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

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	CIA	ESE	Total	Duration of Exam. Hrs.	Credit
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

		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/Y RC/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– CONTINOUS 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   **12UPH101**
CORE PAPER -1 PROPERTIES OF MATTER AND SOUND

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 – Searel'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.Saihgal, S.Chand & Company Ltd, New Delhi, (1982).

Books for reference:

1. A textbook of sound   N.Subrahmanyan 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

PART IV– ENVIRONMENTAL STUDIES

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

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.

CORE PAPER –2 HEAT AND THERMODYNAMICS

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, it's theory and results – Joule Thomson effect for perfect and real gas – Super fluidity; Helium I and Helium II– Lamda 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)

Books for reference:
1. Thermal Physics   R. Murugeshan 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

SEMESTER - II   13VED201

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.

SEMESTER – II
CORE PRACTICAL I   14UPH2CL

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.

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

Books for study:

1. Mechanics   D.S.Mathur,
                                                      S.Chand & Company Ltd,   New Delhi (1996).

2. Classical Mechanics   Gupta, Kumar and Sharma.
                                                      Pragathi Prakasan   Publishers, Meerut (2002).

Books for reference:

1. Mechanics and
      General properties of matter   P.K.Chakrabarthy,
                                                     Books & Allied (P) Ltd, (2001)

2. Fundamentals of Physics   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   **14UGA3S1**
PART IV –SKILL BASED SUBJECT 1
GENERAL AWARNESS (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.

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) – Dril – 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 Administrational 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.

Semester IV
12UHR3N1
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, comparision 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

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

SEMESTER IV   **12UPH4S2**
SKILL BASED SUBJECT II – PROGRAMMING IN C

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

Semester IV
12UWR4N2
Non – Major Elective – II Women's Rights

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   Aruna Goal,
   Women Development and Empowerment   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).

UPH25

SEMESTER IV   **12UPH4CM**

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

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

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

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

SEMESTER–V   **14UPH506**

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 Broglic 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 Uncertainity Principle
Physical significance – Heisenberg's gamma ray microscope – Diffraction of a beam of electrons by a slit – application of uncertainity 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
Schroedinger'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 – Lorenz'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. Murugeshan, S. Chand & Company Ltd (1992).
3. Modern physics   R. Murugeshan 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

UPH32

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 compliment-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 registor-Parallel in parallel out shift
registors.

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::
1. Digital principles and applications   Albert Paul Malvino & Donald P Leach, Tata
                                               McGraw Hill,   New Delhi I(1999).
2. Digital fundamentals   Floyd , Tata McGraw Hill, New Delhi(1995).
3. Digital logic and computer design   M.Morris Mano,Prentice-Hall of India Pvt.Ltd,
                                               NewDelhi (2006).

Books for reference::

1. Introduction to Integrated electronics,   V.Vijayendaran, S.Vishwanathan
   digital and analog   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

SEMESTER – V 14UPH5E1

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   D.P. Kothari, K.C. Singal & Rakesh Ranjan
   and emerging Technologies   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   S.A. Abbasi and Nasema Abbasi
   Environmental impact   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.

SEMESTER –V   **12UPH5E1**

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

SEMESTER V   **12UPH5S3**

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

SEMESTER VI   14UPH609

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.

SEMESTER –VI   **14UPH610**

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

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   **12UPH611**
CORE PAPER -11   NUCLEAR PHYSICS

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 quadruple 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-cylotron – 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 Nuttal experiment – Geiger Nuttal 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

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

SEMESTER – VI   14UPH6E2

MAJOR ELECTIVE PAPER - I1

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

Books for study:

1. Introduction to microprocessors   A.P.Mathur, Tata McGraw Hill Publishers Ltd (2004).
2. Microprocessor Architecture   Ramesh S.Gaonkar , Penram International Publishing
   and applications with 8085   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   Mohammad AliMazidi and Janice Gillespie
   and embedded systems   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   Ayala K.J, III rd Edition, Penram International(1999) .
   Applications

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 – Involutes and evolutes – 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 Jerssey(2006).

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).

SEMESTER - VI   14UPH6E3

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

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 Murugeshan,
	S.Chand &Co Ltd, New Delhi
	(2003).

Book for reference

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

SEMESTER – VI   **14UPH6E3**

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
                                                                                         IInd edition Tata Mc GrawHill Co.
2. Electronic Instrumentation and Measurement Techniques   William David Cooper: (2nd edition or
                                                                                         1st edition 2nd 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).

SEMESTER–VI   12UPH6S4

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 - Pioseuille'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 O_2 in
blood – Transport of CO_2 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   Vasantha pattabhi 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

UPH52

SEMESTER –VI   **14UPH6CO**

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

SEMESTER–VI   **12UPH6CP**

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

UPH54

ALLIED PHYSICS PAPER FOR B.SC., MATHEMATICS / CHEMISTRY   12UPH3A1

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 rigidify 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

Books for study:
1. Allied Physics   `   R. Murugeshan, S.Chand & Company (2004).
2. Properties of matter and sound   R. Murugeshan, 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

ALLIED PHYSICS PAPER FOR B.SC., MATHEMATICS / CHEMISTRY   12UPH4A2

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

SEMESTER I & II / III & IV

ALLIED PHYSICS PRACTICAL   12UPH4AL

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.