**

Nature of motion under central forces–Kepler’s law – Newton’s law of gravitation– Gravitational potential and field – Gravitational potential and field due to i) spherical shell, ii) solid sphere and iii) hollow sphere – Boy’s Method and Heyl’s Method of determining ‘G’.

UNIT II**12 hrs****Elasticity**

Elastic constants of an isotropic solid – Relations connecting them– Poisson’s ratio– bending of beams –uniform and non-uniform bending– bending moment of a bent beam– Cantilever –static and dynamic methods– torsion in a wire–rigidity modulus determination by static and dynamic methods.

UNIT III**12 hrs****Surface Tension**

Surface tension and Surface energy– pressure in a curved surface of a liquid–Shape of Liquid Meniscus in a Capillary tube – Angle of contact – Measurement of angle of contact – Rise of a liquid in a capillary tube – Experimental determination of Surface Tension: Searl’s Torsion Balance Method, the drop-weight method, Quincke’s method – Variation of surface tension with temperature – Jaeger’s method.

UNIT IV**12 hrs****Viscosity**

Streamline flow, Turbulent flow – Energy of a liquid – Bernoulli’s theorem and its important applications – Coefficient of viscosity – Poiseuille’s formula to find η of low viscous liquid – Stoke’s method, Searle’s viscometer method to find η of a high viscous liquid – Comparison of viscosities – Ostwald Viscometer – Viscosity of Gas – Meyer’s formula – Rankine’s method – Searle’s method.

UNIT V**12 hrs****Acoustics and Ultrasound**

Acoustics–Basic principle–Reverberation– Sabine’s reverberation formula – Determination of absorption coefficient– Factors affecting the acoustics of buildings– Sound distribution in an auditorium– Requisites for good acoustics.

Ultrasonics – Production of ultrasonic waves– Magnetostriction oscillator and piezo-electric oscillator– Detection of ultrasonic waves– Acoustic grating – **Application of ultrasonics***.

*** Self study****Books for study:**

1. Elements of properties of matter D.S.Mathur, Shyamlal Charitable Trust, New Delhi, (2010).
2. Properties of matter R.Murugesan, S.Chand & Company Ltd, New Delhi, (1995).
3. A textbook of sound R.L.Saihgale, S.Chand & Company Ltd, New Delhi, (1982).

Books for reference:

- | | |
|-------------------------|---|
| 1. A textbook of sound | N.Subrahmanyam and Brijlal, Vikas House Pvt.Ltd. Publishing(1980). |
| 2. Mechanics | D.S.Mathur, S.Chand & Company Ltd, New Delhi,(1996). |
| 3. Properties of Matter | N. Subrahmanyam and Brijlal, S.Chand & Company Ltd, New Delhi (2005). |

Specific topics for problems

- i. Gravitational potential and field
- ii. Gravitational constants
- iii. Modulus of elasticity, poisson's ratio
- iv. Calculation of surface tension

UPH8
SEMESTER I
PART IV– ENVIRONMENTAL STUDIES

12EVS101

Total Credits: 2

Total Hours : 30

Objectives:

- To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
- To shape students into good “ecocitizens”, thereby catering to global environmental needs.

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENT (6 hours)

1.1 Definition : scope and importance

1.2 **Need for public awareness***

1.3 Natural resources

1.3.1 Types of resources

Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources.

UNIT II ECOSYSTEMS (6 hours)

2.1 Concept of an ecosystem

2.2 Structure and functions of an ecosystem

2.3 Producers, consumers and decomposers

2.4 Energy flow in the ecosystem

2.5 Ecological succession

2.6 Food chains, food web and ecological pyramids

2.7 Structure and function of the following ecosystem*

Forest Ecosystem – Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem.

UNIT III BIODIVERSITY AND ITS CONSERVATION (6 hours)

3.1 Introduction – Definition – Genetic – Species and ecosystem diversity

3.2 Biogeographical classification of India

3.3 Value of biodiversity*

3.4 Biodiversity at global, national and local levels

3.5 India as a mega – diversity Nation

3.6 Hot spot of biodiversity

3.7 Threats to biodiversity

3.8 Endangered and endemic species of India

3.9 Conservation of Biodiversity

insitu Conservation of Biodiversity – *exsitu* Conservation of Biodiversity

UPH9

UNIT IV ENVIRONMENTAL POLLUTION (6 hours)

- 4.1 Definition
- 4.2 Causes, effects and control measures of: Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution.
- 4.3 Solid Waste Managements: causes, effects, control measures of urban and industrial wastes.
- 4.4 Role of individual in prevention of pollution*.**
- 4.5 Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution.
- 4.6 Disaster Management – Flood, Drought, Earthquake, Tsunami, Cyclone and Landslide.

UNIT V SOCIAL ISSUES AND THE ENVIRONMENT (6 hours)

- 5.1 Sustainable Development
- 5.2 Urban problems related to energy
- 5.3 Water Conservation : Rain Water Harvesting and Watershed Management
- 5.4 Resettlement and rehabilitation of people, its problems and concerns, case studies – Narmatha Valley Project.
- 5.5 Environmental ethics, issues and possible solutions.
- 5.6 Climatic change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl.
- 5.7 Consumerism and waste products
- 5.8 Environmental Protection Act
- 5.9 Air Pollution Act (Prevention and Control)
- 5.10 Water Pollution Act (Prevention and Control)
- 5.11 Wild Life Protection Act
- 5.12 Forest Conservation Act
- 5.13 Issues involved in enforcement of environmental legislation
- 5.14 Public awareness***
- 5.15 Human population and the environment
 - 5.15.1 Population Growth and Distribution
 - 5.15.2 Population Explosion – Family Welfare Programme***
 - 5.15.3 Environment and Human Health
 - 5.15.4 Human Rights***
 - 5.15.5 Value Education***
 - 5.15.6 HIV / AIDS***
 - 5.15.7 Women and Child Welfare
 - 5.15.8 Role of Information Technology in Environment and Human Health*.**

* Self Study (Questions may be asked from these topics also)

Text Book

1. P.Arul, A Text Book of Environmental Studies, Environmental Agency, No 27, Nattar street, Velacherry main road, Velacheery, Chennai – 42, First Edition, Nov. 2004.

References

1. Purohit Shammi Agarwal, A text Book of Environmental Sciences, Publisher Mrs. Saraswati Prohit, Student Edition, Behind Naswan Cinema Chopansi Road, Jodhpur.
2. Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering, Publisher S.K.Kataria & Sons, 424/6, Guru Nanak Street, Vaisarak, Delhi – 110 006.
3. J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering, Prentice Hall of India Private Ltd., New Delhi – 110 001.

UPH11
SEMESTER – II
CORE PAPER –2 HEAT AND THERMODYNAMICS

12UPH202

Total Hours of Teaching: 60

Total Credits: 5

Objectives

To enable the learners to

- i. Understand the equation of states of a real gas, quantum theory of specific heat and basic theory of entropy.
- ii. Understand the principle and different methods of production of low temperature and liquefaction of He.
- iii. Understand the quantum theory of radiation and three types of thermodynamical statistics.

UNIT I

12 hrs

Equation of states of a real gas

Van der waals equation of state– critical constants.

Quantum theory of specific heat

Dulong and Petit's law and the deduction; failure of Dulong and Petit's law – Einstein's theory and its limitation – Debye's theory – **Specific heat of diatomic gases***.

UNIT II

12 hrs

Entropy

Principle of increase of entropy; temperature entropy diagram; entropy of a perfect gas.

Thermodynamic potentials– internal energy (U) – Helmholtz function (F) – Gibb's function (G) and enthalpy (H); Maxwell's thermodynamic relations – the (T-dS) equation– Clapeyron's latent heat equation and Clausius latent heat equation from Maxwell's thermodynamic relation.

UNIT III

12 hrs

Production of low temperature and liquefaction of gases

Methods of production of low temperature– Joule Thomson effect; porous plug experiment, its theory and results – Joule Thomson effect for perfect and real gas – Super fluidity; Helium I and Helium II– Lambda point – Adiabatic demagnetization .

UNIT IV

12 hrs

Thermal radiation

Quantum theory of radiation; Planck's hypothesis – average energy of Planck's oscillator– Planck's radiation law and its experimental verification– Wien's law and Rayleigh– Jean's law in relation to Planck's law– Stefan's constant and Wien's constant from Planck's law

UNIT V

12 hrs

Statistical Thermodynamics

Statistical equilibrium– probability theorem in statistical thermodynamics; Maxwell - Boltzmann distribution law ; Maxwell – Boltzmann distribution in terms of temperature – Maxwell's quantum statistics – phase space – Fermi- Dirac distribution law – Bose-Einstein distribution law (Qualitative study only) – **comparison of three statistics***

***Self study**

Books for study:

- | | |
|----------------------------|--|
| 1. Heat and Thermodynamics | Brijlal and Subramanian, S.Chand &Company, New Delhi(2002) |
| 2. Text Book of Heat | M. Narayanamurthi, K. Ramamoorthi and S. Devanathan,
Triveni Publishers, Chennai (1972) |

UPH12

Books for reference:

1. Thermal Physics

R. Murugesan and K. Sivaprasath , S.Chand &Company,
New Delhi(2004)

Specific topics for problems

- i. Calculation of critical constants
- ii. Calculation of change in entropy
- iii. Calculation of Stefan's constant

PART IV – VALUE EDUCATION

Total Credits: 2

Total hours: 30

UNIT I

(6 Hours)

Early years - At the feet of Ramakrishna

UNIT II

(6 Hours)

Training of the disciple

UNIT III

(6 Hours)

As a Wandering Monk-Trip to America

UNIT IV

(6 Hours)

The Parliament of Religions-Experience in the west

UNIT V

(6 Hours)

Towards the end

Prescribed Text Book:

“Vivekananda A Biography” by Swami Nikilananda – Advaita Ashrama, 27th Reprint, 2011, Kolkata.

Total Hours of Teaching: 90

Total Credits: 2

List of experiments (Any Fifteen)

1. Young's Modulus – Non-uniform bending – Optic lever
2. Young's Modulus– Cantilever – Static method
3. Rigidity Modulus –Static Torsion
4. A.C. frequency– Sonometer
5. Acceleration due to Gravity – Compound pendulum
6. Co-efficient of Thermal conductivity – Lee's disc method
7. Refractive index of a liquid prism – Spectrometer
8. Refractive index of a solid prism – Spectrometer
9. Refractive index of a solid prism (i-d) curve – Spectrometer
10. Wave length of spectral lines – Grating – Normal incidence method – Spectrometer
11. Calibration of low range voltmeter – Potentiometer
12. Calibration of low range ammeter – Potentiometer
13. Specific resistance – Potentiometer
14. Moment of a magnet – Circular coil – Deflection magnetometer
15. Characteristic of a junction diode
16. Study of various types of electronic components and Study of basic electronic instruments
(Multimeter – analog and digital , AFO, CRO, function generator ,etc)
17. Measurement of Terminal velocity for different liquids by Stokes method
18. Temperature co-efficient of resistance of a thermistor – Post office box.
19. Experimental determination of M.I. of a fly wheel.
20. Determination of surface tension and interfacial surface tension of a liquid by drop weight method.

UPH15
SEMESTER III
CORE PAPER –3 MECHANICS

12UPH303

Total Hours of Teaching: 60

Total Credits: 5

Objectives

To enable the learners to

- i. Understand principles of rigid body dynamics and Projectile motions,
- ii. Understand statics, hydrostatics and hydrodynamics and
- iii. Understand principles and applications of Lagrangian and Hamiltonian equations

UNIT I

12 hrs

Rigid body dynamics

Rigid body–rotational and vibrational motion –Torque–moment of inertia – radius of gyration – kinetic energy of rotation– M.I. of a fly wheel– experimental determination–precession– **gyrostat–gyrostatic application ***– M.I. of a diatomic molecule–its rotational energy states.

UNIT II

12 hrs

Projectiles

Projectiles – Range – Expression for the range of projectile on the inclined plane – path of a projectile – Impulse – Direct and oblique impact – Expression for velocity after direct impact – Loss of energy during direct and oblique impact.

UNIT III

12 hrs

Statics

Force of friction –Limiting friction – Laws of friction –Angle of friction and resultant reaction – Cone of friction.

Hydrostatics

Definition and determination of centre of pressure – Expression for centre of pressure of a rectangular lamina with one side on the surface of the liquid – Laws of floatation–Definition for metacentre and metacentric height.

Hydrodynamics

Steady or streamline flow – Lines and tubes flow – Equation of continuity of flow–Bernoulli's theorem.

UNIT IV

12 hrs

Classical Mechanics I

Constraints and degrees of freedom – generalized coordinates – generalized displacement – Velocity – acceleration –momentum –force–potential –D'Alembert's principle–Lagrangian differential equation from D'Alembert's principle– application of Lagrangian's equation of motion to linear harmonic oscillator, simple pendulum and compound pendulum.

UNIT V

12 hrs

Classical Mechanics II

Phase space– Hamiltonian function– Hamilton principle– Hamilton's canonical equation of motion – physical significance of H– application of Hamiltonian equation of motion to simple pendulum; **compound pendulum and linear harmonic oscillator ***.

*** Self study**

UPH16

Books for study:

1. Mechanics
2. Classical Mechanics

D.S.Mathur,
S.Chand & Company Ltd, New Delhi (1996).
Gupta, Kumar and Sharma.
Pragathi Prakasan Publishers, Meerut (2002).

Books for reference:

1. Mechanics and
General properties of matter
2. Fundamentals of Physics

P.K.Chakrabarthy,
Books & Allied (P) Ltd, (2001)
D.Halliday, R.Resnick and J.Walker,
John Wiley & Sons, New Delhi (2006)

Special topics for problems

- i. Calculation of range of projectile
- ii. Calculation of torque and moment of inertia

SEMESTER III
PART IV –SKILL BASED SUBJECT 1
GENERAL AWARENESS (ONLINE)

Total Credits: 3**Total Hours : 30****Objectives:**

- To acquire knowledge in relation to various competitive examinations.
- To create awareness about an online examination which is being followed in competitive examinations.

UNIT I**(6 hours)****1. Tamil and other Literatures**

Tamil, English, Christian and Muslim Literatures – Ancient Literature – Bakthi Literature – Epics – Medieval Literature – Modern Literature (Novel, Dramas, Short Stories, Modern Poetry).

2. Economics and Commerce

Basic Economics – Auditing – Management – Capital Market – Foreign Trade – Companies – Banking.

3. Social studies

Indian History – Inventions – Indian Poetry – Constitution – Judiciary – Languages – Literacy – Indian Geography – Lithosphere – Climate – Soil – Agriculture – Population.

UNIT II**(6 hours)****4. Numerical Aptitude**

Objective Arithmetic : Number systems – probability – **HCF and LCM of numbers*** - decimal fractions – simplification – squareroots and cuberoots – average – percentage – profit and loss – ratio and proportion – time and work – simple interest – area, **volume and surface area***.

5. Verbal Aptitude

Spot the odd one out – correct form of verb – preposition – find out the rightly spelt word – choose the correct meaning of idioms – synonyms and antonyms.

6. Abstract Reasoning

Logic Reasoning : Logic – statement – arguments – statement assumptions – Statement course of action – theme detection – deriving conclusion from passages.

Non – verbal Reasoning : Series – analogy – classification – analytical reasoning – mirror images – water images – paper folding – paper cutting – rule detection – grouping of identical figures.

UNIT III**(6 hours)****7. General Science and Technology**

SCIENCE - Basic principles and concepts in Physics, Chemistry, Botany and Zoology.

TECHNOLOGY - Metallurgy, instrumentation, discoveries and inventions of techniques.

8. Computer Science

Historical evolution of computers – Computer applications – Data processing concepts – Computer codes and arithmetic – Hardware components – Data Structures.

UPH18

9. Education

Development process of the learner – Principles of development (physical, social, emotional and intellectual) – Learning process – Teaching and teacher behaviour – Interaction analysis – Microteaching – Teacher as a leader – Motivation – Personality dimension – concept of mental health – Counseling.

UNIT IV

(6 hours)

10. Library and Information Science

Library and Information Science – Basics, Computer, Library Network and others like Research, Reprography etc.

11. Sports and Games

Athletics – Track Events – Field Events – Games – Indoor Games – Outdoor Games – General knowledge – Sport and Olympics – First Aid.

12. Current Affairs

State, Central and International affairs: Budgets – Politics – Sports – Education – Commerce and Industry – Inventions – Science and Technology – Currency – Agriculture – Movies – Guinness records – Awards – IT Industry – Space Research – Defence etc.

UNIT V

(6 hours)

13. National Cadet Corps (NCC)

Introduction to the Armed Forces (Army, Navy, Air Force) – Drill – Weapon Training – Map Reading – Civil Defence.

14. National Service Scheme (NSS)

History of NSS – History of Motto, Symbol, Badge – Aims and Objectives – Duties and Total Hours – Organisational and Administrative setup – History of voluntary organization – Regular activities – Special camp activities – Special programmes – awards – Important days.

15. Youth Red Cross (YRC)

History of International Red Cross – History of Indian Red Cross – History of Youth Red Cross – Main objectives of YRC – Emblem – Fundamental principles of Red Cross – Organizational Setup – Activities of Youth Red Cross – Role of different functionaries – Training programmes for YRC Program Officers – Training programme for YRC Volunteers – YRC Song – Working Hours – General orientation – Special orientation – Program skill learning.

*** Self Study (Questions may be asked from these topics also)**

Text Book

1. VBC 1 – General Awareness, Question Bank, Kongunadu Arts and Science College, Coimbatore – 29, 2006.

Part IV – Non – Major Elective – I Human Rights**Total Hours of Teaching: 30****Total Credits: 2****UNIT I****6 hrs****Concept of Human Values, Value education towards Personal Development**

Aim of Education and value education, Evolution of value-oriented education, Concept of human values, types of values, Components of value education.

Personal Development

Self-analysis and introspection, sensitization towards gender equality, Physically-challenged, intellectually-challenged, Respect to – age, experience, maturity, family members, neighbours, coworkers.

Character Formation towards Positive Personality

Truthfulness, Constructivity, Sacrifice, Sincerity, Self control, Altruism, Tolerance, Scientific vision.

UNIT II**6 hrs****Value Education towards National and Global Development National and International Values**

Constitutional or national values – Democracy, socialism, secularism, equality, justice, liberty freedom and fraternity.

Social Values – Pity and Probity, Self-control, Universal brotherhood.

Professional values – Knowledge thirst, Sincerity in profession, regularity, punctuality and faith.

Religious values – Tolerance, wisdom, character.

Aesthetic Values – Love and appreciation of literature and fine arts and respect for the same.

National Integration and international understanding.

UNIT III**6 hrs****Impact of Global Development on Ethics and Values**

Conflict of cross-cultural influences, mass media, cross-border education, materialist values, professional challenges and compromise.

Modern challenges of adolescent emotions and behavior, sex and spirituality, comparison and competition, positive and negative thoughts.

Adolescent emotions, Arrogance, anger, sexual instability, selfishness, defiance.

UNIT IV**6 hrs****Therapeutic Measures**

Control of the mind through

- a. Simplified physical exercise
- b. Meditation – objectives, types, effect on body, mind and soul
- c. Yoga – objectives, types, Asana
- d. Activities:
 - i. Moralization of Desires
 - ii. Neutralization of Anger
 - iii. Eradication of Worries
 - iv. Benefits of Blessings

UNIT V**6 hrs****Human Rights**

1. Concept of Human rights – Indian and International Perspectives

- a. Evolution of Human Rights
- b. Definition under Indian and International documents

2. Broad classification of Human rights and Relevant Constitutional Provisions
 - a. Right to Life, Liberty, Dignity
 - b. Right to Equality
 - c. Right against Exploitation
 - d. Cultural and Educational Rights
 - e. Economic Rights
 - f. Political Rights
 - g. Social Rights
 - h. Right to Information
3. Human Rights of Women and Children
 - a. Social Practice and Constitutional Safeguards
 - i. Female Foeticide and Infanticide
 - ii. Physical assault and Harassment
 - iii. Domestic violence
 - iv. Conditions of working women
4. Institutions for Implementation
 - a. Human Rights Commission
 - b. Judiciary
5. Violations and Redressal
 - a. Violation by State
 - b. Violation by Individuals
 - c. Nuclear weapons and terrorism
 - d. Safeguards

SEMESTER IV
CORE PAPER – 4 ELECTRICITY AND MAGNETISM

Total Hours of Teaching: 60**Total Credits: 5****OBJECTIVES**

To enable the learners to

- i. Acquire basic knowledge of electrostatics and thermoelectricity
- ii. Study about magnetic properties of materials
- iii. Learn motion of charges and alternating current and its circuits

UNIT I**Electrostatics:****Gauss theorem and its applications**

Gauss theorem, application of Gauss theorem – Electric intensity at a point immediately adjacent to a charged conductor – energy stored in unit volume of an electric field.

Capacitance and capacitors

Spherical capacitor – cylindrical capacitor – force of attraction between charged plates of a capacitor – change in the energy of a parallel plate capacitor when the distance between the plates is altered and when a dielectric slab is introduced between the plates – types of capacitors – Guard ring capacitor – electrolytic capacitor – variable capacitor

Dielectrics

Polarization in dielectric material – parallel plate capacitor and dielectric slab – boundary condition – depolarization factor.

UNIT II**Magnetic properties of materials:**

Properties of magnetic field B – divergence of B – curl of B – magnetic vector potential – electron theory of magnetism – Dia, Para and Ferromagnetism – magnetic field (B) – magnetization (M) – magnetic field intensity (H) – magnetic susceptibility and magnetic permeability – magnetic materials and magnetization – magnetic hysteresis – area of the hysteresis loop – Ferro magnets, determination of susceptibility – curie balance method – **Guoy's method***.

Magnetic effect of electric current

Moving coil Ballistic Galvanometer – Figure of merit of B.G. – Absolute capacitance of a capacitor.

UNIT III**Thermoelectricity:**

Seebeck effect – Laws of thermo e.m.f – Peltier effect – Peltier co-efficient, determination of Peltier co- efficient at a junction – thermo dynamical consideration of Peltier effect – Thomson effect – Thomson co – efficient – e.m.f. generated in a thermocouple taking both Peltier effect at the junctions and Thomson effect in the metals – thermoelectric power – application of thermodynamics to thermocouple – thermoelectric diagrams and their uses.

UNIT IV**Alternating Current:**

EMF induced in a coil rotating in a magnetic field – AC circuits containing resistance, inductance and capacitance in series – series resonant circuit – acceptor circuit – voltage magnification – the Q -factor – Parallel resonant circuit – Power in AC circuit containing resistance, capacitance and inductance – wattless current – choke coil – the transformer.

UNIT V

Transient currents:

Growth and decay of current in an inductance – resistance circuit – charging and discharging of a capacitance through a resistance – Measurement of resistance by leakage – charging and discharging of a capacitance through an inductance and a resistor

Motion of charged particles in Electric and Magnetic fields

Motion of charged particles in uniform longitudinal and transverse Electric field – Motion of charged particles in a uniform constant magnetic field – Motion of charged particles in a crossed electric and magnetic fields

*** Self study**

Books for study:

1. Electricity and magnetism

Brijlal and Subramaniam, Ratan Prakashan
Mandir, New Delhi (2000).

2. Electricity and magnetism

R. Murugesan, S.Chand & Company
Publishers, New Delhi (2004).

Books for reference:

1. Electricity and magnetism with electronics

K.K. Tewari, S.Chand & Company Publishers,
New Delhi (2003).

2. Mechanics

D.S.Mathur, S.Chand & Company publishers,
New Delhi (2003).

3. Fundamentals of Electricity and magnetism

D.N. Vasudeva, McGraw Hill Publishers, Delhi
(1998).

Specific topics for problems:

- i) Calculation of capacitance of spherical, cylindrical and parallel plate capacitors
- ii) Calculation of energy stored in a capacitor
- iii) Calculation of total charges of a combination of capacitors

UPH23
SEMESTER IV
SKILL BASED SUBJECT II – PROGRAMMING IN C

12UPH4S2

Total Hours of Teaching: 30

Total Credits: 3

Objectives

To enable the learner to

- i. Know about basic in C language
- ii. Develop programming skill in C language

UNIT I

6 hrs

Constants, Variables and data types

Introduction – character set – C tokens – keywords and identifiers – constants – variables – data types – declaration of variables – assigning values to variables – operators and expressions : operators : arithmetic – relational – logical – assignment – increment and decrement – conditional – bitwise - special operators – arithmetic expressions – evaluation of expressions – precedence of arithmetic operators

UNIT II

6 hrs

Managing input and output operations

Introduction – reading a character – writing a character – formatted input and output – decision making and branching: simple if – if else – nesting of if else – else if ladder – switch statement – conditional expressions – goto statement

UNIT III

6 hrs

Decision making and looping

The while statement – The Do statement – the for statement - jumps in loop – arrays – declaration and initialization of one dimensional and two dimensional arrays

UNIT IV

6 hrs

Character arrays and strings

Introduction – declaring and initializing string variables – reading strings from terminal and writing strings to screen – structure and unions (basic concepts only)

UNIT V

6 hrs

Pointers and C preprocessors

Pointers: Introduction – understanding pointers – accessing the address of a variable – declaring pointer variables – initialization of pointer variables – The preprocessors: Macro substitution – File inclusion

Books for study:

Programming in ANSI C

E. Balagurusamy, Tata McGraw Hill
Publishers Ltd., (2010)

Books for reference:

Let us C

Yashwant Kaneetka, BPB Publications
New Delhi (2008)

Specific topics for problems:

Develop C programs to illustrate the usage of

- i. String handling functions
- ii. while and do – while loop

UPH24
Semester IV
Non – Major Elective – II Women’s Rights

12UWR4N2

Total Hours of Teaching: 30

Total Credits: 2

UNIT I

6 hrs

Laws, Legal systems & Change

Definition–constitutional law, CEDAW and international human rights –Laws and norms –Laws and social context– constitutional and legal frame work.

UNIT 2

6 hrs

Politics of land and gender in India

Introduction – Faces of poverty – Land as productive resources – Locating identities – Women’s claims to land – Right of properties – case studies.

UNIT III

6 hrs

Women’s Rights: Access to Justice

Introduction–Criminal Law– Crime Against women – domestic violence–Dowry Related Harassment and dowry deaths – Molestation –Sexual Abuse and rape – Loopholes in practice – Law Enforcement Agency.

UNIT IV

6 hrs

Women’s Right

Violence Against – women – Domestic violence – The protection of Women from Domestic Violence Act, 2005– the Marriage Validation Act, 1982– The Hindu Widow Re-marriage Act, 1856– The dowry prohibition Act 1961.

UNIT V

6 hrs

Special women welfare Laws

Sexual Harassment at work places – Rape and indecent Representation – The indecent representation (Prohibition) Act, 1986 – Immoral Trafficking – The Immoral Traffic (Prevention) Act, 1956 – Acts Enacted for women development and empowerment – role of rape crisis centers.

Books for reference:

- | | |
|---|---|
| 1. Good Women do not Inherit Land | Nitya Rao, Social Science Press and Orient Blackswan (2008). |
| 2. Knowing Our Rights | An imprint of Kali for Women (2006).
International Solidarity network |
| 3. Women Rights | P.D.Kaushik, Bookwell Publication (2007). |
| 4. Violence Protective Measures for Women Development and Empowerment | Aruna Goal,
Deep and Deep Publications Pvt. (2004). |
| 5. Gender Justice | Monika Chawla, Deep and Deep Publications Pvt.(2006). |
| 6. Domestic Violence against Women | Preeti Mishra, Deep and Deep Publications Pvt. (2007) |
| 7. Violence against Women | Clair M. Renzetti, Jeffrey L. Edleson, Raquel Kennedy Bergen, Sage Publications (2001). |

CORE PRACTICAL –II

List of Experiments (Any Fifteen)

Total Hours of Teaching: 90

Total Credits: 2

1. Young's modulus – uniform bending – Pin and microscope
2. Young's modulus – cantilever–dynamic method
3. Wavelength of mercury spectral lines – grating – minimum deviation – spectrometer
4. Series Resonance Circuit
5. Parallel Resonance Circuit
6. Refractive index of a prism (i-i') – spectrometer
7. Thickness of a thin wire–Air wedge method
8. Solar spectrum–spectrometer
9. Calibration of high range voltmeter–potentiometer
10. Temperature co-efficient of resistance–Carey Foster's Bridge
11. EMF of a thermocouple–potentiometer
12. Specific Resistance of a wire – Metre Bridge
13. Figure of merit of B.G.
14. Capacity of a condenser – B.G.
15. Field intensity circular coil – Vibrational magnetometer
16. Characteristics of Zener diode
17. Rigidity modulus and moment of inertia – Torsional Pendulum
18. Determination of specific gravity of liquid – Joule's Calorimeter
19. Determination of frequency – Melde's method
20. Multimeter Principle – Ammeter, Voltmeter and Ohm meter

UPH26
SEMESTER-V
CORE PAPER –5 OPTICS AND LASER PHYSICS
14UPH505

Total Hours of Teaching: 75 Total Credits: 4

Objectives

To enable the learners to

- i. Acquire knowledge in ray optics
- ii. Understand mechanism of energy transfer in the form of waves
- iii. Basic principles of laser physics

UNIT I

15hrs

Geometrical optics:

Aberrations and dispersion

Aberrations –spherical aberrations in a lens– coma–aplanatic lens – astigmatism –curvature of the field – distortions – chromatic aberration– dispersion by a prism – irrational dispersion– angular and chromatic dispersions – Cauchy’s dispersion formula– dispersive power, achromatism in prisms– dispersion without deviation –chromatic aberration in a lens– **circular of least confusion***, achromatic lenses –condition for achromatism of two thin lenses separated by a finite distance.

Eye pieces – Ramsden and Huygen’s eye piece

UNIT II

15hrs

Physical Optics:

Interference

Fresnel’s bi prism– interference in thin films due to reflected and transmitted light – fringes due to wedge shaped thin film–Newton’s rings–refractive index of a liquid– **Michelson’s interferometer–determination of wavelength of monochromatic light*** – difference in wave length between two neighbouring spectral lines – visibility of fringes – sharpness of fringes–resolving power – Airy’s formula.

UNIT III

15hrs

Diffraction:

Fresnel’s assumptions – rectilinear propagation of light – half period zone– zone plate –action and construction–comparison with the convex lens–Fresnel and Fraunhofer diffraction – Fraunhofer diffraction at a single slit – diffraction grating – resolving power and dispersive power of a grating.

UNIT IV

15hrs

Polarization:

Double refraction – Huygen’s explanation in uniaxial crystals – production and detection of plane, circularly and elliptically polarized light – optical activity–Fresnel’s explanation–specific rotation – Laurentz’s half shade polarimeter.

UNIT V

15hrs

Laser physics:

Basic principles of Laser – Einstein coefficients – **condition for light amplification – population inversion*** – Threshold condition – Types of Laser– Ruby Laser – He-Ne Laser – Applications of Laser in industry, medicine and holography.

*** Self study**

UPH27

Books for study:

- | | |
|---|---|
| 1. A text book of optics | Brijlal and Subramaniam, S.Chand & Co Publishers, New Delhi (1995). |
| 2. Modern physics | R.Murugesan, S.Chand & Co Ltd Publishers, New Delhi (2003). |
| 3. Essentials of
Lasers and Nonlinear optics | G.D.Baruah, Pragathi Prakashan Publishers, Meerut (2000). |

Books for reference:

- | | |
|--------------------------------|---|
| 1. Lasers and Nonlinear Optics | Laud.B.B, New Age International Publishers, New Delhi (1996). |
| 2. Optics and spectroscopy | R.Murugesan, S.Chand & Company Ltd Publishers, New Delhi (2003). |
| 3. Atomic and nuclear physics | N.Subramanyam and Brijlal, S.Chand & Co Ltd Publishers, New Delhi (2001). |
| 4. Laser Fundamentals | William T.Silvast, Cambridge University Publishers, New Delhi (2003). |

Specific topics for problems:

- i) Determination of wavelength of reflected light from air-wedge
- ii) Refractive index of liquid from Newton's experiment
- iii) Calculation of difference in wavelength between two neighboring spectral lines

CORE PAPER - 6 PRINCIPLES OF ELECTRONIC DEVICES AND CIRCUITS**Total Hours of Teaching: 60****Total Credits: 4****Objectives**

To enable the learners to

- i. Know the basics of AC&DC circuits.
- ii. Understand the action of semiconductor devices and their applications.
- iii. Know the principle and working of oscillators.

UNIT I**12 hrs****Network theorems**

Statements and applications to the D.C. circuits of Thevenin's theorem – Norton's theorem and Maximum power transfer theorem.

Semiconductors devices**Special Diodes**

Characteristics, equivalent circuits and applications of Zener diode– Tunnel diode– Photodiode– Thermistors

Rectifiers And Filters

Rectifiers: Half wave – Full wave – Bridge rectifiers – Ripple factor.

Filters: Inductive and capacitive*.

UNIT II**12 hrs****Transistor Biasing and Stabilization**

Leakage currents and total output currents in a common emitter and common collector circuits – advantages of common emitter circuits.

Load line – Q – point and maximum undistorted output – factors affecting stability of Q-point– stability factor.

Transistor Equivalent Circuits and H- Parameters

AC – load resistance – current gain – voltage gain – h- parameter – Finding h_{11} and h_{21} from short circuit test – finding h_{12} and h_{21} from open circuit test – h- parameter notation for transistors – The h- parameters of an ideal transistor.

UNIT III**12 hrs****Field Effect Transistor**

Junction Field Effect Transistor (JFET) – construction, operation and characteristics of JFET – Parameters of JFET – expression for transconductance – comparison between FET and bipolar junction transistor.

Metal Oxide Semiconductor FET (MOSFET)

Construction, working of drain and transfer characteristics of depletion type and enhancement type MOSFETs – advantages of MOSFETs over JFETs and N-channel MOSFETs over P-channel MOSFETs.

UniJunction Transistor (UJT)

Construction, equivalent circuit, operation, characteristics and application of UJT.

UNIT IV**12 hrs****Single and Multistage Transistor Amplifiers**

Advantages, disadvantages and applications of transformer coupled amplifier.

Power Amplifiers

Difference between voltage and power amplifier – classification of power amplifiers – operation, characteristics and maximum collector efficiency of class A transformer coupled power amplifier – operation, efficiency and advantages of a class B push-pull power amplifier – notes on class C power amplifier.

Operational Amplifiers

Circuit, symbol, polarity conventions and summing point (or virtual ground) of an operational amplifier – characteristics of an ideal operational amplifier*– operational amplifier as inverting and non- inverting amplifier – operational amplifier as an adder, subtractor, differentiator and integrator.

UNIT V

12 hrs

Sinusoidal Oscillators

Principle of an Oscillator – Crystal Oscillators – Hartely and Colpitts oscillators with theory - Waveforms of astable, monostable and bistable multivibrator circuits – Wave Shaping Circuits.

*** Self study**

Books for study:

- | | |
|---------------------------------------|---|
| 1. Principles of Electronics | V.K.Metha , S.Chand & Company Ltd, New Delhi (1990). |
| 2. A Text Book of Applied Electronics | R.S. Sedha, , S.Chand &Company Ltd, New Delhi(1999). |
| 3. Basic Electronics– Solid State | B.L.Theraja , S.Chand &Company Ltd, New Delhi (2002). |

Book for reference:

- | | |
|----------------------|--|
| 1. Basic Electronics | Bernod Grob, McHraw Hill, New Delhi, (1992). |
|----------------------|--|

Specific topics for problems:

- i) Application of network theorem in complex circuits.
- ii) Determination of the electrical parameters using Thevenin's theorem and Norton's theorem and Maximum power transfer theorem.
- iii) Determination of the electrical parameters using Maximum power transfer theorem.

CORE PAPER – 7 QUANTUM MECHANICS AND RELATIVITY

Total Hours of Teaching: 75

Total Credits: 5

Objectives

To enable the learner to

- i) Know about de Broglie concept and the uncertainty relation.
- ii) Know about the applications of Schrodinger's equation
- iii) Know about the postulates constancy of light as well as the mass-energy relationship in relativity

UNIT I

15 hrs

Foundations of wave mechanics

Inadequacy of classical mechanics – Dual nature of light – Davisson and Germer experiment – G.P. Thomson's experiment – wave velocity and group velocity for De Broglie waves – relation between phase velocity and group velocity for a non relativistic free particle.

Heisenberg's Uncertainty Principle

Physical significance – Heisenberg's gamma ray microscope – Diffraction of a beam of electrons by a slit – application of uncertainty principle

UNIT II

15 hrs

Wave function for a free particle

Equation of motion of matter waves – Physical interpretation of the wave function – Normalised and Orthogonal wave function – Expansion theorem – conditions satisfied by wave function – solution of the Schrödinger equation – operators associated with different observables – Expectation values of dynamical quantities – probability current density – Ehrenfest theorem.

UNIT III

15 hrs

Applications of Schrödinger's Equation to one and three dimensional problems

The Free particle: The Wave equation – Wave function – Energy values

Particle in a box: The Wave equation – Wave function – Energy values

Potential step: Reflectance and transmittance – Energy greater than potential barrier – Energy lesser than the potential barrier

Rectangular potential barrier: Reflectance and transmittance – Energy greater than potential barrier – Energy lesser than the potential barrier

A particle in one dimensional infinitely deep potential well: Eigen function – Eigen values

One dimensional linear harmonic oscillator: Wave equation – Recursion formula – Eigen values – Zero point energy – Eigen functions.

UNIT IV

15 hrs

Spherically symmetric systems

Schrodinger's equation for spherically symmetric potentials – three dimensional harmonic oscillators: Wave function – Energy values

The rigid rotator with free axis: Energy for the rotator – Wave equation – Eigen function – Eigen values

Rigid rotator in a fixed plane: Eigen function – Eigen values

The hydrogen atom: Wave equation – Solutions of ϕ equations – Solution of Radial equation – Recursion formula – Energy Eigen values – Radial wave function – Complete wave function – Degeneracy – **the normal state of the hydrogen atom ***.

UNIT V

15 hrs

Relativity

Frames of reference – inertial frames of reference – Galilean transformation – Michelson-Morley experiment – explanation of negative results. Postulates of special theory of relativity – Lorentz's transformation equation – length contraction – time dilation – Meson decay – relativity of simultaneity – addition of velocities – variation of mass with velocity – **mass energy equivalence*** – General theory of relativity.

*** Self study**

Books for study:

- | | |
|----------------------|---|
| 1. Quantum mechanics | Satya Prakash and Swati Saluja, Kedar Nath Ram Nath & Co. (2004). |
| 2. Modern physics | R. Murugesan, S. Chand & Company Ltd (1992). |
| 3. Modern physics | R. Murugesan and Kiruthiga Sivaprasath, S.Chand & Co (2006). |

Books for reference:

- | | |
|----------------------|--|
| 1. Quantum Mechanics | S.P.Singh and M.K.Bagde, S.Chand Company Ltd New Delhi (1994). |
| 2. Quantum Mechanics | V.Devanathan, Narosa Publishing House (2006). |

Specific topics for problems:

- i. Calculation of DeBroglie Wavelength
- ii. Calculation of uncertainty in position and momentum
- iii. Calculation of inter-planar spacing of the crystal using DeBroglie concept of matter waves

SEMESTER –V **12UPH508**
CORE PAPER-8 FUNDAMENTALS OF DIGITAL ELECTRONICS

Total Hours of Teaching: 60**Total Credits: 4****Objectives**

To enable the learners to acquire knowledge about

- i) Four different number systems
- ii) Logic gates, Boolean Algebra and Karnaugh map
- iii) Flip-flops, counters, arithmetic circuits, data processing circuits and shift registers, semiconductor memories, D/A Converter and A/D converter

UNIT I**12 hrs****Number System, Binary Arithmetic and Binary Codes**

Decimal, Binary, Octal, Hexadecimal number system – Conversion from one system to another system-Binary arithmetic operations-Representation of negative number-Binary subtraction using 1's and 2's complement-weighted codes-non weighted codes-alpha numeric codes: ASCII code – EBCDIC - Parity : even parity and odd parity method of single bit error detection

UNIT II**12 hrs****Logic gate, Logic circuits, Boolean Algebra and Karnaugh map**

Basic Logic gates(NOT,OR,AND) – Universal building blocks (NAND and NOR gates) –EX-OR and EX-NOR gates- construction of basic gates using discrete components-Law of Boolean algebra-circuits using IC – action truth table – logic symbol – De Morgan's theorems– Simplifications of Boolean expressions – Karnaugh maps – Constructions – Karnaugh map simplifications.

UNIT III**12 hrs****Flip-flops and Counters**

R-S flip flop – D flip flop- JK flip flop – Master slave J-K flip flop –Edge triggered flip flops. Asynchronous and synchronous counters - Ring counters- Modulus counters-Mod 3,Mod 5 and Decade counters.

UNIT IV**12 hrs****Arithmetic, Data processing circuits and Shift Register**

Half and full adder – half and full subtractor – parallel binary adder and subtractor –Multiplexer-Demultiplexer-Encoder-Decoder-Serial in serial out shift register-Parallel in parallel out shift registers.

UNIT V**12 hrs****Semiconductor Memories, D/A Converter and A/D converter**

Memory addressing – Volatile and Non-Volatile: ROM- PROM–EPROM-RAM-Static and dynamic RAM-Binary weighted register D/A converter-R-2R ladder D/A converter-Counter type A/D converter-**Successive approximation A/D converter***.

*** Self study****Books for study::**

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Digital principles and applications 2. Digital fundamentals 3. Digital logic and computer design | <p>Albert Paul Malvino & Donald P Leach, Tata McGraw Hill, New Delhi I(1999).</p> <p>Floyd, Tata McGraw Hill, New Delhi(1995).</p> <p>M.Morris Mano,Prentice-Hall of India Pvt.Ltd, NewDelhi (2006).</p> |
|---|--|

UPH33

Books for reference::

1. Introduction to Integrated electronics, digital and analog V.Vijayendaran, S.Vishwanathan
Printers and Publishers Pvt.Ltd (2005).

Specific topics for problems:

- i) Determination of fundamental products and simplification of Boolean expressions using K-maps
- ii) Finding the Boolean output of the given logic circuit
- iii) Conversion of Boolean expressions into logic circuits

MAJOR ELECTIVE PAPER I : 1. ENERGY SOURCES**Total Hours of Teaching: 45****Total Credits: 5****Objectives**

To enable the learner to

- i. Know about the Conventional Energy Sources, Solar energy, Biomass energy and its utilization.
- ii. Know about the Geothermal energy, Wind energy, Ocean thermal energy conversion and Chemical energy.

UNIT I**9 hrs****Conventional Energy Sources**

World's reserve - commercial energy sources and their availability – various forms of energy – renewable and conventional energy system – comparison – Coal, oil and natural gas – applications – Merits and Demerits

UNIT II**9 hrs****Solar Energy**

Renewable energy sources – solar energy – nature and solar radiation – components – solar heaters – crop dryers – solar cookers – water desalination (block diagram) – Photovoltaic generation – merits and demerits

UNIT III**9 hrs****Biomass energy fundamentals**

Biomass energy - classification - photosynthesis - Biomass conversion process - Methods for obtaining energy from Bio mass.

UNIT IV**9 hrs****Biomass Utilization**

Gobar gas plants – thermal gasification of Biomass - advantages & disadvantages of biomass as energy source.

UNIT V**9 hrs****Other forms of energy sources**

Geothermal energy – wind energy – Ocean thermal energy conversion – **Energy from waves and tides (basic ideas)*** – chemical energy sources.

*** Self study****Books for study:**

- | | |
|---|--|
| 1. Renewable energy sources and emerging Technologies | D.P. Kothari, K.C. Singal & Rakesh Ranjan
Prentice Hall of India pvt. Ltd., New Delhi (2008). |
| 2. Non- Conventional Energy Sources, | G.D.Rai, Khanna Publishers, Delhi, India (2006). |

Book for Reference:

- | | |
|--|--|
| 1. Renewable Energy sources and their Environmental impact | S.A. Abbasi and Nasema Abbasi
PHI Learning Pvt. Ltd., New Delhi (2008). |
| 2. Non-Conventional Energy Resources | D.S.Chauhan & S.K.Srivastava, New Age International Publishers (2004). |

Specific topics for the problem:

- i. Determination of fill factor and efficiency of a solar cell.
- ii. Determination of output, reversible voltage and efficiency of chemical energy sources.

MAJOR ELECTIVE PAPER I : 2.MEDICAL ELECTRONICS**Total Hours of Teaching: 45****Total Credits: 5****Objectives**

To enable the learners to

- i. Understand about ECG,ERG etc
- ii. Understand the concepts of the pacemaker and the batteries used in it, kidney machine etc
- iii. Know the role of the LASER in the medical field
- iv. Know the determination of the frequency of interference

UNIT I**9 hrs**

Design of medical instruments - Components of biomedical instrument systems-Electrodes and transducers - Recording system – ElectroCardiography (ECG) - Electroretinography (ERG) - Electromyography.

UNIT II**9 hrs**

Pacemakers - Pacemaker batteries - **Defibrillators*** - Nerve and muscle stimulators -Heart, lung machine - Kidney machine - Blood flow meter.

UNIT III**9 hrs**

LASERS in medicine – Endoscopes - Cryogenic surgery - Nuclear imaging technique-Thermography - Ultrasonic imaging systems - Magnetic resonance – Imaging -Angiography.

UNIT IV**9 hrs**

Measurement of blood pressure - Blood flow and cardiac output - Measurements of heart sounds - **Respiration rate** * – Temperature - Plethysmography.

UNIT V**9 hrs**

50 Hz interference - Magnetic component - Electric component - Lead as a path of least resistance - Patient body as a path of least resistance - Determination the frequency of interference.

*** Self study****Books for study::**

- | | |
|---|--|
| 1. Biomedical instrumentation | K.Arumugham,
Anuradha agencies publishers (2002). |
| 2. Handbook of biomedical instruments | Khandpur. R.S,
Tata McGraw Hill Company (2003). |
| 3. Introduction to biomedical electronics | Joseph Dubovy,
Tata McGraw Hill Company(1978). |

Book for reference:

- | | |
|-----------------------------------|--|
| 1. Biomedical Instrumentation and | Leslie Crombwell, Fred.J.Weibell &
Trich.A.Pfeiffer, Measurements Prentice
Hall of India (1997). |
|-----------------------------------|--|

Specific topics for the problems:

- i. Blood flow meter
- ii. Frequency of interference
- iii. Blood pressure

SKILL BASED SUBJECT III – OBJECT ORIENTED PROGRAMMING IN C++**Total Hours of Teaching: 30****Total Credits: 3****Objectives**

To enable the learners to

- i. Know about the basic in C++ language
- ii. Develop programming skill in C++ language

UNIT I**6 hrs****Beginning with C++**

Basic concepts of OOP – Tokens – keywords – identifiers and constants – basic data types – user defined data types – derived data types – declaration of variables – dynamic initialization of variables – reference variables – scope resolution operators – **expression and their types – control structures***

UNIT II**6 hrs****Functions in C++**

Introduction - the main function – function prototyping – call by reference – return by reference - inline functions – default arguments – const arguments – function overloading

UNIT III**6 hrs****Classes and Objects**

Introduction – Specifying a class – defining member functions – A C++ program with class – making an outside function inline – nesting of member functions – private member functions – arrays within class – memory allocation for objects – static data members and functions – arrays of objects – objects as function arguments – friendly functions

UNIT IV**6 hrs****Constructors and Destructors**

Introduction – constructors – parameterizes constructors – multiple constructors in class – copy constructors – dynamic constructors – destructors

UNIT V**6 hrs****Polymorphism and Inheritance**

Introduction – defining operator overloading – overloading unary and binary operators – rules for overloading operators – inheritance: Introduction – defining derived class – single inheritance – **multilevel inheritance*** – multiple inheritance

Books for study:

Object Oriented Programming with C++

E.Balagurusamy, Tata McGraw Hill
Publishers Ltd., (2010)

Books for reference:

Let us C++

Yashwant Kaneetka, BPB Publications
New Delhi (2008)

Specific topics for problems:

Develop C++ programs to illustrate the usage of

- i. Classes and Objects
- ii. Constructors and destructors

CORE PAPER – 09 ATOMIC AND SOLID STATE PHYSICS**Total Hours of Teaching: 60****Total Credits: 4****Objectives**

To enable the learners to

- i) Know about the X – rays , Photoelectric effect, their application
- ii) Know about different coupling schemes and the effect of magnetic and electric fields on the spectrum of an atom and molecule
- iii) Understand the different crystal structure and their bindings

UNIT I**12 hrs****Atomic and Molecular Spectroscopy**

The Vector atom model – Quantum number associated with the Vector atom model – Coupling schemes – Pauli's exclusion principle – Electronic configuration of some light elements – Normal and anomalous Zeeman effects. Expression for the Zeeman shift – Anomalous Zeeman effect – Paschen Back effect – Stark effect – Basic concepts of NMR, ESR, NQR – Raman effect – Raman shift – Stokes and Antistokes lines.

UNIT II**12 hrs****Bonding in solids**

Interatomic forces and types of bonding – Ionic bonds – Metallic bonds – Van der waals' bonds – Hydrogen bonds – Binding energy of ionic crystals – Evaluation of the Madelung constant – Determination of range – Binding energy of crystals of inert gases – Van der Waals' Interaction – Repulsive interaction.

UNIT III**12 hrs****Crystal structure**

Introduction – Crystal lattice – Unit cell – Lattice parameter – Primitive cell – Types of crystal system – Bravais lattices – BCC – FCC – HCP – Miller indices – Procedure for finding miller indices of crystal planes – Representation of crystal planes in cubic unit cell – Procedure for sketching the plane from the given miller indices – Common planes in a simple cubic, bcc and fcc structures -Crystal directions – Procedure for finding miller indices of crystal directions – Representation of crystal directions in a cubic units – Atomic radius in a cubic system – No of atoms in a cubic structures – Atomic packing factor

UNIT IV**12 hrs****X-Rays and Photoelectric effect****X-Rays**

Productions of X-rays-Coolidge tube method – Spacing between three dimensional lattice planes – The absorptions of X – rays-Bragg's Law-The Bragg's X-ray Spectrometer - The powder crystal diffraction - The Compton Scattering.

Photoelectric effect:

Lenard's method of determining e/m for photoelectrons – Einstein's Photoelectric equation Experimental verification Einstein's Photoelectric equation – Millikan's experiment – Determination of Planck's constant - photoelectric cells – Applications of photoelectric cells-

Photomultiplier

UNIT V**12 hrs****Electron Theory of Metals and Superconductivity****Electron Theory of Metals**

Drude – Lorentz theory and its applications – Sommerfield theory – Fermi-Dirac distribution – Brillouin Zone theory – Relation between energy and wave number.

Superconductivity:

Superconductivity – Occurrence of Superconductivity – Experimental facts of Superconductivity – Persistent currents – Effect of magnetic fields – Meissner effect – Type I and Type II superconductors – BCS theory of superconductivity.

Books of study

- | | |
|------------------------|---|
| 1. Material Science | R.S.Khurmi, R.S.sedha. S.Chand and Company, New Delhi(2004) |
| 2. Solid State Physics | R.K.Puri and V.K.Babbar. S.Chand and Co., New Delhi (2001) |
| 3. Modern Physics | R.Murugesan Kiruthiga Sivaprasath. S' chand and Company, New Delhi (2006) |

Books for reference:

- | | |
|--|--|
| 1. Atomic and nuclear Physics | Brijlal and Subramaniam. S.Chand and Company Ltd, New Delhi, (2010). |
| 2. Fundamentals of Solid State Physics | Saxena, Gupta and Saxena, Pragati Prakashan, Meerut (2008) |

Specific topics for the problems

- i) Calculation for finding Miller Indices of Crystal Planes.
- ii) Calculation for sketching the plane from the Giran Miller indices
- iii) Calculation for finding Miller Indices of Crystal directions
- iv) Atomic radius in cubic system
- v) Number of square millimeter in simple cubic, BCC and FCC structures.

CORE PAPER –10 PRINCIPLES OF COMMUNICATION SYSTEMS**Total Hours of Teaching: 75****Total Credits: 4****Objectives**

To enable the learners to understand

- i. Modulation, demodulation, transmission lines and antennas
- ii. Radio, cellular, fiber optic, television and satellite communications

UNIT I**15 hrs****Modulation and Demodulation**

Amplitude modulation- Theory of AM- modulation index – Single side band generation – Suppression of carrier-Frequency modulation-Expression for FM wave- PM definition- Comparative advantages and disadvantages of FM, PM and AM – Basic principles of demodulation-The diode detector –FM detectors-Ratio detector-**Effect of analog signals in the presence of noise***.

UNIT II**15 hrs****Transmission Lines and Antennas**

Line equations of transmission lines- Short circuited and open ended lines – Standing wave ratio- relation between SWR and reflection coefficient - Types of transmission lines - Properties of transmission lines - Mechanism of electromagnetic radiation from resonant circuit - Elementary dipole antenna-current and voltage distribution in a half-wave dipole antenna – Principle of radiation of a half-wave dipole antenna-directional pattern- Derivation of E and H in principle of radiation of half-wave.

UNIT III**15 hrs****Radio and Cellular Communications**

Classification of Radio Transmitters -AM radio transmitter stages –note on AM radio broadcast transmitters - Principle of superheterodyne receiver-Block diagram of the stages of superhet - AM receiver - Block diagram of stages of a FM radio receiver – difference between AM and FM receivers – Cellular communications (Elementary ideas).

UNIT IV**15 hrs****Fiber Optic Communications**

Fiber cable construction - Fiber optic cable applications – Acceptance angle and numerical aperture – Propagation of light through an optical fiber (Single mode, Multimode, Step index, Graded index) – Fiber configuration (Single mode step index, Multimode step index and Multimode graded index fibers) - Losses in fiber - Light sources and detectors – Optical connectors and couplers – Transmitter for fiber optic communication – High performance circuit(LED digital transmitter) – Fiber optic receiver – High performance receiver – Repeaters – Fiber optic based modems : Transreceivers.

UNIT V**15 hrs****Television and Satellite Communications**

Principle of picture transmission and reception – gross structure of a television – Picture elements – Scanning, image continuity and persistence of vision – Horizontal and vertical blanking pulses – TV camera tubes: image orthicon – Vidicon – The block diagram of a basic TV transmitter – Block diagram of a monochrome TV receiver. Introduction on satellite communications – Satellite links – Satellite construction – Different domestic satellites – **Telemetry***.

*** Self study**

UPH40

Books for study:

- | | |
|---|--|
| 1 .Communication Electronics | Deshpande N.D, Deshpande D.A and Rangole P.K,
Tata McGraw Hill Publishers Ltd (1996). |
| 2. Optical Fibres and Fibre Optic Communication | Subir.Kumar. Sarkar ,S.Chand & Co, New Delhi (2001). |
| 3. Basic Television and Video Systems | Bernard Grob, McGraw Hill, New York (1997). |

Book for reference:

- | | |
|--------------------------------------|---|
| 1. .Electronic Communication Systems | George Kennedy, Tata McGraw Hill Publishers Ltd,
New Delhi (1994). |
| 2. Electronics Communication Systems | Sanjeeva Gupta, Khanna Publications, Salem (1992). |

Specific topics for problems:

- i) Determination of modulation index
- ii) Determination of frequency of output voltage
- iii) Determination of deviation ratio

SEMESTER VI
CORE PAPER -11 NUCLEAR PHYSICS

12UPH611

Total Hours of Teaching: 60**Total Credits: 5****Objectives**

To study about the

- (i) General properties of atomic nuclei, particle accelerators, Radioactivity,
- (ii) Artificial transmutation of elements, nuclear transmutation,
- (iii) Nuclear fission and fusion and (iv) Elementary particles

UNIT I**12 hrs****General properties of atomic nuclei**

Classification of nuclei- nuclear spin angular momentum – nuclear magnetic dipole moment – electric quadrupole moment – nuclear size – nuclear stability – nuclear forces – Meson theory of nuclear forces- theories of nuclear composition- proton –electron hypothesis – models of nuclear structure – liquid drop model – shell model.

Particle accelerators:

Synchro-cyclotron – betatron – electron synchrotron and **proton synchrotron***.

UNIT II**12 hrs****Radioactivity**

Determination of e/m of alpha particles – determination of charge of alpha particles – experimental measure of range of alpha particles* – Geiger and Nuttall experiment – Geiger Nuttall law – alpha particle disintegration energy – determination of e/m of beta particles – origin of line and continuous spectrum – neutrino theory of beta decay- k- electron capture – origin of gamma rays – absorption of gamma rays – natural radioactive series – law of successive disintegration – radioactive equilibrium and radioactive dating.

UNIT III**12 hrs****Artificial transmutation of elements**

Discovery of artificial transmutation – Rutherford experiment – Bohr's theory of nuclear disintegration – nuclear reaction – energy balance in nuclear reaction and the Q value

Nuclear transmutation:

Transmutation by a) alpha particles b) protons c) deuterons and d) neutrons. The scattering cross – section and its determination. Production of radioisotopes and their uses.

UNIT IV**12 hrs****Nuclear fission and fusion**

Nuclear fission – energy released in fission – Bohr and Wheeler's theory of nuclear fission – chain reaction- multiplication factor- natural uranium and chain reaction-design of nuclear reactor-breeder reactor - nuclear fusion-source of stellar energy-thermonuclear reactions-transuranic elements.

Detectors of nuclear radiations:

Ionization chamber-Geiger-Muller counter-proportional counter-Wilson's cloud chamber-bubble chamber-their principles and working.

UNIT V**12 hrs****Elementary particles**

Baryons – Leptons – Mesons – particles and antiparticles –concept of antimatter – strong interaction – electromagnetic interaction – weak interaction – gravitational interaction – elementary particle quantum numbers – conservation laws and symmetry – charge conjugation, parity and time reversal – CPT Quark model .

*** Self study**

UPH42

Books for study:

- | | |
|-------------------------------|---|
| 1. Modern physics | R.Murugesan ,Kiruthiga Sivaprasath , S.Chand & Company Ltd. New Delhi (2002). |
| 2. Atomic and nuclear physics | Brijlal and Subramaniam, S,Chand &Co Ltd, New Delhi(1997) |
| 3. Modern physics | B.L.Theraja, S.Chand &Co-505, New Delhi(1985). |

Books for reference:

- | | |
|--------------------------------|--|
| 1. Nuclear physics | D.C. Tayal , Himalaya Publishing House, Bombay (IV edition) (2002). |
| 2. Elements of Nuclear Physics | M.L.Pandya and R.P.S.Yadav, Kedar Nath RamNath Publishers, Meerut, New Delhi (2003). |
| 3. Modern physics | Sehgal Chopra Sehgal, Sultan Chand & Sons, New Delhi (2004). |

Specific topics for problems:

- i) Calculation of nuclear size and binding energy
- ii)Energy balance in nuclear reactions- Q-value calculations

MAJOR ELECTIVE PAPER - II**1. FUNDAMENTALS OF MICROPROCESSOR AND MICROCONTROLLER****Total Hours of Teaching: 60****Total Credits: 5****Objectives**

To study about the

- (i) Architecture, instruction set and programming of 8085 microprocessors,
- (ii) Timing of instructions and interfacing devices,
- (iii) Architecture, instruction set and programming of MC 8051 microcontroller.

UNIT I**12 hrs****Architecture**

Architecture of 8085 – Uses of registers in 8085 – Data and address bus – Control signals and their generation – Instruction set for 8085 – Classification of instructions by their function and size – addressing of I/O devices – addressing modes of data in 8085.

UNIT II**12 hrs****Programming**

Programming process – Machine language programming – Assembly language programming – Flow chart – mnemonics and Op-code – Developing ALP for arithmetic and logical operations – ALP for multiplication, division, biggest number in an array, **sum of all elements in the array***.
Assembler programming – Assembler directives and constants.

UNIT III**12 hrs****Timings**

Microprocessor timings – Basic ideas of fetch and execute cycles – Machine cycles and state – instruction and data flow- counters and time delays – Hexadecimal counter – mod 10 counters – time delay calculations – generating pulse wave forms. Basic ideas of stack subroutine – conditional call and return instructions.

UNIT IV**12 hrs****Interfacing**

Logic devices for interfacing – Tristate devices and buffers – Programmable peripheral interface 8255 – programmable interval timer 8254 – programmable key board / display interface 8279 – interrupt controller 8259 A – DMA controller 8257 - interfacing switches and LED's – Basic idea of serial I/O and data communication.

UNIT V**12 hrs****Programming Instructions**

Memory organization in MCS 51 – instruction set and registers – introduction to 8051 assembly programming – Arithmetic instructions – unsigned addition and subtraction – unsigned multiplication and divisions – logic instructions – **single bit instructions and programming ***.

*** Self study**

UPH44

Books for study:

- | | |
|---|---|
| 1. Introduction to microprocessors | A.P.Mathur, Tata McGraw Hill Publishers Ltd (2004). |
| 2. Microprocessor Architecture and applications with 8085 | Ramesh S.Gaonkar , Penram International Publishing India (2007). |
| 3. Fundamentals of Microprocessor and Micro Computers, | B.Ram (IV Ed), Dhanpat Rai Publication (P) Ltd, New Delhi (2008). |

Books for reference

- | | |
|--|--|
| 1. The 8085 micro controller and embedded systems | Mohammad AliMazidi and Janice Gillespie Mazidi, Pearson Education Ltd, Delhi (2004). |
| 2. Intel Manual Embedded Micro controller | Vol I and II, Intel Corporation, California (1988). |
| 3. The 8085 micro controller Architecture programming and Applications | Ayala K.J, III rd Edition, Penram International(1999) . |

MAJOR ELECTIVE PAPER II: 2. MATHEMATICAL PHYSICS

Total Hours of Teaching: 60

Total Credits: 5

Objectives

To enable the learners to about

- i. Know about the differential equations
- ii. Know about the special functions, curvilinear coordinates, errors etc

UNIT I

12 hrs

Differential Equations

Second order homogeneous differential equations and their series solution (example: Bessel equation), linear independence of two solutions (Wronskian), Integral and power series methods for second solution.

UNIT II

12 hrs

Special Functions

Bessel, Legendre (spherical harmonics), Hermite and Laguerre: generating functions and recurrence relations, orthonormality conditions, Dirac delta function.

UNIT III

12 hrs

Curvilinear Coordinates

Orthogonal curvilinear coordinates; concept of a metric, spherical and **cylindrical coordinates*** and their unit vectors.

UNIT IV

12 hrs

Geometrical Applications of Differential Calculus

Curvature – Cartesian and polar co-ordinates – **Centre and radius of curvature*** – Circle of curvature – Involute and evolute – Envelopes – Properties of envelopes and evolutes – Evolute as envelope of normals.

UNIT V

12 hrs

Errors, Approximations and Extremum of Functions

Introduction to errors-classifications-accuracy of a function methods-error in laboratory instruments and methods-utility of errors. Approximation and applications. Maxima and minima: Geometrical interpretation and physical application-two and more independent variables-Lagrangian multiplier.

*** Self study**

Books for study:

- | | |
|-------------------------|---|
| 1. Mathematical Physics | Satya Prakash, Sultan chand and Sons, New Delhi (2006). |
| 2. Mathematical Physics | B D Gupta, Vikas publishing house(2001). |
| 3. Mathematical Physics | Rajput, Pragati prakashan(2000). |

Books for reference:

- | | |
|---|---|
| 1. Mathematical Methods for Physicists | Arfken and Weber, Academic Press, London (1984). |
| 2. Mathematical Physics | P. K. Chattopadhyay, New Age International, New Delhi (2001). |
| 3. Mathematical Methods in Physical Sciences, | Boas, John Wiley & Sons Pvt Ltd(Asia), New Jersey(2006). |

UPH46

4. Mathematics for Physicists and Engineers, Pipes, TataMcGraw Hill, New Delhi (1981).
5. Engineering Mathematics Kandasamy. P, Thilagavathy. K and Gunavathy. K, S.Chand and Co, New Delhi (2008).
6. Engineering Mathematics, Veerarajan..T, Fourth Edition TataMcGraw Hill (2004).
7. Engineering Mathematics Venkataraman.M.K, Volume I & II Revised, The National Pub. Co., Chennai (2004).

MAJOR ELECTIVE PAPER III - 1. ASTROPHYSICS**Total Hours of Teaching: 60****Total Credits: 5****Objectives**

To enable the learners to

- i understand the concepts of the celestial coordinate systems and conversion of the coordinate systems
- ii understand the luminosity and some methods to measure the luminosity
- iii know about the stellar distance and the astronomical instruments
- iv know about the star and its classifications

UNIT 1**12 hrs****The Celestial Coordinates**

Astronomy and astrophysics – scope of astronomy – Identification of stars – spherical coordinates – altazimuth system – the local equatorial – system – the universal equatorial system – aspects of sky at a given place – other system – conversion of coordinates

UNIT II**12 hrs****Apparent luminosity**

Magnitude scale- measurement of apparent luminosity- the visual methods- photographic method- photoelectric method- various magnitude systems- the visual system – photographic system - photoelectric system - UBV system - Baker's RGU system – Infrared system (Book 2 chap 3)

UNIT III**12 hrs****Stellar distances**

Measurement of distances within the solar system- Moon- planets and sun- Other methods of determining the astronomical unit- **Aberration of star light***- radial velocities of stars- Stellar distances- Geometrical methods- Cluster parallax- Secular parallax - Angular size method- Method of luminosity distance- Concept of absolute magnitude- Spectroscopic parallax- Period luminosity law

UNIT IV**12 hrs****Astronomical instruments**

Optical telescopes- Main parts -General properties of a telescope- Light gathering power- Angular magnifications- Resolving power- **Telescopic aberrations***- Special purpose telescopes- Meridian circle- Astrograph- Infrared telescope- Solar telescope

Other instruments and accessories

Clocks – Chronograph – Comparators – Photometers – Thermocouples.

UNIT V**12 hrs****Astrophysics**

Introduction- Classification of stars- The Harvard classification system- HR diagram- Luminosity of a star- Stellar evolution- **White Dwarfs***- Electrons in a white dwarf star- Chandrasekhar limit- Neutron stars- Black holes- Supernova explosion- Photon diffusion time- Gravitational potential energy of a star- Internal temperature of a star- Internal pressure of a star.

*** Self study**

UPH48

Books for study

- | | |
|------------------------------------|---|
| 1. An Introduction to Astrophysics | Baidyanath Basu
PHI Learning Pvt. Ltd.(2003). |
| 2. Astrophysics Stars and Galaxies | K D Abhyankar
Universities Press (India) Ltd (2001). |
| 3. Modern Physics | R Murugesan,
S.Chand &Co Ltd, New Delhi
(2003). |

Book for reference

- | | |
|----------------------------|--|
| 1. A brief history of time | Stephen hawking,
Bantam books, London (1998). |
|----------------------------|--|

MAJOR ELECTIVE PAPER III: 2. ELECTRONIC INSTRUMENTATION**Total Hours of Teaching: 60****Total Credits: 5****Objectives**

- i. To impart knowledge on various electronic instruments
- ii. To understand the working of electronic instruments

UNIT I**12 hrs****Direct Current Indicating Instrument**

Suspension galvanometer- Torque and deflection of the galvanometer-permanent magnet moving coil mechanism - Galvanometer sensitivity - D.C. Ammeters - **D.C. Voltmeters*** - Voltmeters sensitivity-Voltmeter ammeter method – Series and Shunt type ohm meter - Multimeter or Vom.

UNIT II**12 hrs****Alternating Current Indicating Instrument**

Introduction – Electrodynamometer (EDM) - Moving iron instruments - Rectifier type instruments - Thermo instruments - Electrostatic voltmeter - Electrodynamometer in power instruments (Watt-Hour meter - Power factor meter, Instrument transformer)

UNIT III**12 hrs****Oscilloscopes**

Introduction - Basic CRO operation - Cathode ray tube (CRT) - Power supply circuits - Vertical deflection system - Delay line – Multitrace - Horizontal deflection system – Digital storage Oscilloscope - CRO probes – Determination of Frequency, Phase angle and time delay - Lissajou's figures*.

UNIT IV**12 hrs****Electronic Instruments**

Introduction- Electronic voltmeter- considerations in choosing analog voltmeters - Digital voltmeters - Differential voltmeters – Successive Approximation conversion – All electronic component measurements - Q meters - Vector impedance meter - Vector voltmeters - **Digital Multi Meter (DMM)***.

UNIT V**12 hrs****Transducers**

Transducers as input elements to instrumentation system- Classification of transducers - Selecting a transducer - Strain gauges - Displacement transducers (Capacitive, Inductive, Variable differential transformer) - Temperature sensors (Resistance thermometers, Thermocouples, Thermistor) - Photosensitive devices - Magnetic sensor.

*** Self study****Books for study:**

- | | |
|--|--|
| 1. Electronic Instrumentation | H.S.Kalsi
II nd edition Tata Mc GrawHill Co. |
| 2. Electronic Instrumentation and Measurement Techniques | William David Cooper: (2 nd edition or 1 st edition 2 nd print),
P.H.I Documentation (1983). |

Book for reference

- | | |
|---|---|
| 1. Measurement Systems: Application and Design, | Dobelin.E.O., Mc-Graw Hill
Kogakusha Ltd., Tokyo (1996). |
| 2. Integrated Electronics | Millman and Halkies, Tata McGraw
Hill edition, New Delhi (2009). |

SKILL BASED SUBJECT IV: INTRODUCTION TO BIOPHYSICS**Total Hours of Teaching: 30****Total Credits: 3****Objectives**

To enable the learners to:

- i. Biophysics of Muscle
- ii. Human Ear
- iii. Physics of Vision

Unit – I Biomechanics**6 hrs**

Biostatics - Forces and Torques - Biophysics of Muscle –Muscle Power –Mass Specific Muscle Power - Strength of Bones - Biodynamics – Newton’s law Frictional forces and stokes law – Frictional forces and Stokes Law - Locomotion of Land - Walking - Jamping - Propelling - Locomotion in Air - Locomotion in Water - Role of Gravity.

Unit – II Biophysics and Fluid run**6 hrs**

Steady Laminar Flow - Co-efficient of viscosity - Temperature dependence Newtonian Fluid - Poiseuille’s Formula - Energetics of Fluid Flow – Turbulence – Reynolds’s Number - Hemodynamics - Plasma Skimming – Turbulence - Pressure Flow Relation - Fluid Flow in Plants

Unit – III Biophysics and Gas Transport**6 hrs**

The Ideal Gas – Dalton’s law of Partial Pressure – Vapour Pressure – Solutions and Henry’s Law - Convective Transport of Gases – Airway Resistance – Transport of O₂ in blood – Transport of CO₂ in Blood - Diffusion of Gases - Fick’s Laws – Gas Exchange in Lungs – Gas Exchange in Tissues – Physiology of Respiration – Physics of Alveoli – Work of Breathing.

Unit – IV Physics of Audition**6 hrs**

Transverse and Longitudinal Waves - Physiological Characteristics of Sound - Human Ear - Phase Sensitivity and Determination of Direction - Doppler Effect

Unit – V Physics of Vision**6 hrs**

Geometrical Optics – Refraction – Gradient index Lens – Spherical Aberration – Chromatic Aberration – Refraction Power of Eye – Reduced Eye Model – Accommodation - Refractive Errors – **Retina and Photoreceptors*** – Photochemistry of receptor cells – Intensity sensitivity – Spectral Sensitivity – Resolving Power of Eye – Diffraction – Polarization and Vision – Optical rotation – Birefringence and dichroism - Photoreceptors and Fiber optics.

*** Self Study****Books for study:**

1. Elementary Biophysics an Introduction

P.K.Srivastava, Narosa Publishing House, New Delhi, (2006)

Books for reference:

1. Biophysics

Vasanthapattabhi and N.Gautham.(2002) Narosa Publishing House.

2. Basic Biophysics

M.Daniel-Student Edition (2004), Jodhpur

CORE PRACTICAL – III

Total Hours of Teaching: 90

Total Credits: 2

**List of Experiments
(Any Fifteen)**

1. Young's modulus – Uniform bending – Koenig's method
2. Young's modulus – Non-uniform bending – Koenig's method
3. Dispersive power and resolving power of a Grating
4. Cauchy's constant and dispersive power of prism
5. Refractive index of a prism- Stoke's formula- spectrometer.
6. Determination of high resistance by charging – Ballistic Galvanometer
7. Determination of high resistance by leakage – Ballistic Galvanometer
8. Determination of Mutual Inductance – Ballistic Galvanometer
9. Comparison of Mutual Inductance - Ballistic Galvanometer
10. Comparison of Capacitors - Ballistic Galvanometer
11. Hartmann's interpolation formula – Determination of the wavelength of the arc spectrum – Spectrometer
12. Energy Gap Measurement of Semiconducting materials
13. Melting point of wax using Thermistor
14. Impedance and Power factor of an Inductive – Resistive circuit
15. Study of Transformer
16. Polarimeter – Rotation of plane of polarization
17. Fresnel's Biprism – Optic bench
18. Planck's constant – Photo electric emission
19. Boltzmann constant
20. Hysteresis- B-H curve
21. Anderson Bridge – Determination of Dielectric constant
22. Determination of Magnetic field - using earth inductor
23. Determination of capacitance using Schering Bridge
24. Comparison of capacitance using DeSauty Bridge
25. Measurement of Inductance using OWEN's Bridge

CORE PRACTICAL – IV – ELECTRONICS, DIGITAL ELECTRONICS & MICROPROCESSOR

Total Hours of Teaching: 60

Total Credits: 2

LIST OF EXPERIMENTS

(Any Fifteen; five from each section)

**SECTION – A
ELECTRONICS**

1. Construction and study of IC Regulated Power Supply
2. Voltage doubler
3. RC-Coupled Amplifier –Single Stage
4. Feed back Amplifier
5. Emitter Follower
6. Hartley Oscillator
7. Astable multivibrator using Transistor
8. Monostable multivibrator using Transistor
9. FET characteristics

**SECTION – B
DIGITAL ELECTRONICS**

10. Logic gates using IC – Verification of truth tables and Demorgan's theorem
11. NOR and NAND gates – Universal building blocks
12. Half adder and Full adder
13. Half subtractor and Full subtractor
13. Analog to digital convertor
14. Digital to analog convertor.
15. Op-Amp LM741 as adder, subtractor and scalar.
16. Op-Amp LM741 as inverting and non inverting amplifier

**SECTION – C
MICROPROCESSOR**

17. 8085-ALP for 8 Bit addition, Subtraction
18. 8085-ALP for one's compliment, masking off most significant 4 bits and setting bits .
19. 8085-ALP for 8 Bit Multiplication and Division
20. 8085-ALP for finding the biggest element in the array and sum the element in the array
21. 8085-ALP to sort the array in descending order and ascending order
22. 8085-ALP to count the number of zeros, +ve, -ve number and square of a number
23. ALP- Matrix addition.
24. 8085-ALP for ASCII to decimal conversion, BCD to Hex conversion, Hex to Decimal conversion and Hex to binary form

CORE PRACTICAL-V : PROGRAMMING IN C and C++

LIST OF EXPERIMENTS

(Any fifteen)

1. Write a program that inputs three integers from the keyboard and prints the SUM, AVERAGE, PRODUCT, SMALLEST, and LARGEST of THREE NUMBERS.
2. Arrange a set of numbers in ascending order using SELECTION SORT
3. Graphical representation of motion of free falling objects
4. Convert integer in the range 1 to 100 into words
5. Calculation of half lifetime of a radioactive element.
6. Verification of Boyle's law
7. Matrix addition
8. Matrix multiplication
9. Develop a C program to check for palindrome string in a sentence
10. Matrix Subtraction
11. Develop a C++ program to demonstrate operator overloading
12. Develop a C++ program to illustrate the addition of objects.
13. Develop a C++ program to illustrate the usage of constructors and destructors
14. Develop a C++ program to calculate the value of m^n
15. Develop a C++ program to calculate an electricity bill
16. Develop a C++ program to demonstrate the usage of classes and objects
17. Develop a C++ program to illustrate the usage of friend functions, object as function arguments and returning objects
18. Develop a C program to illustrate String handling functions
19. Develop a C program to check whether a given number is odd and even
20. Develop a C program to Calculate the sum of natural numbers

Semester I /III – Allied Subject II - Physics–I

MECHANICS, HEAT, SOUND, MAGNETISM AND ELECTRICITY

Total Hours of Teaching: 60

Total Credits: 4

Objectives

To enable the learners to

- i. know about mechanics, properties of matter and sound
- ii. understand thermal physics
- iii. know about the light, electricity and electromagnetism

UNIT I**12hrs****Mechanics**

Composition of two simple harmonic motions along a line and at right angles – Lissajou's figures, uniform circular motion - Acceleration of a particle in a circle - Centripetal and centrifugal forces - Banking on curved tracks. Projectile - Motion in horizontal plane - Maximum height – Time of flight – Range – to prove the path of the Projectile is a parabola – Range and time of flight in a horizontal plane.

UNIT II**12hrs****Properties of matter and sound**

Elasticity: Elastic constants – Bending of beams – Young's modulus by uniform and non uniform bending – Energy stored in a stretched wire – Torsion in a wire – **Determination of rigidity modulus – Torsional oscillation*** – Static torsion.

Sound: interference of sound waves – Beats – Doppler Effect –Applications – Ultrasonics – Piezoelectric method – Applications.

UNIT III**12hrs****Thermal physics**

Specific heat of solids and liquids – Dulong and Petit law – Newton's law of cooling – **Thermal conductivity – Lee's disc method *** – Variation of specific heat with temperature – Vanderwaal's equation of state – derivation of critical constants – Black body radiation – Stefan's law – Laws of thermodynamics – Change of entropy in reversible and irreversible processes.

UNIT IV**12hrs****Optics**

Condition for interference – Young's double slit experiment – Interference due to transmitted light – Air wedge – Newton's rings – Determination of refractive index of a liquid – Diffraction - Diffraction at a single slit – Transmission grating – Polarization – Production and analysis of circularly and elliptically polarized light – Optical activity – Specific rotation – Half shade polarimeter.

UNIT V**12hrs****Current Electricity and Electromagnetism**

Kirchhoff's laws – Wheatstone's network – Condition for balance – Carey –Foster's bridge – measurement of resistance – Capacitor – Energy of charged capacitors – Loss of energy due to sharing of charges. Electromagnetic induction - Faraday's laws – AC circuits – Mean – rms – Peak values – LCR in series and in parallel – Sharpness of resonance – Ballistic Galvanometer – Theory – Measurement of capacitance – Transformer and its applications.

***Self study**

UPH55

Books for study:

- | | |
|-----------------------------------|--|
| 1. Allied Physics | R. Murugesan, S.Chand & Company (2004). |
| 2. Properties of matter and sound | R. Murugesan, S.Chand & Company (2004). |
| 3. Heat and thermodynamics | Brijlal & Subramaniam, S.Chand & Company (2005). |
| 4. Electricity and magnetism | Brijlal & Subramaniam, Rathan Prakasam Mandir(2004). |

Books for reference:

- | | |
|--|--|
| 1. Properties of Matter | D.S.Mathur, Shyamlal Charitable Trust, New Delhi (2010). |
| 2. Heat, Thermodynamics and
Statistical mechanics | Singhal , Agarwal Prakash Pragati Prakashan publisher Meerut
(1992) . |

Specific topics for problems:

- i) Calculation of the current sensitivity of the ballistic galvanometer.
- ii) Calculation of the capacity of condenser using ballistic galvanometer
- iii) Calculation of loss of energy on sharing the charges between two charged condensers

Semester II /IV – Allied Subject II -Physics–II

MODERN PHYSICS, ELECTRONICS AND DIGITAL ELECTRONICS

Total Hours of Teaching: 60

Total Credits: 4

Objectives

To enable the learners to

- i. know about quantum Physics, nuclear & atomic Physics,
- ii. understand relativity
- iii. know the basics of electronics and communication Physics

UNIT I**12hrs****Quantum Physics**

Photoelectric effect - Laws of photoelectric effect – Millikan's experiment – Photoconductive and photovoltaic cells – **Photomultiplier** *– Applications of photo cells – Production and properties of X-rays – X – ray spectrum – Mosley's law – Compton effect – Relation for change in wavelength – X- ray diffraction – Bragg's law – Miller indices – Determination of h,k,l values of cubic crystals.

UNIT II**12hrs****Nuclear Physics**

Classification of nuclei – General properties of nuclei – Characteristics of nuclear forces – Nuclear structure – Liquid drop model – Shell model – Particle accelerators – Betatron – Electron synchrotron – Artificial Transmutations by α -particles – Photon particles Nuclear fission and fusion (Quantitative) -Elementary particles – Mesons – Baryons – Leptons.

UNIT III**12hrs****Atomic Physics and Elements of Relativity**

Atom model – Sommerfeld – Vector atom models –Periodic table – Pauli's exclusion principle – excitation and ionization potentials – Frank and Hertz method – Postulates of theory of relativity – Lorentz transformation equations – derivations – Length contraction – Time dilation – Mass- energy equivalence.

UNIT IV**12hrs****Laser Physics**

Purity of spectral lines – Coherence length and time – Spontaneous and induced emissions – population inversion – Meta stable state – Conditions for laser action – Ruby laser – He-Ne lasers – Applications of lasers – Raman effect – Raman shift – Stokes and antistokes lines – LASER Raman spectrometer.

UNIT V**12hrs****Electronics and Communication Physics**

V – I Characteristics of p-n junction diode – Zenar diode – Uses of Zenar diode – Characteristics of FET – UJT- **Principles of LED***,LCD - Number systems – Conversion of Binary into Decimal – Decimal into Binary – Binary addition – Subtraction – Basic logic gates – Boolean algebra – Demorgan's theorem – Modulation – AM –FM – Basic principles of antenna and RADAR.

* Self study

Books for study:

1. Allied physics R. Murugesan, S.Chand & Company (2005).
2. Modern physics R. Murugesan, S.Chand & Company (2005).

Books for reference:

1. Basic electronics Theraja.B.L, S.Chand & Company (2004).
2. Principles of electronics V.K.Metha, S.Chand & Company (2005).
3. LASER physics Thiagarajan, Mcmillan, New Delhi (1992).

Specific topics for problems:

- i) To calculate the work function of a given metal
- ii) To calculate the kinetic energy of an electron ejected from a metal
- iii) Finding the Miller indices of crystal planes

Total Hours of Teaching: 90

Total Credits: 2

**List of Experiments
Any fifteen**

1. Young's Modulus – Uniform bending – optic lever.
2. Young's modulus – Cantilever – static method.
3. Surface tension and interfacial S.T – Drop weight Method.
4. Rigidity Modulus – Static torsion.
5. Torsional pendulum – Moment of inertia and rigidity modulus.
6. Acceleration due to gravity – compound pendulum.
7. Specific heat of liquid by cooling.
8. Sonometer - AC frequency.
9. Thermal conductivity – Lee's disc.
10. Spectrometer – Refractive index of liquid – Hollow prism.
11. Spectrometer – Grating – wavelength determination – Normal incidence method.
12. Newton's ring – Radius of curvature of lens surface.
13. Potentiometer – Low range Ammeter calibration.
14. Potentiometer – Specific Resistance.
15. Moment of a magnet – Tan C position.
16. Figure of Merit – Ballistic galvanometer.
17. Characteristics of p-n junction diode.
18. Characteristics of a Zener diode.
19. Verification of the truth tables of OR, AND, NOR, NOT, NAND gates using IC'S.
20. Verification of De – Morgan's theorems.
21. Potentiometer – Low range Voltmeter calibration.