DEPARTMENT OF PHYSICS

SYLLABI FOR B.Sc PHYSICS

CURRICULAM AND SCHEME OF EXAMINATIONS (CBCS)

(APPLICABLE TO STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2017-2018 ONWARDS)

KONGUNADU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
COIMBATORE -641029

2017- 2018

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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 **2017 –2018 ONWARDS**)

Semester	Part	Subject code	Title of the Paper	Instruction hours / cycle	Exam. Marks			Duration of Exam. Hrs.	Credit
					CIA	ESE	Total		
I	I	15TML103@	**LAN** –Tamil I/Hindi I/ French I / Malayalam I / Sanskrit I	6	25	75	100	3	3
	II	15ENG101	**LAN**–English I	6	25	75	100	3	3
	III	15UPH101	**C.P.1**– Properties of Matter and Sound	6	25	75	100	3	5
		15UPH2CL	**C.Pr.1-**Practical I	3	-	-	-	-	-
		15UMA1A1	**Allied Subject I** Mathematics – I	7	25	75	100	3	5
	IV	15EVS101	Environmental Studies**	2	-	50	50	3	2
II	I	15TML202@	**LAN-** Tamil II / Hindi II/ French II /Malayalam II / Sanskrit III	6	25	75	100	3	3
	II	15ENG202	**LAN-** English II	6	25	75	100	3	3
	III	15UPH202	**C.P.2** – Heat and Thermodynamics	6	25	75	100	3	5
		15UPH2CL	**C.Pr.1-**Practical I	3	40	60	100	3	2
		15UMA2A2	**Allied Subject I** Mathematics –II	7	25	75	100	3	5
	IV	16VED201	**Value Education** Moral and Ethics**	2	50		50	3	2
III	I	15TML303@	**LAN -** Tamil III/Hindi III/ French III / Malayalam III / Sanskrit III	6	25	75	100	3	3
	II	15ENG303	**LAN** –English III	6	25	75	100	3	3
	III	15UPH303	**C.P.3** – Mechanics	4	25	75	100	3	5
		15UPH4CM	**C.Pr.2** Practical II	3	-	-	-	-	-
		15UCH3A3	**Allied Subject II** Chemistry –I	4	20	55	75	3	4
		15UCH4AL	**Allied Practical** Chemistry Practical	3	-	-	-	-	-
	IV	15UGA3S1	**Skill based Subject 1 –** General Awareness	2	25	75	100	3	3
	IV	17TBT301/ 17TAT301/ 17UHR3N1	Basic Tamil*/Advanced Tamil** / Non Major Elective-I**	2	75		75	3	2

IV	I	15TML404@	**LAN–** Tamil IV/Hindi IV/ French IV / Malayalam IV / Sanskrit IV	6	25	75	100	3	3
	II	15ENG404	**LAN** – English IV	6	25	75	100	3	3
	III	15UPH404	**C.P.4 –** Electricity and Magnetism	4	25	75	100	3	5
		15UPH4CM	**C.Pr.2 –** Practical II	3	40	60	100	3	2
		15UCH4A4	**Allied Subject II** Chemistry –II	4	20	55	75	3	4
		15UCH4AL	**Allied Practical** Chemistry Practical	3	20	30	50	3	2
	IV	15UPH4S2	**Skill based Subject –2** Medical Instrumentation	2	25	75	100	3	3
		17TBT402/ 17TAT402/ 17UWR4N2	Basic Tamil* / Advanced Tamil** / Non Major Elective- II**	2	-	75	75	3	2
V	III	15UPH505	**C.P.5** – Astrophysics	4	25	75	100	3	4
		15UPH506	**C.P.6** – Optics and Laser Physics	4	25	75	100	3	4
		15UPH507	**C.P.7 –** Principles of Electronic Devices and Circuits	4	25	75	100	3	4
		15UPH508	**C.P.8 –** Quantum Mechanics and relativity	4	25	75	100	3	5
		17UPH5E1	Major Elective Paper – I **Principles of Communication Systems /** Mathematical Physics	4	25	75	100	3	5
		15UPH6CN	**C.Pr.3**– Practical III - General	3	-	-	-	-	-
		15UPH6CO	**C.Pr.4**– Practical IV - Electronics , Digital Electronics and Microprocessors	2	-	-	-	-	-
		15UPH6CP	**C.Pr.5**– Practical V - Programming in C	2	-	-	-	-	-
	IV	15UPH5S3	**Skill Based Subject 3 -** Programming in C	3	25	75	100	3	3
VI	III	15UPH609	**C.P.9 –** Atomic and Solid State Physics	4	25	75	100	3	4
		15UPH610	**C.P.10–** Fundamentals of Digital Electronics	4	25	75	100	3	4
		15UPH611	**C.P.11–** Nuclear Physics	4	25	75	100	3	5
		17UPH6E2	Major Elective Paper - II **Energy Sources and Nanoscience /** Object oriented programming in C++	4	25	75	100	3	5

		17UPH6E3	Major Elective Paper - III **Electronic Instrumentation /** Introduction to Biophysics	4	25	75	100	3	5
		15UPH6CN	**C.Pr.3** Practical III - General	3	40	60	100	3	2
		15UPH6CO	**C.Pr.4–** Practical IV - Electronics , Digital Electronics and Microprocessors	2	40	60	100	3	2
		15UPH6CP	**C.Pr.5–** Practical V – Programming in C	2	40	60	100	3	2
	IV	15UPH6S4	**Skill Based Subject 4 –** Introduction to Microprocessor	3	25	75	100	3	3
	V	12NCC/NSS/YRC/PYE101$$	**Extension Activities***	-	50	-	50	-	1
			Total	180			3800		140

@ Malayalam – 15MLM 101 - 404
@ Hindi/ French/ Sanskrit – 15HIN/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

1. Principles of Communication Systems
2. Energy Source and Nanoscience
3. Electronic Instrumentation
4. Mathematical Physics
5. Object oriented programming in C++
6. Introduction to Biophysics

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/Hindi/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 = 10 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.)

Note: In Section B, one question should be a problem from any of the five units (both the options 'a' and 'b')

UPH6

SEMESTER - 1 **15UPH101**

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'. Gravitational field of Erath – equation of motion of elementary volume – general features of field 'g' on the earth's surface.

UNIT II **12 hrs**

Elasticity

Elastic constants – Relations connecting them – Poisson's ratio - Bending of beams - bending moment of a beam - uniform and non - uniform bending – 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).
4. Principles of the Gravitational Method Alex A. Kaufman, Richard O. Hansen, Elsevier, (2007)

UPH8

SEMESTER I **15EVS101**

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.

UPH11

SEMESTER - II **15UPH202**

CORE PAPER - 2 HEAT AND THERMODYNAMICS

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

Objectives

To enable the learners to

1) Understand the **e**quation of states of a real gas, quantum theory of specific heat and basic theory of entropy.
2) Understand the principle and different methods of production of low temperature and liquefaction of He.
3) 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; liquefaction of Air by Linde's process, Oxygen by cascade process, Hydrogen, Helium by Onne's method, Helium I and Helium II - Lamda point – Adiabatic demagnetization, Measurement of very low temperature .

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 Thermodynamics and Statistical Physics: Brij Lal, N. Subrahmanyam S. Chand, 2008 For B.Sc. Classes as Per UGC Model Syllabus
2. Heat and Thermodynamics Brijlal and Subramanian, S.Chand &Company, New Delhi(2002)
3. 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)

UPH12

SEMESTER - II **16VED201**

PART IV – VALUE EDUCATION: MORAL AND ETHICS

Total hours: 30 **Total Credits: 2**

UNIT I : (6 Hours)
Introduction – Meaning of Moral and Ethics – Ethics and culture – Aim of Education.

UNIT II (6 Hours)
Swami Vivekananda – A biography.

UNIT III (6 Hours)
The Parliament of Religions – Teachings of Swami Vivekananda.

UNIT IV (6 Hours)
Steps for Human Excellence

UNIT V (6 Hours)
Meditation.

Text Book:
Value Based Education – Moral and Ethics – Published by Kongunadu Arts and Science College (Autonomous), First Edition, 2015.

Reference Book:
Easy steps to Yoga by Swami Sivananda, A divine Life Society Publication, 2000.

Question Paper Pattern
(External only)

Duration: 3 hrs **Total Marks: 50**

Answer all Questions (5 × 10 = 50 Marks)

Essay type, either or type questions from each unit.

UPH13
SEMESTER – II
CORE PRACTICAL - 1 **15UPH2CL**

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. Specific heat capacity of a liquid – Newton's cooling method
8. Refractive index of a liquid prism – Spectrometer
9. Refractive index of a solid prism – Spectrometer
10. Refractive index of a solid prism (i-d) curve – Spectrometer
11. Wavelength of spectral lines – Grating – Normal incidence method – Spectrometer
12. Wavelength of spectral lines – Grating – minimum deviation – Spectrometer
13. Calibration of low range voltmeter – Potentiometer
14. Calibration of low range ammeter – Potentiometer
15. Specific Resistance of a wire – Meter bridge
16. Temperature co-efficient of resistance of a thermistor – Post office box.
17. Rigidity modulus and moment of inertia – Torsional Pendulum
18. Determination of pole strength – Tan C position
19. Determination of frequency – Melde's method
20. Characteristic of a PN junction diode
21. Measurement of Terminal velocity for different liquids by Stokes method
22. Determination of surface tension and interfacial surface tension of a liquid by drop weight method.

UPH14

SEMESTER III **15UPH404**

CORE PAPER - 4 : MECHANICS

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

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

Centre of gravity – Position of G for simple rigid bodies – rigid solid cone – thin hollow hemisphere – solid hemisphere – Centre of gravity of a body composed of two parts – Equilibrium of bodies – suspended and supported – types of equilibrium.

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

UNIT IV **12 hrs**

Hydrostatics

Fluid thrust

Thrust on a plane surface – the centre of pressure – position of the centre of pressure – Rectangular lamina – Triangular lamina – Thrust on curved surfaces

Flotation

Laws of flotation – Metacentre – Metacentric height – the metacentric height of a ship

UNIT V **12 hrs**

Hydrodynamics

Fluids in Motion – Steady or stream line flow- Equation of continuity of flow – Energy of liquids - Bernoulli's theorem – Euler's equation and Bernoulli's equation – verification – practical applications – Ventury meter – the pitot tube

*** Self study**

Books for study:

1. Mechanics — D.S.Mathur, S.Chand & Company Ltd, New Delhi (2006).
2. Mechanics — Subramaniam Jayarama, Rangarajan, SV publishers Pvt Ltd Madras.

Books for reference:

1. Statics,Hydrostatics and Hydrodynamics — M.Narayanamurthy, N.Nagarathianam, The National Publishing Company
2. Fundamentals of Physics — D.Halliday, R.Resnick and J.Walker, John Wiley & Sons, New Delhi 9th Edition (2010)

UPH15

SEMESTER III **15UGA3S1**

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.

UPH17

SEMESTER - III **17UHR3N1**

PART IV – NON MAJOR ELECTIVE – I HUMAN RIGHTS

Total Hours of Teaching: 2/week **Total Credits: 2**

Objectives:

1. To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
2. To impart education on national and international regime of Human Rights.
3. To sensitize students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy.
5. To appreciate the relationship between rights and duties.
6. To foster respect for tolerance and compassion for all living creatures.

UNIT I **6 hrs**

1.1. Definition, Meaning, Concept, Theories and Kinds of Human Rights.
1.2. Evolution and Protection of Human Rights in India.
1.3. Development of Human Rights under the United Nations.

UNIT II **6 hrs**

2.1 United Nations Charter and Human Rights
2.2 U.N. Commission on Human Rights
2.3 Universal Declaration of Human Rights
2.4 International Covenant on
- Civil & Political Rights
- Economic, Social and Cultural Rights

UNIT III **6 hrs**

3.1 Human Rights and Fundamentals Rights (Constitution)
3.2 Enactments regarding Human Rights Laws in India
3.3 National Human Rights Commission and State Human Rights Commission

UNIT IV **6 hrs**

4.1 Aged persons and their Human Rights
4.2 Human Rights of Persons with Disabilities
4.3 Tribal Human Rights in India
4.4 The Three Generation Human Rights

UNIT V **6 hrs**

5.1 Rights of Woman, Child, Refugees and Minorities
5.2 Media and Human Rights
5.3 NGO's in protection of Human Rights
5.4 Right to Election

Books for Study:

1. Human Rights — Compiled by Dr.V.Sugantha, Dean (Unaided), Kongunadu Arts and Science College, Coimbatore-29

Books for Reference:

1. Human Rights, Humanitarian Law and Refugee Law — P.Jaganathan, MA., MBA., MMM., ML., ML., J.P.Arjun Proprietor, Usha Jaganath law series, 1st floor, Narmatha Nathi Street, Magathma Gandhi Nagar, Madurai – 625014.

UPH18

Question paper pattern

Duration: 3 hrs Max: 75 Marks

Section A (5 x 5 = 25)

Short notes

Either – Or/ Type – Question from each unit.

Section B (5 x 10 = 50)

Essay type

Either – Or/ Type – Question from each unit.

UPH19

SEMESTER - IV **15UPH404**

CORE PAPER - 4 : ELECTRICITY AND MAGNETISM

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

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 12 Hrs

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 12 Hrs

Magnetic properties of materials:

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 – properties of magnetic materials– 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 12 Hrs

Thermoelectricity:

Seebeck effect – Laws of thermo e.m.f – measurement of thermo emf using potentiometer - Peltier effect – Peltier co-efficient- determination of Peltier effect – Thomson effect – Thomson co – efficient – determination of Thomson effect - e.m.f. generated in a thermocouple taking both Peltier effect at the junctions and Thomson effect in the metals (Thermodynamics of a thermocoupe) – thermoelectric power – thermoelectric diagrams and their uses.

UNIT IV 12 Hrs

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 **12 Hrs**

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 R. Murugesan, S.Chand & Company Publishers, New Delhi (2004).
2. Electricity and magnetism Brijlal and Subramaniam, Ratan Prakashan, New Delhi (2000).

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).

UPH21

SEMESTER - IV **15UPH4S2**

SKILL BASED SUBJECT II - MEDICAL INSTRUMENTATION

Total Hours of Teaching: 45 **Total Credits: 3**

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).

UPH22

SEMESTER - IV **17UWR4N2**

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 Women Development and Empowerment	Aruna Goal, Deep and Deep Publications Pvt. (2004).
5. Gender Justice	Monika Chawla, Deep and Deep Publications Pvt.(2006).
6. Domestic Violence against Women	Preeti Mishra, Deep and Deep Publications Pvt. (2007)
7. Violence against Women	Clair M. Renzetti, Jeffrey L. Edleson, Raquel Kennedy Bergen, Sage Publications (2001).

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SEMESTER - IV **15UPH4CM**

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 – Potentiometer.
13. Figure of merit - B.G.
14. Capacity of a condenser – B.G.
15. Field intensity circular coil – Vibrational magnetometer
16. Characteristics of Zener diode
17. Moment of a magnet – Circular coil – Deflection magnetometer
18. Determination of specific gravity of liquid – Joule's Calorimeter
19. Verification of NAND and NOR gate as Universal gate
20. Multimeter Principle – Ammeter, Voltmeter and Ohm meter

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SEMESTER - V **15UPH505**

CORE PAPER - 5 : ASTROPHYSICS

Total Hours of Teaching: 75 **Total Credits: 5**

Objectives

i To know about the sun, star and planetary motion
ii To know about the astronomical instruments
iii To know about the age and evaluation of earth

UNIT I **15 hrs**

Theories of the universe, galaxies and star clusters

Origin of the universe - the big bang theory - the steady state theory - the oscillating universe theory - Hubble's law

Galaxies

Types of galaxies - Milky Way - star clusters - **globular clusters***

UNIT II **15 hrs**

Solar System

Mass and stability of the sun of the sun - solar constant - temperature of the sun - source of solar energy - solar wind - corona

Other members of the solar system

Mercury - Venus - Earth - Mars - Jupiter - Saturn - Uranus - Neptune - Moon - Bode's law

UNIT III **15 hrs**

Age and evaluation of earth

Solar nebula theory – planetesimials theory – age of earth – radiative dating – exposure age of meteoroids – age of radiative elements – motion of the planets – evaluation of earth's atmosphere – formation of ozone layer – role of life in changing the earth's atmosphere

UNIT IV **15 hrs**

Distance and magnitude of stars

Magnitude and brightness - apparent magnitude of stars - absolute magnetic of stars - relation between apparent magnitude and absolute magnitude of stars - Luminosities of stars - **measurement of stellar distance***

UNIT V **15 hrs**

Astronomical Instruments

Optical telescope – reflecting telescope – types of reflecting telescope – advantages – antenna requirements for solar observations – parapoloid reflection antenna – broad band antennas – dipole arrays

*** Self study**

Books for study:

1. Astrophysics: A modern perspective: K.S.Krishnaswamy, New Age International Pvt Ltd, New Delhi, 1st Edition (2002)
2. Astronomy and Astrophysics A.B.Bhattacharya, S.Joardar, R.Bhattacharya, Overseas Press (2010)

Books for reference:

1. An introduction to Astrophysics B.Basu, Hall of India Pvt Ltd (2001)
2. Modern Physics R.Murugesan, 11th edition, S.Chand and Co (2003)

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SEMESTER–V **15UPH506**

CORE PAPER - 6 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 – Fabry perot intefrometer - 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 – quarter wave plate – Half wave plate – papinet's compensator - 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, M.N.Avadhanulu and N. Subrahmanyam, 4th edition S. Chand & Co Publishers, New Delhi (2012)
2. Lasers: Fundamentals and Applications K. Thyagarajan, Ajoy Ghatak Springer Science & Business Media, (2010)

Books for reference:

1. Optics and spectroscopy — R.Murugesan, S.Chand & Company Ltd , New Delhi (2003).
2. Laser Fundamentals — William T.Silvast, Cambridge University Publishers 2nd Ed (2004).

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SEMESTER–V **15UPH507**

CORE PAPER - 7 PRINCIPLES OF ELECTRONIC DEVICES AND CIRCUITS

Total Hours of Teaching: 75 **Total Credits: 4**

Objectives

To enable the learners to

i. Understand the action of semiconductor devices and their applications.

ii. Know the principle and working of oscillators.

UNIT I **15 hrs**

Semiconductors:

Semi-Conductor – commonly used semiconductors – energy band description of semiconductors – effect of temperature on semiconductors –n- type and p-type semiconductors – majority and minority carriers - p-n junction – volt ampere characteristics of p-n junction

Semiconductors devices

Special Diodes

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

Rectifiers and Filters

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

Filters: Inductive and capacitive*.

UNIT II **15 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 – The h- parameters of an ideal transistor.

UNIT III **15 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

Silicon Controlled Rectifier

SCR - Working of SCR - V-I characteristics – SCR as a switch

UNIT IV **15 hrs**

AMPLIFIERS – SINGLE STAGE & MULTISTAGE

Design of single stage transistor amplifier – RC coupled amplifier – multistage amplifier – transformer coupled 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 **15 hrs**

SINUSOIDAL OSCILLATORS

Principle of an Oscillator - Crystal Oscillators - Hartley and Colpitts oscillators with theory - Waveforms of astable, monostable and bistable multivibrator circuits – clipping circuits – Applications of clippers – clamping 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).

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SEMESTER - V **15UPH508**

CORE PAPER – 8 QUANTUM MECHANICS AND RELATIVITY

Total Hours of Teaching: 75 **Total Credits: 5**

Objectives

To enable the learner to

i) Know about DeBroglie 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

UNIT I **15 hrs**

Inadequacy of classical mechanics – Shortcomings of old quantum theory – Foundations of wave mechanics - Dual nature of light and matter – Experimental evidence for matter waves - Davisson and Germer's electron diffraction experiment – G.P.Thomson's experiment – DeBroglie concept of stationary orbits – DeBroglie wavelength associated with electron accelerated through a potential difference – Non relativistic expression – Relativistic expression.

UNIT II **15 hrs**

Wave (or Phase) velocity and group velocity – velocity of DeBroglie waves – relation between phase velocity and group velocity for a non relativistic free particle - Equation of motion of matter waves – Physical interpretation of the wave function – Normalized and Orthogonal wave function – conditions satisfied by wave function – solution of the Schrödingers equation – Stationary state solution.

UNIT III **15 hrs**

Ooperators associated with different observables – Expectation values of dynamical quantities – probability current density – Ehrenfest theorem – related problems.

Uncertainty Principle - Heisenberg's gamma ray microscope – Diffraction of a beam of electrons by a slit – application of uncertainty principle – Nonexistence of electron in a nucleus – the radius of the first orbit.

UNIT IV **15 hrs**

Physical aapplications of Schrödinger's Equation - The Free particle - Particle in a box - Potential step – Refelcetance and Transmittance for $E>V_0$ and $E<V_0$ - A particle in one dimensional infinitely deep potential well - A particle in three dimensional infinitely deep potential well - One dimensional linear harmonic oscillator.

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 Co (1994).
2. Quantum Mechanics V.Devanathan, Narosa Publishing House (2006).

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SEMESTER – V **17UPH5E1**

MAJOR ELECTIVE PAPER 1: PRINCIPLES OF COMMUNICATION SYSTEMS

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

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 **12 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 - Ratio detector .

UNIT I I **12 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 **12 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 **12 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) - 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 **12 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 and Satellite construction*** – Different domestic satellites.

*** 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 (2008).

2. Electronics Communication Systems Sanjeeva Gupta, Khanna Publications, Salem (1992).

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SEMESTER – V **17UPH5E1**

MAJOR ELECTIVE PAPER 1: 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 (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 (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 (2004).

UPH32

SEMESTER - V **15UPH5S3**

SKILL BASED SUBJECT III – 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., 5th edition (2011)

Books for reference:

Let us C — Yashwant Kaneetka, BPB Publications New Delhi (2008)

UPH33

SEMESTER - VI **15UPH609**

CORE PAPER - 9 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

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:

Einstein's photoelectric equation - Experimental verification - Applications of photoelectric effect - Millikan's experiment – Determination of Planck's constant

UNIT V **12 hrs**

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

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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. SChand 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)
3. Basic solid state physics Dr. Arun Kumar, Roy chaudhuri , Sarat book house (2014)

UPH35

SEMESTER –VI **15UPH610**

CORE PAPER-10 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- DeMorgan's theorems– Simplifications of Boolean expressions – Karnaugh maps - constructions – Simplification of Boolean expressions using Karnaugh maps.

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, digital and analog — V.Vijayendaran, S.Vishwanathan Printers and Publishers Pvt.Ltd (reprint 2011).

UPH36

SEMESTER VI **15UPH611**

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 (2010).
2. Atomic and nuclear physics	Brijlal and Subramaniam, S,Chand &Co Ltd, New Delhi 5th Edition (2000)
3.Modern Physics	B.C.Theraja, S.Chand & Co., New Delhi(1985).

Books for reference:

1. Nuclear physics	D.C. Tayal , Himalaya Publishing House, Bombay (4th 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).

UPH38

SEMESTER – VI **17UPH6E2**

MAJOR ELECTIVE PAPER II - ENERGY SOURCES AND NANOSCIENCE

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

Objectives

To enable the learner to

i. Know about the Conventional Energy Sources and Renewable energy sources.

ii. To gain knowledge about Nano science and Nano technology.

UNIT I 12 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 12 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 12hrs

Other forms of energy sources

Energy from Biomass:

Biomass energy - photosynthesis - Biomass conversion technologies (wet processes , dry processes)

Wind Energy:

Principles of wind energy conversion – The nature of the wind – Power in the wind- Applications of wind Energy.

Geothermal energy & Ocean thermal energy:

Nature of Geothermal fields - Geothermal sources – An introduction to Energy from the Oceans

UNIT IV

Development of Nano materials **12 hrs**

Introduction - Solid materials and their strength – Perspective of length – Nanoscience and Nano technology - Quantum Structures – Quantum confinement – Top down and Bottom up approach – Synthesis of nanomaterials – Arc discharge method – Coprecipitation method

UNIT V

Overview of Nanomaterials **12 hrs**

Nanomaterials and Nanostructures in nature – Super hydrophobic surfaces - Fundamental approaches for cleaning – Self-cleaning and easy cleaning materials: Self-cleaning and easy cleaning glasses and tiles – Self-cleaning paints , textiles and other materials.

Books for study:

1. Renewable energy sources and emerging Technologies — D.P. Kothari, K.C. Singal & Rakesh Ranjan, Prentice Hall of India pvt. Ltd., New Delhi (2008).
2. Non ConventionalEnergy Sources, — G.D.Rai, Fifth Edition, Khanna Publishers, New Delhi, (12th reprint 2014).
3. Principles of Nanoscience and Nanotechnology — M.A.Shah & Tokeer Ahmed , Narosa Publishing house(2010)
4. Nanomaterials, Nanotechnologies and design: An introduction for Engineers and Architects — Micheal F. Ashby , Paulo J. Ferreira , Daniel L.Schodek , Elsevier Science (2009)

Book for Reference:

1. Renewable Energy sources and their Environmental impact	S.A. Abbasi and Nasema Abbasi PHI Learning Pvt. Ltd., New Delhi (2008).
2. Non-Conventional Energy Resources	D.S.Chauhan & S.K.Srivastava, New Age International Publishers (2004).
3. Nano Crystals : synthesis , properties and Applications	C.N.R.Rao , P.J.Thomas and G.U . Kulkarni , Springer (2007)

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SEMESTER – VI **17UPH6E2**

MAJOR ELECTIVE PAPER II : OBJECT ORIENTED PROGRAMMING IN C++

Total Hours of Teaching: 30 **Total Credits: 5**

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., (2008)

Books for reference:

1.Let us C++	Yashwant Kaneetka, BPB Publications New Delhi (2008)
2. C++: A beginners guide	H. Schildt , Mc Graw Hill edu. 3rd edition (2014)

UPH41

SEMESTER –VI **17UPH6E3**

MAJOR ELECTIVE PAPER III: 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 – Temperature compensation - D.C. Ammeters - **D.C. Voltmeters*** - Voltmeter sensitivity - Series and Shunt type ohm meter - Multimeter or Vom.

UNIT II 12 hrs

Alternating Current Indicating Instrument

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

UNIT III 12 hrs

Oscilloscopes

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

UNIT IV 12 hrs

Electronic Instruments

Electronic Multimeter - considerations in choosing an analog voltmeter - Differential voltmeters - Digital voltmeters - Successive Approximation conversion – All electronic component measurements - Q meters - Vector impedance meter - Vector voltmeters*

UNIT V 12 hrs

Transducers

Classification of transducers - Selecting a transducer - Strain gauges – Gage factor - Displacement transducers (Capacitive, Inductive, Variable differential transformer) - Temperature measurements (Resistance thermometers, Thermocouples, Thermistor) - Photosensitive devices (Vacuum phototube, Gas filled phototube, Multiplier, Photoconductive cells*)

*** Self study**

Books for study:

1. Electronic Instrumentation	H.S.Kalsi, 2nd edition Tata Mc GrawHill Co. (2010)
2. Electronic Instrumentation and Measurement Techniques	A.D. Helfrick and W.D.Cooper (2nd Indian edition - P.H.I (1994).

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).

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SEMESTER –VI **17UPH6E3**

MAJOR ELECTIVE PAPER III : 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 Torguess - 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.

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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 Photo receptors _ Photo – Chemistry of receptor cells – Intensity sensitivity – Spectral Sensitivity – Resolving Power of Eye – Diffraction – Polarization and Vision – Optical rotation – Bire fringence and dichroism - **Retain and Photoreceptors*** - Photoreceptors and Fiber optics - Resolving Power of Eye - Polarization and Vision

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*** Self Study**

Books for study:

1. Elementary Biophysics an Introduction — P.K.Srivastava, Narosa Publishing House, New Delhi, 2nd Ed (2011)

Books for reference:

1. Biophysics — Vasantha pattabhi and N.Gautham Narosa Publishing House (Reprint 2015)
2. Basic Biophysics — M.Daniel-Student Edition (2004), Jodhpur

UPH43

SEMESTER - VI **15UPH6S4**

SKILL BASED SUBJECT IV: INTRODUCTION TO MICROPROCESSOR

Total Hours of Teaching: 30 **Total Credits: 3**

Objectives

To study about the

(i) History, Origin and Development of Microprocessor
(ii) Architecture, instruction set and programming of 8085 microprocessors
(iii) Interfacing

UNIT I **9 hrs**

Introduction

Microprocessor – Origin – History and Development – difference between microprocessor and microcomputer – Uses of Microprocessor

UNIT II **9 hrs**

Architecture

Pin diagram of 8085 – Architecture – Data and address bus – Control signals and their generation

UNIT III **9 hrs**

Instruction Set and Programming

Instruction set – Data Transfer Group - Arithmetic Group – Logical Group – Control Group – Machine Control Group – Mnemonics – Op code – **Simple Programming: Addition, Subtraction, Multiplication, Division, Sorting arrays, Finding smallest & biggest number in an array, etc*.**

UNIT IV **9 hrs**

Interfacing

Need for interfacing – Basic interfacing concepts – Interfacing output displays, Interfacing input devices, memory, memory mapped i/o and i/o mapped i/o schemes.

UNIT V **9 hrs**

Stack and Subroutine

Stack, Stack Pointer, Stack related Instruction – Push and Pop – Subroutine – Unconditional and Conditional Call and return instructions.

*** Self study**

Books for study:

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

Books for reference

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

UPH44

SEMESTER –VI **15UPH6CN**

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
26. Rydberg's Constant – Scale and Telescope
27. Study of various types of electronic components and Study of basic electronic instruments (Multimeter – Analog and digital , AFO, CRO, function generator, etc)

SEMESTER –VI **17UPH6CO**

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. Transistor Characteristics - CE configuration
4. RC-Coupled Amplifier –Single Stage
5. Feed back Amplifier
6. Hartley Oscillator
7. Monostable multivibrator using Transistor
8. Bistable 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
14. Analog to Digital convertor
15. Digital to Analog convertor.
16. Op-Amp LM741 as adder, subtractor and scalar.
17. Op-Amp LM741 as inverting and non inverting amplifier

SECTION – C
MICROPROCESSOR

18. 8085-ALP for 8 Bit addition, Subtraction
19. 8085-ALP for 8 Bit Multiplication and Division
20. 8085-ALP to sort the array in descending order and ascending order
21. 8085-ALP for finding the biggest element in the array and sum the element in the array
22. 8085-ALP for one's compliment, masking off most significant 4 bits and setting bits .
23. 8085-ALP to count the number of zeros, +ve, -ve number and square of a number
24. ALP- Matrix addition.
25. 8085-ALP for ASCII to decimal conversion, BCD to Hex conversion, Hex to Decimal conversion and Hex to binary form

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SEMESTER–VI **15UPH6CP**

CORE PRACTICAL-V : PROGRAMMING in C

Total Hours of Teaching: 60 **Total Credits: 2**

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 illustrate the addition of objects
12. Develop a C program to calculate the value of m^n
13. Develop a C program to calculate an electricity bill
14. Develop a C program to illustrate String handling functions
15. Develop a C program to check whether a given number is odd and even
16. Develop a C program to Calculate the sum of natural numbers
17. Develop a C program to write a multiplication table
18. Develop a C program to convert days to month
19. Develop a C program to conversion of distance
20. Develop a C program to conversion of temperature
21. Develop a C program to find the length of a string using arrays
22. Develop a C program to find the greatest among 10 numbers using arrays
23. Develop a C program to write vowels using switch case statement
24. Develop a C program to calculate the age using nested if else statement

UPH47

ALLIED PHYSICS PAPER FOR B.SC., MATHEMATICS / CHEMISTRY 15UPH3A1

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) .

UPH49

ALLIED PHYSICS PAPER FOR B.SC., MATHEMATICS / CHEMISTRY 15UPH4A2

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).

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SEMESTER I & II / III & IV

ALLIED PHYSICS PRACTICAL **15UPH4AL**

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 – Newton's cooling.
8. Sonometer - AC frequency.
9. Thermal conductivity – Lee's disc.
10. Spectrometer – Refractive index of material of the prism– Solid prism.
11. Spectrometer – Grating – Wavelength determination – Minimum deviation 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 PN - 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.
22. Determination of frequency – Melde's method
23. Measurement of Terminal velocity for different liquids by Stokes method
24. Spectrometer – Refractive index of Liquid– Liquid prism.
25. Determination of surface tension and interfacial surface tension of a liquid by drop weight method.