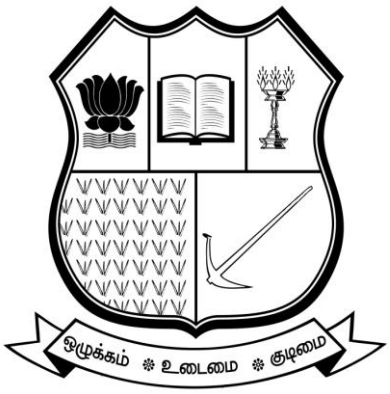
LOGANATHA NARYANASAMY GOVERNMENT COLLEGE (AUTONOMOUS)

PONNERI- 601 204



PG & RESEARCH DEPARTMENT OF PHYSICS

B.Sc. PHYSICS SYLLABUS

Version 4.0

2020-21 batch onwards

LOGANATHA NARAYANASAMY GOVERNMENT COLLEGE (AUTONOMOUS)

PONNERI- 601 204

PG & RESEARCH DEPARTMENT OF PHYSICS

BOARD OF STUDIES- (2020 - 2021)

MINUTES

The board of studies on curriculum was held on **16.03.2020.** The proposed revised syllabi were presented before the board.

This presentation contains the following enclosures along with the proposed syllabi.

1. Brief write up of relevant modifications carried out in the syllabi.
2. Subject code for the papers have been revised
3. List of papers in the syllabi for choice based credit system (UG) – Annexure-I
4. Question paper pattern – Annexure II
5. Scheme of Examination and Internal evaluation pattern-Annexure III

LOGANATHA NARAYANASAMY GOVERNMENT COLLEGE (AUTONOMOUS) PONNERI-601 204

PG & RESEARCH DEPARTMENT OF PHYSICS

BOARD OF STUDIES - (2020 - 2021)

Meeting on curriculum: 16.03.2020

EXTERNAL MEMBERS OF THE BOARD

1. **Dr. Hemamalini Rajagopal,** University Nominee & Subject Expert
   Associate Professor,
   PG & Research Department of Physics,
   Queen Mary's College,
   Chennai - 600 005.

2. **Dr. P. Murugakoothan,** Subject Expert
   Principal,
   C.Kandaswami Naidu College for Men,
   Anna Nagar,Chennai-600102.

3. **Dr. J. Merline Shyla** Subject Expert
   Dean of Sciences & Director-LIFE,
   PG & Research Department of Physics,
   Loyola College (Autonomous),
   Chennai-600 034.

4. **Er. C. Renganathan,** Industrial Representative
   Director,
   Chennai Metco Pvt Ltd.,
   SP-100A Ambattur Industrial Estate,
   Chennai- 600 058.

5. **S. Asraf Ali** Alumni
   Alumni - Department of Physics,
   L. N. Govt. College, Ponneri - 601 204.

6. **Dr. R. Samuel Selvaraj,** Chair person
   Associate Professor & Head,
   PG & Research Department of Physics,
   L. N. Govt. College(Autonomous), Ponneri - 601 204.

Internal members (All staff members of the department)

7. Dr. A. Kandasamy

8. Dr. K Senthil Kumar

9. Dr. S. Devashankar

10. Dr. L. Mariappan

CHOICE BASED CREDIT SYSTEM

(Effective from the academic year 2011-2014)

1. ELIGIBILITY FOR ADMISSION

Candidates for admission to the first year of the degree of Bachelor of Science courses shall be required to have passed the Higher Secondary Examinations conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereof by the syndicate of University of Madras. Provided that candidates for admission into the specific main subject of study shall be possess such other qualifying conditions as may be prescribed by the University.

2. ELIGIBILITY FOR THE AWARD OF DEGREE

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed course of study in a college affiliated to the University for a period of not less than three academic years, passed the examination of all the six semesters prescribed earning 140 credits (in Parts, I,II,III,IV & V) and fulfilled such conditions as have been prescribed there for.

3. DURATION OF THE COURSE

Three years Courses:

a) Each academic year shall be divided into two semesters. The first academic year shall comprise the first and second semesters. The second academic year will have the third and fourth semesters, the third academic year will have the 5^{th} and 6^{th} semesters respectively.

b) The odd semesters shall consist of the period from June to November of each year and the even semesters from December to April of each year. There shall be not less than 90 working days of each semester.

4. COURSE OF STUDY:

The main subject of study for Bachelor Degree courses shall consist of the following

PART – I TAMIL/OTHER LANGUAGES

PART – II ENGLISH

PART – III CORE SUBJECTS

ALLIED SUBJECTS

PROJECTS/ELECTIVES WITH THREE COURSES

PART – IV

1. (a) Those who have not studied Tamil upto XII std. and taken a Non-Tamil Language under Part – I shall take Tamil comprising of two course (Level will be at 6th standard)

(b) Those who have studied Tamil upto XII std and taken a Non-Tamil Language under Part – I shall take Advanced Tamil comprising of two courses.

(c) Others who do not come under a + b can choose non – major elective comprising of two courses.

2. SKILL BASED SUBJECTS (ELECTIVE) – (SOFT SKILLS)

3. ENVIRONMENTAL STUDIES

4. VALUE EDUCATION

PART – V EXTENSION ACTIVITIES

5. EXTENSION ACTIVITIES:

A candidate shall be awarded a maximum of 1 credit for compulsory extension service.

All the students shall have to enrol for NSS/NCC/NSO (sports & Games) Rotract/ Youth Red Cross or any other service organisations in the college and shall have to put in compulsory minimum attendance of 40 hours which shall be duly certified by the Principal of the college on or before 31st March in a year. If a student lacks 40 hours of attendance in the first year, he/she shall have to compensate the same during the subsequent years.

Students those who complete the minimum attendance of 40 hours in One year will get half a credit and those who complete the attendance of 80 hours or more in two years will get one credit.

Literacy and population Education field work shall be compulsory component in the above extension service activities.

6. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTERS:

(i) Candidates shall register their names for the First semester examination after the admission in the UG courses.

(ii) Candidates shall be permitted to proceed from the First Semester up to the Final Semester irrespective of their failure in any of the Semester Examination subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subject) Semester subjects.

(iii) Candidates shall be eligible to proceed to the subsequent semester, only if they earn sufficient attendance as prescribed by the Board of Studies from time to time.

Provided in case of candidate earning less than 50% of attendance in any one of the semester due to any extraordinary circumstance such as medical grounds, such candidates who shall produce Medical Certificate issued by the Authorized Medical Attendant (AMA), duly certified by the Principal of the College, shall be permitted to proceed to the next semester and to complete the course of study. Such candidate shall have to repeat the missed semester by rejoining after completion of final semester of the course, after paying the fee for the break of study as prescribed by the Board of Studies (University) from time to time.

7. PASSING MINIMUM:

a) There shall be no Passing Minimum for Internal.
b) For External Examination, Passing Minimum shall be of 40 % (Forty Percentage) of the maximum marks prescribed for the paper.
c) In the aggregate (External + Internal) the passing minimum shall be of 40% for each Paper/ Practical/ Project and Viva-voce.
d) He / She shall be declared to have passed the whole examination, if he/she passes in all the papers and practicals wherever prescribed as per the scheme of examinations by earning 140 credits in Parts-I, II, III, IV and V. He/she shall also fulfil the extension activities prescribed earning a minimum of 1 credit to qualify for the degree
Grading shall be based on overall marks obtained (internal + external).

8. CLASSIFICATION OF SUCCESSFUL CANDIDATES:

PART – I TAMIL / OTHER LANGUAGES: Successful Candidates passing the examinations for the language and securing the marks (1) 60 % and above aggregate marks (Internal + External) in the whole examination shall be declared to have passed the examination in the First Class. (2) candidates who have secured 50 % and above but below 60 % aggregate marks (Internal + External) in the whole examination shall be declared to have passed the examination in the Second Class respectively. All the other successful candidates shall be declared to have passed the examination in the Third class.

PART –II ENGLISH: Successful Candidates passing the examinations for ENGLISH and securing the marks (1) 60 % and above aggregate marks (Internal + External) in the whole examination shall be declared to have passed the examination in the First Class. (2) candidates who have secured 50 % and above but below 60 % aggregate marks (Internal +

External) in the whole examination shall be declared to have passed the examination in the Second Class respectively. All the other successful candidates shall be declared to have passed the examination in the Third class.

PART – III consisting of CORE SUBJECTS, ALLIED SUBJECTS, PROJECT/ELECTIVE WITH THREE COURSES.

Successful Candidates passing the examinations for the language and securing the marks (1) 60 % and above aggregate marks (Internal + External) in the whole examination shall be declared to have passed the examination in the First Class. (2) candidates who have secured 50 % and above but below 60 % aggregate marks (Internal + External) in the whole examination shall be declared to have passed the examination in the Second Class respectively. All the other successful candidates shall be declared to have passed the examination in the Third class.

PART – IV consisting of sub items 1(a), (b) & (c), 2, 3 and 4 as furnished in the Regulations 4.

PART – V EXTENSION ACTIVITIES: Successful candidates earning of 1 credit shall not be taken into consideration for Classification / Ranking/Distinction.

9. RANKING:

Candidates who pass all the examinations prescribed for the course in the first appearance itself alone are eligible for Ranking / Distinction.

Provided in the case of candidates who pass all the examinations prescribed for the course with a break in the First Appearance due to the reasons as furnished in the Regulations under "Requirements for Proceeding to subsequent Semester" are only eligible for Classification.

10. TRASITORY PROVISION:

Candidates who have undergone the course of study prior to the academic year 2008-2009 will be permitted to appear for the examination under those regulations for a period of TWO years i.e. up to and inclusive of April/May 2012 examinations. Thereafter, they will be permitted to appear for the examination only under the Regulations then in force.

11. GRADING SYSTEM:

The term grading system indicates a Seven (7) Point Scale of evaluation of the performances of students in terms of marks obtained in the Internal and External Examination, grade points and letter grade.

SEVEN POINT SCALE (As per UGC notification 1998)

GRADE	GRADE POINT	PERCENTAGE EQUIVALENT
`O' = Outstanding	5.50 – 6.00	75 – 100
`A' = Very Good	4.50 – 5.49	65 – 74
`B' = Good	3.50 – 4.49	55 – 64
`C' = Average	3.00 – 3.49	50 – 54
`D' = Below Average	1.50 – 2.99	35 – 49
`E' = Poor	0.50 – 1.49	25 – 34
`F' = Fail	0.00 – 0.49	0 - 24

ANNEXURE-I

List of papers (Syllabus) for the Choice Based Credit System (CBCS-UG)

Sl. No	Sem	Course component	Subjects	Hrs	Cre	Exam Hrs	Max Marks		
							Ext.	Int.	Total
1	I	Part – I	Language Paper – I - 20UAF1A	4	3	3	75	25	100
2		Part – II	English Paper – I - 20UBF1A	4	3	3	75	25	100
3		Part - III	Core – 1 Mechanics & Properties of Matter- 20UHM1A	5	5	3	75	25	100
			Core – 3 Major Practicals - I - 20UHM21	*	*	Examination will be held in the II Semester			
5			Allied Paper – I Theory - 20UGA1A	5	5	3	75	25	100
8			1 Non Major Elective I - 20UHN1A	2	2	3	75	25	100
9			1 Skill Based Elective Paper I – 20USS1A	2	2	3	75	25	100
TOTAL CREDITS					**20**				**600**
10		Part – I	Language Paper – II - 20UAF2A	4	3	3	75	25	100
11		Part – II	English Paper – II - 20UBF2A	4	3	3	75	25	100

12	II	Part - III	Core – 2 Thermal Physics and Acoustics - 20UHM2A	5	5	3	75	25	100
13			Core – 3 Major Practicals - I - 20UHM21	3	3	3	60	40	100
14			Allied Paper – II Theory - 20UGA2A	5	5	3	75	25	100
16			2 Non Major Elective II - 20UHN2A	2	2	3	75	25	100
17			2 Skill Based Elective Paper II - 20USS2A	2	2	3	75	25	100
TOTAL CREDITS					**23**				**700**
18	III	Part – I	Language Paper – III - 20UAF3A	6	3	3	75	25	100
19		Part – II	English Paper – III - 20UBF3A	6	3	3	75	25	100
20		Part – III	Core – 4 Mathematical Methods and Classical Mechanics - 20UHM3A	5	5	3	75	25	100
			Core – 5 Major Practicals - I - 20UHM21	*	*	Examination will be held in the IV Semester			
21			Allied Paper – III Theory - 20UEA3A	5	5	3	75	25	100
23		Part – IV	3 Soft Skill Paper III - 20USS3A	2	2	3	60	40	100
TOTAL CREDITS					**18**				**500**
26	IV	Part – I	Language Paper – IV - 20UAF4A	6	3	3	75	25	100
27		Part – II	English Paper – IV - 20UBF4A	6	3	3	75	25	100
28		Part - III	Core – 6 Optics and Quantum Optics - 20UHM4A	5	5	3	75	25	100
29			Core – 5 Major Practicals - II - 20UHM41	3	3	3	60	40	100
30			Allied Paper – IV Theory - 20UEA4A	5	5	3	75	25	100
31			Allied Practicals - 20UEA41	3	2	3	60	40	100
32		Part – IV	1 Computing Skill Paper I - 20USS4A	2	2	3	60	40	100
33			1 Environmental Studies - 20UEN4J	2	2	3	75	25	100
IV SEMESTER TOTAL CREDITS					**25**				**800**
34		Part – III	Core – 7 Electricity & Magnetism - 20UHM5A	5	5	3	75	25	100
35			Core – 8 Atomic Physics - 20UHM5B	5	5	3	75	25	100
36			Core – 9 Solid State Physics - 20UHM5C	5	5	3	75	25	100
37			Core – 10 Analog Electronics - 20UHM5D	5	5	3	75	25	100

38	**V**		Core – 11 Practicals – III	2		**	Practicals will be at the end of VI semester		
39			Core – 12 Practicals – IV	2		**			
40			Core – 13 Practicals – V	2		**			
41			Elective – I μP Fundamentals -20UHE5A	5	4	3	75	25	100
42		Part – IV	Value Education - 20UEV5J	2	2	3	75	25	100
V SEMESTER TOTAL CREDITS					**26**				**600**
43		Part – III	Core – 14 Relativity and Quantum Mechanics - 20UHM6A	6	5	3	75	25	100
44			Core – 15 Nuclear and Particle Physics - 20UHM6B	6	5	3	75	25	100
45			Core – 11 Practicals – III - 20UHM61	2	3	3	60	40	100
46			Core – 12 Practicals - IV - 20UHM62	2	3	3	60	40	100
47	**VI**		Core – 13 Practicals – V - 20UHM63	2	3	3	60	40	100
48			Elective – II Digital and Communication Electronics - 20UHE6A	6	4	3	75	25	100
49			Elective – III Numerical Methods - 20UHE6B	6	4	3	75	25	100
50		Part – IV	Extension Activities - 20UXT6A		1				
VI SEMESTER TOTAL CREDITS					**28**				**700**

ALLIED PAPERS:

MATHEMATICS: PAPER I & PAPER II

CHEMISTRY: PAPER I & PAPER II

Subject	Papers	Credits	Total Credits	Marks	Total Marks
CORE	10	5	50	10 *100	1000
CORE-PRACTICALS	5	3	15	5 * 100	500
ELECTIVES	3	5 & 4	14	3 * 100	300
NON MAJOR ELECTIVE	2	2	4	2 * 100	200
ALLIED THEORY	4	5 & 4	18	4 * 100	400
ALLIED PRACTICALS	1	2	2	1 * 100	100
SKILL BASED ELECTIVE & SOFT SKILL	4	2	8	4 * 100	400

ENVIRONMENTAL STUDIES & VALUE EDUCATION	1 1	2 2	2 2	1 * 100 1 * 100	100 100
LANGUAGE	4	3	12	4 * 100	400
ENGLISH	4	3	12	4 * 100	400
EXTENSION ACTIVITIES			1		
		Total CREDITS	140	Total	3900

- Number of units in the syllabus of core papers 05
- Number of units in the syllabus of elective papers 05
- Maximum marks per paper 100
- Total marks 4000

ANNEXURE II

QUESTION PAPER PATTERN

B. Sc. PHYSICS

CREDIT CUM SEMESTER PATTERN
(EFFECTIVE FROM THE ACADEMIC YEAR 2011 - 2012)

QUESTION PAPER PATTERN:

PART –A (30 words): Answer 10 out of 12 Questions 10 x 2 = 20 marks

PART –B (200 words): Answer 5 out of 7 Questions 5 x 5 = 25 marks

PART –C (500 words): Answer 3 out of 5 Questions 3 x 10 = 30 marks

TOTAL =75 Marks

QUESTION PAPER FOR PRACTICALS: The external examiner will prepare a question paper on the spot with the help of the question bank supplied by the Controller's office.

ANNEXURE – III

SCHEME OF EXAMINATION

COURSE COMPONENT	Inst Hours	Credits	Exam Hours	Max. marks		
				Ext. Marks	Int. Marks	Total
PART – I LANGUAGE				75	25	100
PART – II ENGLISH				75	25	100
PART – III CORE SUBJECTS				75	25	100
ALLIED SUBJECTS				75	25	100
PART – IV 1.(a). Those who have not studied Tamil up to XII std. And taken a Non-Tamil Language under Part-I shall take Tamil comprising of two course (level will be at 6th Standard) (b) Those who have studied Tamil up to XII std. And not taken a Non-Tamil Language under Part-I shall take Advanced Tamil comprising of two courses. (c) Others who do not come under a and b can choose non-major elective comprising of two courses.						

EXAMINATIONS

There shall be four semester examinations: first semester examinations at the middle of the first academic year and the second semester examination at the end of the first academic year. Similarly, the third and fourth semester examinations shall be held at the middle and the end of the second academic year, respectively.

The scheme of examinations for different semesters shall be as follows:

The following procedure is followed for Internal Marks:

Theory Papers:	Internal Marks	25 marks
Best 2 tests out of 3	10 marks	
Attendance	5 marks	
Seminar	5 marks	
Assignment	5 marks	
Total	25 marks	

Break-up Details for Attendance

Below 60%	- No marks
60% to 75%	- 3 marks
76% to 90%	- 4 marks
91% to 100%	- 5 marks

Practical:	Internal Marks	40 marks
Attendance		05 marks
Practical Best Test 2 out of 3		30 marks
Record		05 marks

MINUTES OF THE BOARD OF STUDIES MEETING HELD ON 16.03.2020

- The meeting of the board of studies on curriculum was held on 16.03.2020. The proposed modified syllabi were presented before the board
- The subject codes for the Major, Electives, Practicals and Non major elective papers are revised.
- In the third year swapping of papers between semesters are essential for the benefit of students as practical syllabus is concerned and are modified accordingly.
- Uniformity has been maintained for Science Subjects in the
    1. Allotment of Marks
    2. Theory and Practical hours
    3. Question Paper Pattern

4. Internal Evaluation Pattern

The details are given in the Annexure.

The above details are presented before the Board for recommendations,

Suggestions and final approval after the suggestions are carried out.

All the above suggestions were carried out. The papers were shuffled and the revised list of papers are enclosed. The copy of the syllabi after carrying out the suggestions was submitted for approval.

The meeting came to an end after the above discussion.

The following members were present.

S.NO	NAME OF THE STAFF	SIGNATURE
1	**Dr. Hemamalini Rajagopal,** University Nominee & Subject Expert	
2	**Dr. P. Murugakoothan,** Subject Expert	
3	**Dr. J. Merline Shyla** Subject Expert	
4	**Er. C. Renganathan,** Industry Representative	

5	**S. Asraf Ali** Alumni	
6	**Dr. R. Samuel Selvaraj,** Chair person	
7	**Dr. A. Kandasamy** Internal Member	
8	**Dr. K. Senthilkumar** Internal Member	
9	**Dr. S. Devashankar** Internal Member	
10	**Dr. L. Mariappan** Internal Member	

B. Sc. Degree Course in Physics

SEMESTER- I

Core Paper 1 - Mechanics and Properties of Matter – (20UHM1A)
(Students admitted from 2020-21 Onwards)

Objective: To develop knowledge and understanding over mechanics and properties of matter, for technological advances.

Unit 1: Frames of reference

Conservative and Non conservative forces- Frames of Reference- Galilean invariance, moving coordinate system, linearly accelerated frame and concept of pseudo force- centre of mass and laboratory coordinates-Reduced mass

Unit 2: Motion of a particle in one dimension

Motion of a particle in one dimension- time dependent force- velocity dependent damping force- conservative force – concept of potential-, simple harmonic oscillator- Conservation of linear momentum and energy- Motion of falling bodies in a variable Gravitational field.

Unit 3: Motion of a system of particle

Motion of a system of particles, Centre of mass (derivation in some simple cases – linear distribution of mass, laminar bodies, hemisphere etc.), Variable mass problem (rockets and conveyor belts): The two body problem; Collision – elastic and inelastic collisions

Unit 4: Hydrodynamics

Streamline and turbulent flows- coefficient of Viscosity – Determination of viscosity by Poiseuille's method- Equation of continuity of flow-Venturi meter- energy possessed by a liquid, Bernoulli's theorem and its applications-Stokes law- Surface tension, surface energy, excess pressure in a liquid drop and bubble, factors affecting surface tension, applications- Reynolds number and its importance.

.**Unit 5: Elasticity**

Hooke's Law - Stress – Strain - Elastic constants – Expression for Poisson's ratio in terms of elastic constants – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion – torsional pendulum – rigidity modulus and moment of inertia-Young's modulus of a beam by uniform and non uniform bending

Course Outcome:

1. Understanding the basic of motion of any body, moment of inertia and apply to solve numerical problems.
2. Recollect the basic concepts of gravitation and employ the concepts for various geometrical shapes.
3. Recalling the basics ideas about conservation of momentum and apply for moment of inertia .
4. Apply knowledge of the elasticity, to explain natural physical processes and related mathematical derivation for modulus of elasticity.
5. Use an understanding of elementary mathematics along with physical principles of surface tension and viscosity to effectively solve problems encountered in everyday life.
6. Explore the physical principles of hydrostatics and effectively apply for Low pressure physics related studies.

Books for Study

1. Mechanics – Part I and II by Narayanamoorthy, National Publishing Company
2. Mechanics by D.S. Mathur, S. Chand & Co., 2nd Edition (2001)
3. Mechanics by P. Duraipandian, Laxmi Duraipandian, Muthamizh Jayapragasam, S. Chand & Co., New Delhi (1988)
4. Properties of Matter by Brijlal and N. Subramaniam., S. Chand & Co., New Delhi (1994).
5. Properties of Matter by R. Murugesan, S. Chand & Co., New Delhi (2001).

Books for Reference

1. General properties of matter by C.J. Smith, Orient Longmen Publisher (1960).
2. Fundamentals of Physics by D. Halliday, R. Resnick and J. Walker, 6th Edn, Wiley HY (2001).
3. Mechanics and General Properties of Matter by PK Chakrabarthy – Books and Allied (P) Ltd., (2001).
4. Fundamental and General Properties of Matter by H.R. Gulati, S. Chand & Co., New Delhi (1982)

SEMESTER – II

Core Paper 2 Thermal Physics and Acoustics – (20UHM2A)
(Students admitted from 2020-21 Onwards)

Objective: To enable the student to inquire the importance of temperature, and the thermodynamic concepts in real life and to understand the concepts of Sound.

Unit 1: Thermometry and Calorimetry

Platinum resistance thermometer – Calender and Griffith's bridge – Thermistor – Dulong and petit's law - Specific heat capacity of solids — Specific heat capacity of liquid – method of mixtures – Barton's correction – specific heat capacity of gases – C_p and C_v by Regnault's and Callendar and Barne's methods- Introduction to superconductivity and Liquid helium

Unit 2: Laws of Thermodynamics

Thermodynamic equilibrium – thermodynamics scale of temperature- Zeroth law of thermodynamics – First law of thermodynamics – Reversible and irreversible process –Quasi static process - Second law of thermodynamics – heat engine – Carnot's engine – Carnot's theorem – Internal combustion engines – petrol and diesel engines —Enthalpy – entropy and available energy – entropy diagram for Carnot's cycle – III law of thermodynamics.

Unit 3: Conduction and Radiation

Thermal conductivity – rectilinear flow of heat – thermal conductivity of a good conductor – Forbe's method – thermal conductivity of a bad conductor – Lee's disc method – radiation – black body radiation- Wien's law – Stefan's law – Newton's law of cooling from Stefan's law – solar constant – Pyroheliometer.

Unit 4: Fundamentals of oscillations

Simple harmonic oscillator – Physical characteristics of Simple harmonic motion- Combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures free, damped, forced oscillations and resonance - Damped harmonic oscillator

Unit 5: Sonics and Ultrasonics

Intensity and loudness of sound – intensity level – decibel – noise pollution- Acoustics of buildings – reverberation –absorption coefficient – Sabine's formula (No derivation)-Ultrasonics – production – Piezoelectric crystal method – Magneto- striction method- applications – Application of Ultrasonics in industry and medicine.

Course Outcome:

1. Apply thermodynamic concepts in using thermal devices.
2. Identify appropriate thermal equipment for various applications.
3. Learning the impact of Sound and the medical applications of Ultrasonics.

Books for study:

1. Heat and Thermodynamics by D.S. Mathur, 3rd Edition, Sulthan Chand & sons, New Delhi (1978)
2. Heat and Thermodynamics by Brijlal and N. Subramanyam, S. Chand & Co, New Delhi (2000)
3. Heat by Narayanamoorthy and KrishnaRao, Triveni Publishers, Madras (1969)
4. Text book of Sound by V.R. Khanna and R.S. Bedi, 1st Edition, Kedarnath Publish & Co. Meerut (1998).
5. Waves and Oscillations by Brijlal and N. Subramanyam, Vikas Publishing house, New Delhi (2001).
6. Text book of Sound by Ghosh, S. Chand & Co., New Delhi (1996).

Books for Reference

1. Heat and Thermodynamics by Zemansky, McGraw – Hill Book Co., Inc., New York.
2. Fundamentals of Physics by Resnick and Halliday and Walker, 6th Edition, John Wiley and Sons, Asia Pvt., Ltd., Singapore.
3. Fundamentals of Thermodynamics by Carroll M.Leonard, Prentice Hall of India (P) Ltd., New Delhi (1965).
4. Heat and Thermodynamics by J.B. Rajam and C.L. Arora, 8th Edition, S. Chand & Co., Ltd., New Delhi (1976).
5. Principles of Thermodynamics by Jin Sheng Hsieh, 1st edition, McGraw Hill Kogakusha Ltd., Tokyo (1975).
6. Thermodynamics by Warren Giedt, 1st Edition, Van Nostrand Reinhold Company, New York (1971).

SEMESTER – III

Core Paper 4 - Mathematical Methods and Classical Mechanics - (20UHM3A)
(Students admitted from 2020-21 onwards)

Objective: To acquire knowledge over Classical Mechanics and to familiarize the students with applications of Mathematics in Physics.

Unit 1: Matrices

Characteristic equation of a matrix - Eigenvalues and Eigenvectors - Hermition and Unitary matrices - Properties of their eigenvalues and eigenvectors - Diagonalisation of matrices.

Unit 2: Elementary Complex Analysis

Functions of a Complex variable - Continuity and differentiability - single and multivalued functions - Analytic function - Cauchy - Riemann conditions (necessity and sufficiency). Cauchy - Riemann Conditions in the Polar (r,θ) coordinates.

Unit 3: Vector Analysis

Scalar and Vector fields - Gradient, Divergence and Curl - Equations of motion in the vector notation - equations of motion (components) in cartesian coordinates and spherical polar coordinates - equation of motion in the polar coordinates.

Unit 4: Classical Mechanics

Constraints and Degrees of Freedom - Generalised coordinates – Generalised displacement – velocity – acceleration – Momentum – Force – Potential Energy – D'Alembert's principle - Lagrangian equation from D'Alembert's principle- applications of Lagrange's equation of motion to Linear harmonic oscillator, simple pendulum and Compound pendulum.

Unit 5: Statistical Physics

Phase space - Maxwell - Boltzmann, Bose - Einstein and Fermi - Dirac statistics -Fermi energy distribution function- Derivation of Planck's radiation formula from Bose - Einstein statistics.

Course Outcome:

1. For better understanding the concepts of classical mechanics.
2. solve a linear system of equations using an appropriate numerical method

Books for Study

1. Mathematical Physics by Sathya Prakash, Sultan Chand and Sons, New Delhi (1996)
2. Classical Mechanics by J.C. Upadhyaya, Himalaya Publishing House, Mumbai(2003).

Books for Reference

1. Mathematical Physics by B.D. Gupta, Vikas Publishing House Pvt. Ltd., New Delhi(1996).
2. Advanced Engineering Mathematics by E.Kreyszig, Eighth Edition, Wiley Publishers, New York(1989).

SEMESTER- IV

Core Paper 5 - Optics and Quantum Optics – (20UHM4A)
(Students admitted from 2020-21 onwards)

Objective: To realize the fundamental properties of light propagation and applications

Unit 1: Geometrical Optics

Huygen's and Ramsden's eyepiece – small angled prism – Determination of refractive index of the material of the small angled prism - Spherical aberration in lenses - methods of minimizing spherical aberration - Coma – Astigmatism – Distortion - Chromatic aberration in lenses - Dispersion produced by a thin prism - Achromatic prisms - Combination of prisms to produce - Dispersion without deviation - Deviation without dispersion.

Unit 2: Interference

Coherent source – Phase difference and path difference - Fresnel's biprism – fringes with white light using a biprism – determination of the thickness of a thin sheet of transparent material – air wedge – testing the planeness of a surface – theory of newton's rings – determination of refractive index of liquid using Newton's rings – Newton's rings formed by two curved surface - Michelson's interferometer – determination of wavelength and fine structure difference

Unit 3: Diffraction

Diffraction – introduction – Fresnel assumption – rectilinear propagation of light – zone plates and its action – Fresnel's and Fraunhoffer diffraction – Fraunhoffer diffraction at a double slit – Plane diffraction grating – Theory – Width of principal maxima – Normal incidence – oblique incidence (qualitative analysis only) – determination of wavelength using grating – Dispersive power.

Unit 4: Polarisation

Polarisation of transverse wave- plane of polarisation – plane of vibration – principal section of crystal – principal plane - Huygen's explanation of double refraction in uniaxial crystals - Quarter wave plate and half wave plate - production and detection of plane, elliptically and circularly polarized light – Dichroism – Optical activity - specific rotation - determination using Laurent's half shade polarimeter.

Unit 5: Quantum Optics

LASER: Basic principles – Spontaneous and stimulated emission – population inversion- pumping – threshold condition – Type of Lasers – CO_2 laser, Nd-YAG lasers, semiconductor lasers- applications of lasers in industry and medicine. Hologram Recording – Theory of construction and reconstruction of images – Characteristics of Hologram- applications.

Course Outcome:

1. Develop an intuitive understanding of basic concepts of light as ray, wave and particle/photon.
2. Understand the nature of light, its propagation and interaction with matter.
3. Understand the principles of lasers and their applications.
4. Handle and align optical elements and set-up basic optical experiments.
5. Operates optical devices and equipment.

Books for Study:

1. A Text book of Optics by Subrahmanyam N., Brij Lal and M.N. Avadhanulu, S. Chand & Co., New Delhi (2006).
2. Optics by Khanna D.R. & Gulati H.R., S.Chand & Co., New Delhi (1979).

Books for Reference :

1. Fundamentals of Physics, by D.Halliday, R. Resnick and J. Walker, Wiley, 6th Edition, New York (2001).
2. Optics by Ajay Ghatak, Tata McGraw-Hill publishing Co. Ltd., New Delhi(1998).
3. Fundamentals of optics by A Jenkins & White, Mc Graw Hill Kogakusha Ltd.

SEMESTER – V
Core Paper 6 - Electricity and Electromagnetism- (20UHM5A)
(Students admitted from 2020-21 onwards)

Objective: To enable the student to get a strong foundation in electricity and magnetism and its relations.

Unit 1: Electrostatics

Gauss law and its application –gauss divergence theorem-Electrostatic potential – electric potential as line integral of electric field – relation between electric potential and electric field – Poisson's and Laplace's equations – capacitance – capacitance of a spherical and cylindrical capacitors – energy of a charged capacitor – energy density – loss of energy due to sharing of charges.

Unit 2: Thermal and chemical effect of electric current

Thermoelectricity-seebeck effect laws of thermo e.m.f.-measurement of thermo e.m.f. using potentiometer –Peltier effect-demonstration – Thomson effect – demonstration-thermodynamics of thermo couple-Faradays laws of electrolysis –electrical conductivity of an electrolyte-specific conductivity-Arrhenius theory of electrolytic dissociation –mobility of ions – Secondary cells- Gibbs-Helmholtz equation for a reversible cell.

Unit 3: Magnetic Effect of Electric Current

Biot and Savart's law - magnetic field intensity due to a solenoid carrying current - effect of iron core in a solenoid - Helmholtz galvanometer - moving coil ballistic galvanometer - theory - damping correction - determination of the absolute capacity of a condenser using B.G.

Unit 4: Electromagnetic Induction and transient currents

Faraday's laws of electromagnetic induction-lenz's law - inductor and inductance - determination of self inductance of a coil using Anderson method - Growth and decay of current in a circuit containing resistance and inductance - growth and decay of charge in a circuit containing resistance and capacitor - growth and decay of charge in an LCR circuit - condition for the discharge to be oscillatory – Frequency of oscillation

Unit 5: Maxwell's Equations and Electromagnetic waves

Introduction -Maxwell's equation - displacement current –Poynting vector-electromagnetic waves in free space - Hertz Experiment to produce and detection of E.M. waves.

Course Outcome:

1. Solve numerical problems related to electricity and magnetism.
2. Identify and sort out the problems in the electrical devices.

Books for Study :

1. Electricity & Magnetism by M.Narayanamurthy & N.Nagarathnam, NPC pub., Revised edition.
2. Electricity and Magnetism by Brijlal and Subrahmanyam; S.Chand & Co., New Delhi, (2000).
3. Electricity & Magnetism by D.Chattopadhyay and P.C. Rakshit, Books and Allied (P) Ltd.(2001).
4. Fundamentals of electricity and magnetism by B.D. Dugal and C.L. Chhabra, Shobanlal Nagin, S. Chand & Co., 5th edition, New Delhi(2005).
5. Electricity and Magnetism by R. Murugeshan, S.Chand & Co., New Delhi, (2008).

Books for Reference:

1. Electricity & Magnetism by K.K.Tewari, S.Chand & Co., New Delhi, .(2002).
2. Introduction to Electrodynamics by D.J.Griffiths, Printice Hall of India Pvt. Ltd., 3rd Edition, New Delhi (2003).
3. Fundamentals of Physics, D.Halliday, R.Resnick and J.walker, Wiley, 6th Edition, New York (2001).

Web Site:

http://www2.warwick.ac.uk/fac/sci/physics/teach/ module-home/px207.

www.core.org.cn/ocw web/physics/8-311 spring 2004/lecture notes.

SEMESTER - V
Core Paper 7 - Atomic Physics - (20UHM5B)
(Students admitted from 2020-21 onwards)

Objective: To impart knowledge about atoms and its spectra

Unit 1: Band Theory of Solids

The free electron theory of metals - expressions for electrical conductivity thermal conductivity Weidman-Franz's law-Hall effect-magneto resistance determination of electronic charge - Millikan's oil drop method - electron microscope Band theory of solids-classification of solids on the basis of band theory.

Unit 2: Positive Rays

Discovery-properties analysis - Thomson's parabola method - Aston's mass spectrograph Dunnington's method of determining e/m. Bainbridge mass spectrograph – Dempster's mass spectrograph.

Unit 3: Atomic Structure

Bohr atom model -Bohr's interpretation of the Hydrogen spectrum correction for nuclear motion-evidence in favour of Bohr's theory-Ritz combination principle-correspondence principle-Sommerfield's relativistic atom model-drawbacks- the vector atom model - Quantum numbers associated with the vector atom model-the Pauli's exclusion principle - periodic classification of elements

Unit 4: Fine Structure of Spectral Lines

Coupling schemes – L-S Coupling -j-j Coupling- Hund rules- magnetic dipole moment due to orbital motion of the electron due to spin of the electron - Stern and Gerlach experiment-spin-orbit coupling-optical spectrum-spectral terms-spectral notation- selection rules- intensity rules interval rule- fine structure of sodium D line-hyperfine structure Normal Zeeman elect theory and experiment quantum mechanical explanation Larmor's theorem-Anomalous Zeeman effect Paschen -- Back efFect-Stark effect

Unit 5: X-Rays and Photo Electric Effect

Bragg's X-ray spectrometer the powder crystal method - Rotating crystal method X-ray spectra- continuous spectra- characteristic spectra Moseley's law importance width of spectral lines - Doppler broadening - collision broadening - X-ray Detectors - scintillation detector - semiconductor detectors Compton effect - theory and experimental verification.

Photoelectric Effect: Einstein's photoelectric equation - Photoelectric cells - Photo emissive cells - Photovoltaic cells - Photoconductive cells - Applications of photoelectric cells.

Course Outcome:

1. Understand the concepts of quantum number.
2. Understand the origin of line widths and shapes in atomic spectra.
3. Understand the quantum numbers, including their physical significance, and quantum mechanical states of the hydrogen atom.
4. Know about the origins of fine structure in atomic spectra.
5. Understand the exchange degeneracy and how this affects the excited states of helium.
6. Understand the Periodic table from the viewpoint of the electronic structure.
7. Understand the derivation of and be able to apply the selection rules for the interaction of electric dipole radiation and atoms.

Books for Study

1. Modern Physics by R. Murugeshan, KiruthigaSivaprasath, S. Chand & Co, New Delhi(2008)
2. Modern Physics by D.L. Sehgal, K.L.Chope and N.K.Sehgal. Sultan Chand & Sons Publication, 7th Edition, New Delhi 1991)
3. Atomic Physics by J.B. Rajam, S. Chand & Co., 20thEdition, New Delhi (2004)
4. Atomic and Nuclear Physics by N. Subrahmanyam and Brijal. S. Chand & Co Sth Edition. New Delhi 2000)

Book for Reference:

1. Modern Physics by J.H.Hamilton and Yang. McGraw-Hill Publication, (1996)
2. Concepts of Modern Physics by A. Beiser Tata MCgraw-Hill, New Delhi (1997)
3. Fundamentals of Physics by D.Halliday Resnick and New Yo2011
4. Modern Physics by Kenneth S. Krane, John Willey & Sons, Canada (1998).

SEMESTER – V
Core Paper 8 - Solid State Physics – (20UHM5C)
(Students admitted from 2020-2021 onwards)

Objective: To enable the student to get knowledge about various crystal structures and other materials.

Unit 1: Crystal Structure

Crystal lattice – primitive and unit cell – seven classes of crystal – Bravais Lattice – Miller Indices – Structure of crystals and crystal symmetry – Number of atoms, Atomic radius, coordination number and packing fraction-simple cubic, body centred cubic structure, face centred cubic structure, hexagonal close packed structure.

Unit 2: X- ray Diffraction and Defects in Solids

X ray diffraction – Bragg's law in X ray diffraction – Experimental methods – Laue Method, powder crystal method and rotating crystal method.

Defects in solids - Point defects - Frenkel and schottky defects - Line defects - Edge dislocation and screw dislocation - Surface defects - Grain boundary - Effects of Crystal imperfections.

Unit 3: Bonding in Solids and Superconductivity

Inter atomic forces - Different types of chemical bonds - Ionic bond - Cohesive energy of ionic Crystals and Madelung constant - Covalent bond - Metallic bond - Van der Waal's bond - Hydrogen bond.

Superconductivity - General properties - Type I and II Superconductors - Meissner effect - BCS theory – Josephson Effect – applications of super conductors –SQUID devices

Unit 4: Dielectric Properties

Dielectric materials - Polarization, susceptibility and dielectric constant - Local field or internal field - Clausius - Mossotti relation - Sources of polarizability - Electronic polarizability - ionic polarizability - Orientational polarizability –Space charge, Langevin-Debye theory Frequency and temperature effects on polarization - Dielectric breakdown – Properties of different types of insulating materials.

Unit 5: Magnetic Properties

Different types of magnetic materials - classical theory of diamagnetism (Langevin theory) - Langevin theory of paramagnetism - Weiss theory of paramagnetism - Heisenberg interpretation on internal field and quantum theory of ferromagnetism - Antiferromagnetism - Hard and soft magnetic materials-Application of magnetic storage devices – Elementary Lattice dynamics:Einstein and Debye theory- Ferro, Piezo, Pyro Lattice effects.

Course Outcome:

1. Identify the crystal and its application.
2. Analyse the behaviour of magnetic materials.
3. Understand ceramic and polymer materials in day to day life.

Books for Study

1. Materials Science by M. Arumugam, Anuradha Agencies Publishers.(2002)
2. Solid State Physics by R L Singhal, Kedarnath Ram Nath & Co., Meerut (2003)
3. Introduction to Solid State Physics by Kittel, Willey Eastern Ltd(2003)
4. Materials Science and Engineering by V. Raghavan, Prentice Hall of India Private Limited, New Delhi (2004).

Books for Reference

1. Solid State Physics by S.O.Pillai, New Age International (P) Ltd.,(2002).
2. Solid State Physics by A. J.Dekker, Macmillan India(1985).
3. Solid State Physics by HC Gupta, Vikas Publishing House Pvt. Ltd., New Delhi (2001).

Web Site

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

http://www.physics.brocku.ca/courses/4p7d.

SEMESTER – V
Core Paper 10 - Analog Electronics – (20UHM5D)
(Students admitted from 2020-21 onwards)

Objective: To expose the students on the basics and working of semiconductor devices.

Unit 1: Semiconductor

Band gap - forbidden energy gap - valence and conduction bands, Intrinsic semiconductor- Carrier concentration - Law of mass action, Extrinsic semiconductors – N and P type semiconductors – elemental and compound semiconductors - energy band diagram and Fermi level – formation of PN junction- V-I Characteristics of PN junction- barrier voltage across the junction- Basics of LED.

Unit 2: Transistor Amplifier

Transistor – different modes of operations – CB mode & CE mode - Two port representation of a transistor - h parameter - AC equivalent circuit using h parameters - analysis of an amplifier using h parameters common emitter only - expression for current gain, voltage gain, input impedance, output impedance and power gain - RC coupled amplifier - frequency response - analysis of low, mid and high frequency regions - classification of amplifiers - class A power amplifier – push pull, class B power amplifier - emitter follower.

Unit 3: Feedback oscillators

Feedback in amplifiers - effect of negative feedback - concept of feedback – Barkhuesen condition - oscillators –Hartley, Colpitt's, phase shift and Wien's bridge oscillators - expression for frequency of oscillation and condition for oscillation in each case.

Unit 4: Wave shaping circuits and multivibrators

Integrating and differentiating circuits - RC time constant - Multivibrators - astable, monostable and bistable multivibrator using transistors - Schmitt trigger.

Unit 5: Special semiconductor devices and applications

Clipping and clamping circuits - biased clipper -Field effect transistor (FET) – JFET-MOSFET-characteristics - FET amplifier - Unijunction transistor (UJT) - characteristics - saw tooth generator - relaxation oscillator - frequency of oscillation - SCR characteristics - SCR as a switch.

Course Outcome:

1. Identify the devices and select them based on the needed application
2. Design and fabricate new devices
3. Apply their gained knowledge in modifying the needful changes in the communication system

Books for Study

1. Hand Book of Electronics by Gupta and Kumar - Pragati Prakashan – Meerut(2002).
2. Principles of Electronics by V.K. Mehta, Rohit Mehta S. Chand & Co.(2006).
3. Electronics by M. Arul Thalapathi, Comptek Publishers(2005).
4. Elements of Electronics by M.K.Bagde and Singh S.P., S. Chand & Co., New Delhi(1990).
5. Applied Electronics by A. Subramanyam – National Publishing Co.(1997)

Books for Reference

1. Electronic Devices by Mittal.G.K., G.K. Publishers Pvt. Ltd., (1993).
2. Basic Electronics by B.L. Theraja, S. Chand & Co., (2008).
3. Solid State Electronics by Ambrose and Vincent Devaraj, Meera Publication.
4. Applied Electronics by R.S. Sedha, S. Chand & Co.(1990).

Web Site

http://www.dear.haward.edu/courses/es154.
http://www.phys.ualberta.ca/~gingrich/phys395/notes/phy 395.html.

SEMESTER – VI
Core Paper 11 - Relativity and Quantum Mechanics- (20UHM6A)
(Students admitted from 2020-21 onwards)

Objective:

To acquire working knowledge of the quantum mechanics postulates of the physical and universal systems

Unit 1: Relativity

Frames of reference - Galilean transformation - Michelson-Morley experiment - Postulates of special theory of relativity Lorentz transformation length Contraction time dilation - Relativity of simultaneity - addition of velocities - variation of mass with velocity- Mass energy relation - Elementary ideas of general relativity.

Unit 2: Wave Nature of Matter

Phase and group velocity wave packet- expression of De Broglie's wave length- Davisson and Germer's experiment G.P.Thomson's experiment Heisenberg's uncertainty principle and its consequences.

Unit 3: Schrodinger Equation

Inadequacy of classical mechanics - Basic postulates of quantum mechanics - Schrodinger equation Properties of wave function - Probability interpretation of wave function - linear operator - self adjoint operator - expectation value – eigen values and eigen functions.

Unit 4: Angular Momentum in Quantum Mechanics

Orbital angular momentum operators and their commutation relations - separation of three dimensional Schrodinger equation into radial and angular parts Elementary ideas of spin angular momentum of an electron Pauli matrices.

Unit 5: Solutions of Schrodinger Equation

Free particle solution - Particle in a box - Potential well of finite depth (one dimension) - linear harmonic oscillator - rigid rotator and hydrogen atom.

Course Outcome:

1. Understand basic ideas of quantum mechanics
2. Understand the idea of wave function
3. Understand the uncertainty relations
4. Solve Schrodinger equation for simple potentials, identify and relate the eigen value problems for energy, momentum, angular momentum and central potentials explain the idea of spin

Books for Study

1. A Text book of Quantum mechanics by P.M.Mathews and S.Venkatesan, Tata McGraw-Hill, New Delhi(2005).
2. Quantum Mechanics by VK Thankappan, New Age International (P) Lid. Publishers, New Delhi(2003).
3. Quantum mechanics by K.K. Chopra and G.C. Agrawal, Krishna PrakashanMedia(P) Ltd., Meerut First Edition(1998).
4. Modern Physics by R. Murugeshan and KiruthigaSivaprasath, S. Chand &Co.(2008).

Books for Reference

1. Mechanics and Relativity by Brijlal Subramanyam, S.Chand& Co., New Delhi, (1990).

2. Concepts of modern physics by A. Beiser. Tata McGraw-Hill, "edition, New Delhi(1997).

3. Introduction to quantum mechanics by Pauling and Wilson, McGraw-Hill.

4. Quantum mechanics by A. Ghatak and Loganathan, Macmillan India Pvt. Ltd.

SEMESTER VI

Core Paper 12- Nuclear and Particle Physics (20UHM6B)
(Students admitted from 2020-21 onwards)

Objective: To learn the theories of nuclear structures, particles and various nuclear applications.

Unit 1: General Properties of Nuclei

Nuclear size, charge, mass-determination of nuclear radius-mirror nucleus method-mass defect and binding energy-packing fraction - nuclear spin - magnetic dipole moment - electric quadrupole moment-nuclear models-liquid drop model-Weizacker semi empirical mass formula-shell model and magic numbers-collective model-nuclear forces-meson theory of nuclear force (qualitative)-proton electron theory.

Unit 2: Radioactivity

Natural radioactivity-law of disintegration-measurement of radiative widths -half life and mean life period-units of radioactivity-transient and secular equilibrium-radiocarbon dating-age of earth - alpha rays-characteristics-Geiger Nuttal law –collision and radiationloss-Gamow's theory of α-decay (qualitative study)-beta rays-characteristics-beta ray spectra-neutrino hypothesis-violation of parity conservation-experimental verification with Co^{60}-gamma rays and internal conversion-nuclear isomerism.

Unit 3: Nuclear Reactions

Type of reactions-Conservation laws-nuclear reaction Kinematics-Q-value-threshold energy –formation of transuranic elements - artificial radioactivity-radioisotopes and its uses-classification of neutrons-neutron detectors -nuclear fission-chain reaction - critical mass and size-nuclear reactor-breeder reactor - transuranic elements-nuclear fusion-thermonuclear reactions-sources of stellar energy.

Unit 4: Radiation Detectors and Particle Accelerators

Ionisation chamber-G.M. Counter-quenching and resolving time-scintillation counter-bubble chamber-material modification-uses –radiation hazards and safety -photo multiplier tube – thermo luminescence -thermo luminescence dosimetry (TLD) - Linear accelerator-cyclotron-synchrocyclotron, betatron.

Unit 5: Elementary Particles and Cosmic rays

Classification of elementary particles-relation between particle and anti particle-fundamental interaction-elementary particle quantum numbers - isospin and strangeness - conservation laws and symmetry-basic ideas about quark-quark model-origin of cosmic ray-effects-cosmic ray shower-production of positron.

Course Outcome:

1. Gain knowledge of core concepts in physics to more advanced topics in nuclear and particle physics.
2. Knowledge of basic properties of nuclei and nuclear structure. Improves the capacity of elementary problem solving skills in nuclear and particle physics.
3. Understand nuclear techniques of materials analysis and their application within industry and the medical applications of nuclear phenomena.
4. Understand basic properties of nucleus and nuclear models to study the nuclear structure properties.
5. Classify elementary particles and nuclear states in terms of their quantum numbers
6. Understand the effects of radioactivity in biological matter.
7. Enumerate the various types of nuclear reactors and distinguish them.

Books for study

1. Atomic and Nuclear Physics by N. Subrahmanyam and Brijlal, S Chand & Co., New Delhi(1996).
2. Nuclear Physics by Tayal D.C., Himalaya Publishing House, Mumbai(2006).
3. Nuclear Physics by R.C.Sharma, K.Nath & Co., Meerut (2000)
4. Nuclear Physics by Irving Kaplan, Narosa Publishing house, New Delhi.
5. Nuclear physics –Dr.S.N.Ghoshal-S.Chand.
6.

Books for Reference

1. Nuclear Physics by R.R.Roy and B.P.Nigam, New Age International (P) Ltd., New Delhi(1997).
2. Fundamentals of Elementary Particle Physics by Longo, Mc Graw-Hill.
3. Nuclei and Particles by Serge., W.A. Benjamin, USA
4. Elements of Nuclear Physics by ML Pandya and RPS Yadav, Kedarnath Ram Nath, Meerut.

Web Site

http://ocw.mit.edu/ocw Web/physics/8-701 spring 2004/Lectine notes.

http://faraday.physics.utoronto.ca/GeneralInterest/D.Bailey/Sub Atomic/Lectures/Lect.html.

Elective Subjects

SEMESTER – V
Elective Paper 1 - Microprocessor Fundamentals (20UHE5A)
(Students admitted from 2020-21 onwards)

Objective: To familiarize the students with basic architecture, programming and interfacing of 8085 microprocessor.

Unit 1: Architecture

Architecture of 8085 – registers, flags, ALU, address and data bus, demultiplexing address/data bus – control and status signals – control bus, Programmer's model of 8085 – Pin out diagram – Functions of different pins.

Unit 2: Programming Techniques

Instruction set of 8085 – data transfer, arithmetic, logic, branching and machine control group of instructions – addressing modes – register indirect, direct, immediate and implied addressing modes.

Assembly language & machine language – programming techniques: addition, subtraction, multiplication, division, ascending, descending order, largest and smallest (single byte)

Unit 3: Interfacing memory to 8085

Memory interfacing –Basic concepts in Memory Interfacing, Interfacing circuit - Interfacing
2kx8 ROM and RAM, Timing diagram of 8085 (MOV R_d, R_s – MVI R_d, data(8)) .

Unit 4: Interfacing I/O Ports to 8085

Design of an input and output port - Interfacing input port and output port to 8085 – Programmable peripheral interface 8255 – flashing LEDs.

Unit 5: Interrupts

Interrupts in 8085 - hardware and software interrupts – RIM, SIM instructions – priorities – simple polled and interrupt controlled data transfer –Microprocessor Applications – LED interface, seven segment display interface, temperature controller, direct memory access.

Course Outcome:

1. Understand 8085 Microprocessors and its Architecture
2. Write 8085 Assembly level programs
3. Interface 8085 with 8255 and write interfacing programs

Books of Study

1. Microprocessor Architecture programming and application with 8085 / 8080A by R.S. Gaonkar, Wiley Eastern Ltd.(1992).
2. Fundamental of microprocessor 8085 by V. Vijayendran, S. Viswanathan Publishers, Chennai (2003).
3. Fundamentals of Microprocessors and microcomputers by B.Ram - Dhanpat RAI publication.

Books for Reference

1. Introduction to microprocessor by Aditya Mathur - Tata Mc.Graw Hill Publishing Company Ltd. (1987).
2. Microprocessor and digital system by Dougles V. Hall - 2nd Edition - McGraw Hill Company (1983).

Web Site

http://www.engj.ulst.ac.uk/sidk/eeellla/lecture-series//microprocessor.

SEMESTER – VI
Elective Paper 2 - Digital and Communication Electronics (20UHE6A)
(Students admitted from 2020-21 onwards)

Objective: To understand the role of analog and digital electronics in the fabrication of modern devices.

Unit 1: Fundamental Digital Electronics

Number systems – binary – hexadecimal – Binary addition – subtraction (1's and 2's compliment method) – multiplication - division - BCD – Gray Code – Excess 3- ASCII Code- Conversion – simplification of logic circuits - using (i) Boolean algebra, (ii) Karnaugh map – Demorgan's theorems - NAND and NOR as universal building blocks.

Unit 2: Combinational and Sequential Logic Circuits

Half adder, full adder, half subtractor and full subtractor – 4 bit adder/subtractor – R-S flip flop, D flip flop and JK flip flops - JK Master Slave flip flop – Shift registers – serial and parallel registers - synchronous and ripple counters - BCD counter – Up/Down counters - ring counter.

Unit 3: Modulation, Demodulation and Satellite Communication

Amplitude modulation - Frequency modulation. Phase Modulation and Pulse Width Modulation - Detectors of AM, FM, PM and PWM, PLL - Noise in Communication Systems Communication Satellite Systems - Telemetry - Tracking and Command System - Satellite Links - Commonly Used frequency in Satellite Communication - Multiple access - Error Detection.

Unit 4: OP-AMP Basic Applications

Characteristics parameters – differential gain – CMRR – Slew rate – bandwidth - applications – inverter, non-inverter, integrator, differentiator, summing, difference and averaging amplifier - solving simultaneous equations - comparator - square wave generator - Wien's bridge oscillator - Schmitt trigger

Unit 5: Fibre Optic Communication

Basic Fibre Optic System - Advantages of Fibre Optic System - Propagation of light through fibre- Numerical aperture - Acceptance angle - Losses and distortion in optical fibres - Basic fibre Optical communication and links - Special applications.

Course Outcome:

1. Employ the codes and number systems converting circuits and Compare different types of logic families which are the basic unit of different types of logic gates.
2. Apply the design and analysis procedures to design the assigned combinational logic circuits of decoders and encoders.
3. Analyse the sequential logic circuits by understanding flip flops, counters and register circuits.
4. Have a broad coverage in the field that is relevant to design Linear circuits using Op-amps.
5. Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.

Books for Study

1. Digital Principles and Application by Malvino Leach, Tata McGraw Hill, 4th Edition (1992).
2. Digital Fundamentals by Thomas L. Floyd, Universal Book Stall, New Delhi (1998).
3. Introduction to Integrated Electronics by V.Vijayendran, S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai(2005).
4. OP - AMPs and Linear Integrated Circuits by Ramakant A. Gayakwad, Prentice Hall of India(1994).
4. Electronic Communication System by George Kennedy, Tata McGraw Hill.
5. Optical Fibres and Fibre Optic Communication Systems by Dr.Subir Kumar Sarkar, S.Chand

Books for Reference

1. Digital Electronics by Practice Using Integrated Circuits - R.P.Jain - Tata McGraw Hill(1996).
2. Linear Integrated Circuits by D. Roy Choudhury and Shail Jain - New Age International (P) Ltd.(2003).
3. Electronics - Analog and Digital by I.J. Nagrath - Prentice - Hall of India, New Delhi(1999).
4. Integrated Electronics by J.Millman and C.Halkias, Tata McGraw Hill, New Delhi (2001)

Web Site

http://www.dear.harward.edu/courses/es154.

http://www.phys.ualberta.ca/~gingrich/phys395/notes/phys395.html.

SEMESTER – VI
Elective Paper 3 - Numerical Methods (20UHE6B)
(Students admitted from 2020-2021 -Onwards)

Objective: In order to learn various approximation methods to find solution to problems have no exact solutions.

Unit 1: Errors and Root of Equations

What is Numerical analysis-numbers and their accuracy-errors-measurement of errors-round off error-truncation error-absolute error-relative error-percentage error inherent error-accumulated error-general error formula-convergence Roots of equations-Iteration method-Maclaurin's series method-Newton-Raphson method-Von-Moise Formula-Bisection method.

Unit 2: Matrix and Linear Equations

Introduction- pivotal condensation method- system of linear equations- Gauss Elimination method-Gauss Seidel Iteration method-Gauss Jordan elimination method Matrix Inversion method.

Unit 3: Interpolation and Approximation

Linear Interpolation -Quadratic Interpolation - Lagrange's Interpolation - Richardson's Extrapolation-Aitken's iterated Interpolation

Unit 4: Numerical Differentiation and Integration

Numerical Differentiation – approximation of derivatives using interpolation polynomials – Taylor series method.

Numerical Integration - trapezoidal rule-simpson's 1/3 and 3/8 rules

Unit 5: Differential Equations

Introduction-Euler's method (Adams Bashforth first order method)- backward Euler method- Taylor's series method - Runge-kutta method - predictor corrector methods.

Course Outcome:

1. Improves the ability to seek and solve numerical solutions to various equations.
2. Provides systematic approach of solving problems.

Books for Study

1. Numerical methods - M.K.Venkatraman, National Publishing Company, (1990).
2. Numerical methods by V. Rajaraman, Prentice - Hall India Pvt. Ltd., (2003).
3. Numerical methods by P. Kandasamy, K. Thilagavathy and K. Gunavathy, S. Chand & Co. (2002).
4. Numerical Methods – A. Singaravelu, Meenakshi Agency, Chennai (2001).

Books for References

1. Numerical methods for Scientific and Engineering computation by Jain Iyenger and Jain, New Age International (P) Ltd.,(2004).
2. Introductory methods of Numerical Analysis by S.S.Sastry, Prentice Hall of India Pvt. Ltd., New Delhi (2003).

Core Paper–3 Major Practical Practical – I – (20UHM21)
(Students admitted from 2020-21 onwards)
(Practical Examination at the end of Second semester)

1. Young's modulus – Non Uniform bending – Pin & microscope
2. Young's modulus – Uniform bending – Optic lever
3. Rigidity modulus – Torsional pendulum (without identical masses)
4. Rigidity modulus and moment of inertia – Torsional pendulum (with identical masses)
5. Surface tension and interfacial surface tension – drop weight method
6. Coefficient of Viscosity of liquid – Graduated burette (radius of capillary tube by Mercury pellet method)
7. Sonometer – Verification of laws and frequency of tuning fork
8. Sonometer – Relative density of a solid and liquid
9. Specific heat capacity of a liquid – Newton's law of cooling
10. Specific heat capacity of liquid – Method of mixtures (Half – time correction)
11. Focal length of a long focus convex lens
12. Focal length of a concave lens
13. Spectrometer – refractive index of a liquid
14. P.O. Box – Temperature coefficient of resistance
15. Potentiometer – Internal resistance of a cell

Note : Use of Digital balance is permitted

Core Paper – 6 Major Practical Practical – II – (20UHM41)
(Students admitted from 2020-21 onwards)
(Practical Examination at the end of Fourth semester)

1. Young's modulus - cantilever - depression - (Static method)-(Scale and telescope)
2. Young's modulus - cantilever oscillations - (Dynamic method)
3. Rigidity modulus - Static torsion
4. Compound pendulum - g and k
5. Sonometer - A.C. Frequency - Steel and Brass wires
6. Melde's string - frequency, Relative Density of a solid and liquid
7. Thermal conductivity of a bad conductor - Lee's disc method
8. Spectrometer - μ of a glass prism - i-d Curve
9. Spectrometer - Grating N and λ - normal incidence method
10. Spectrometer - Grating N and λ - minimum deviation method
11. Air wedge - Thickness of a wire
12. m and B_H - deflection magnetometer Tan C position and vibration magnetometer
13. Carey Foster bridge - Temperature coefficient of resistance of a coil
14. Potentiometer - Calibration of low range voltmeter
15. Potentiometer - Ammeter calibration.
16. Figure of merit of galvanometer (Miror Galvanometer Or Table Galvanometer)
17. C.R.O. Study of wave forms - Lissajou's figures - frequency determination
18. Study of resistors, Choke, capacitors and transformer
19. Construction of battery eliminator - various voltages - with filter circuit and IC voltage regulator.
20. Two transistor Radio receiver

Core Paper – 13 Major Practical Practical - III - (20UHM61)
(Students admitted from 2020-21 onwards)
(Practical Examination at the end of Sixth Semester)

(Any Fifteen Experiments)

1. Young's modulus - Uniform Bending - Koenig's method.
2. Young's modulus – Non uniform Bending - Koenig's method.
3. Kundt's Tube – Determination of velocity of sound in solid - Young's modulus.
4. Spectrometer - Small angled prism - Normal incidence and emergence refractive index of the material of prism.
5. Spectrometer - (i - i') curve - refractive index.
6. Spectrometer - Cauchy's constant.
7. Newton's rings - R_1, R_2 and μ of convex lens.
8. Newton's rings - Refractive index of liquid.
9. Field along axis of a circular coil - Deflection magnetometer - B_H and M.
10. Field along axis of a circular coil - vibration magnetic needle - B_H.
11. Potentiometer - Calibration of high range voltmeter
12. Potentiometer - Temp coeff. of resistance of a thermistor
13. Potentiometer - Emf of a thermo couple.
14. Thermo emf - Mirror galvanometer (or) spot galvanometer
15. B.G - Figure of merit (quantity of charge)
16. B.G - Comparison of EMFs
17. B.G - Comparison of capacitances
18. B.G - Internal resistance of a cell
19. B.G - High Resistance by leakage
20. B.G - Absolute capacitance
21. B.G - Comparison of mutual inductances
22. B.G - Absolute mutual inductance
23. B.G - Self inductance - Anderson method.

Core Paper – 14 Major Practical Practical –IV – (20UHM62)
(Students admitted from 2020-21 onwards)

(Practical Examination at the end of Sixth Semester)

(Any Fifteen Experiments)

1. A.C. Circuit – LCR – Series resonance
2. A.C. Circuit – LCR – Parallel resonance
3. Bridge rectifier - Zener regulated power supply - 9V characteristics.
4. R-C Coupled Single Stage Amplifier - Frequency Response
5. R-C Coupled Amplifier with feedback.
6. Emitter follower
7. Transistor - Phase Shift Oscillator
8. Transistor - Wien's Bridge Oscillator
9. FET characteristics
10. FET amplifier
11. UJT characteristics
12. UJT Relaxation oscillator
13. SCR characteristics
14. Transistor - Astable multivibrator
15. Transistor - Bistable multivibrator
16. NAND / NOR as universal gates.
17. Half Adder – Full adder – Ex-OR(7486)
18. Half Subtractor – Full subtractor – Ex - OR(7486)
19. 4 bit ripple counter using 7473/7476
20. 4 bit shift register using 7473/7476
21. Decade counter using 7490 (4 bit BCD)
22. 4 bit binary adder.

Core Paper – 15 Major Practical Practical –V – (20UHM63)
(Students admitted from 2020-21 onwards)

(Practical Examination at the end of Sixth Semester)

(Any Fifteen Experiments)

1. Microprocessor – 8085 – 8 bit Addition
2. Microprocessor – 8085 – 8 bit Subtraction
3. Microprocessor – 8085 – 8 bit Multiplication
4. Microprocessor – 8085 – 8 bit Division
5. Microprocessor – 8085 – Addition of N Number of single byte numbers
6. Microprocessor – 8085 – Sorting of given set of numbers in ascending order
7. Microprocessor – 8085 – Sorting of given set of numbers in descending order
8. Microprocessor – 8085 – Finding the largest no. in a given set of numbers.
9. Microprocessor– 8085–Finding the smallest no. in a given set of numbers.
10. Op amp 741 - Inverting , Non - Inverting amplifier, unity follower.
11. Op amp 741 - Summing and difference amplifier
12. Op amp 741 – Differentiator, integrator
13. OP amp 741 – Solving simultaneous equations
14. Op amp 741 – Wein's Bridge oscillator
15. Op amp 741 - Phase Shift oscillator
16. 555 - Timer - Schmitt Trigger
17. 555 - Timer - Astable operation
18. 555 - Timer - Monostable
19. D/A Converter – 4 bit, binary weighted resistor method

Books for the Study & Reference :

1. Practical Physics by D. Chattopadhyay, P.C. Rakshit, New Central Book Agency (p) Ltd. Kolkata(2007).
2. Practical Physics and Electronics by C.C.Ouseph, U.J.Rao and Vijayendran, S.Viswanathan (Printers & Publishers) Pvt., Ltd (2007).
3. Practical Physics by C L Arora, S. Chand & Co., New Delhi (2008)

Allied Physics Paper 1 (20UHA1A/20UHA3A)
(Students admitted from 2020-21 onwards)

Objective: This paper is offered to the students of chemistry, mathematics and, computer science as allied. While learning in major subjects the study of physical properties will complement their studies.

Unit 1: Mechanics

a) Particle dynamics: Displacement, velocity and acceleration– distance-time graph – velocity- time graph – projectile motion– uniform circular motion – acceleration in circular motion –angular momentum – conservation of momentum – relative velocity.

b) Simple Harmonic Motion: Formula for acceleration, velocity and displacement – oscillation in spring mass system –potential and kinetic energy exchanges – springs in series and parallel simple pendulum – energy method for period – oscillations of liquid in U – tube.

Unit 2: Properties of matter

Elasticity: Elastic constants – bending of beam – Young's modulus by non- uniform bending – energy stored in a stretched wire – determination of rigidity modulus by torsional pendulum – static torsion(scale and telescope).

Viscosity: Coefficient of viscosity – Poissuelle's formula – comparison of viscosities - burette method – variation of viscosity of a liquid with temperature.

Surface tension: Surface tension - Molecular theory of surface tension – excess of pressure inside a drop and bubble – Jaeger's method.

Unit 3: Thermal physics

(a) Work done by gas – Internal energy of gas – First law of thermodynamics – Internal energy changes, Ideal gas – Work done from p-v graphs – Isothermal changes – Kinetic theory in isothermal change – External work done in expansion – Adiabatic change – Heat and mechanical work in engines –Refrigerators and the second law – Real gases -critical temperature.

(b) Laws of thermodynamics

Boyle's law – Charles's law – Expansivity of gas– Absolute temperature – Ideal gas equation, the gas constant –Avogadro's Hypothesis: Molar gas constant – General gas equation- Application – Mixture of gases: Dalton's law –Unsaturated and saturated vapors – Gas laws for vapours. Entropy- change of entropy in reversible and irreversible process

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Unit 4: Crystal Physics

a) **Crystal structures:** Introduction – periodic array of atoms– crystal lattice – unit cell – basis – symmetry considerations –classification of crystals – Bravais lattices in three dimensions –crystal planes and Miller indices – simple crystal structures.

b) **Crystal diffraction:** Bragg's law – experimental X-ray diffraction methods: rotating crystal method – powder method.

Unit 5: Geometrical optics

Refraction – Refractive index by microscopy – air cell – refraction at grazing incidence and grazing emergence in prisms – combination of two small angled prisms to produce dispersion without deviation and deviation without dispersion – direct vision prism – constant deviation prism – defects of images – coma – distortion – spherical and chromatic aberration in lenses.

Course Outcome

1. Explain basic concepts in mechanics and properties of matter, thermal physics, crystal physics, optical properties etc.,
2. Analyze and solve elementary problems in the above mentioned fields.

Books for study

1. Allied Physics by R. Murugesan, S.Chand & Co, New Delhi(2008).
2. Waves and Oscillations by Brijlal and N. Subramanyam, Vikas Publishing house, New Delhi(2001).
3. Properties of Matter by Brij Lal and N.Subramaniam, S. Chand & Co., New Delhi(1994).
4. Heat and Thermodynamics by J.B.Rajam and C.L.Arora, S.Chand & Co., 8th edition, New Delhi(1976).
5. Optics and Spectroscopy by R. Murugesan, S.Chand & Co, New Delhi (2005).
6. D.S Mathur, Mechanics, S. Chand&Co.Ltd., New Delhi

Books for Reference

1. Fundamentals of Physics by Resnick Halliday and Walker, John Willey and Sons, Asia Pvt.Ltd., 6th edition, Singapore.
2. Text book of Sound by V.R.Khanna and R.S.Bedi, Kedharnaath Publish & Co, 1st edition, Meerut (1998).
3. Electricity and Magnetism by N.S. Khare and S.S. Srivastava, Atma Ram & Sons, 10th Edition, New Delhi (1983).
4. Optics by D.R. Khanna and H.R. Gulati, S. Chand & Co., New Delhi (1979).
5. R.P.Feyman et al,The Feyman Lecture on Physics Volume I & II Narosa and publishing House.

Allied Physics Paper 2 (20UHA2A/20UHA4A)
(Students admitted from 2020-21 onwards)

Objective: To induce a taste and scientific temper in some fields of physics

Unit 1: Atomic Physics

Atom model – vector atom model – electron, spin, quantum numbers – Pauli's exclusion principle – electronic configuration of elements and periodic classification of elements – various quantum numbers – magnetic dipole moment of electron due to orbital and spin motion – Bohr magneton – spatial quantisation – Stern and Gerlach experiment.

Unit 2: Nuclear Physics

Nuclear model – liquid drop model – magic numbers - shell model – nuclear energy – mass defect – binding energy. Radiation detectors – ionization chambers – GM Counter – Fission Controlled and Uncontrolled chain reaction – nuclear reactor – thermonuclear reactions – stellar energy.

Unit 3: Elements of relativity and quantum mechanics

Postulates of theory of relativity – Lorentz transformation equations – derivation – length contraction – time dilation – mass energy equivalence – uncertainty principle – postulates of wave mechanics – Schrodinger's equation – application to a particle in a box.

Unit 4: Electricity and Magnetism

Electrostatics: Electric field potential- potential due to point charge capacitance- calculation of capacitance of a spherical cylindrical, and parallel plate capacitance- energy of charged capacitor.

Electromagnetic Induction: Faradays law- lenz's law -self inductance-Growth and decay of current in an inductance and resistance circuits

Unit 5: Electronics

Basic Electronics: P-N junction diode,Zener diode – voltage regulator – LED – Transistor RC coupled amplifier – feedback principle – condition for oscillation – phase shift oscillator – Wein's bridge oscillator.

Digital Electronics : NAND and NOR gates – Universal building blocks – Boolean algebra – Demorgan's theorem – verification – elementary ideas of ICs – SSI , MSI, LSI and VLSI – Half adder, Full adder, Half Subtractor and Full subtractor.

Course Outcome

1. Explain basic concepts in geometrical, wave and quantum mechanics.
2. Explain basic concepts on electricity, electronics and digital electronics.
3. Explain basic concepts on atomic physics and nuclear physics and electricity magnetism.

Books for study

1. Allied Physics by R. Murugesan, S.Chand & Co, New Delhi(2008).
2. Allied Physics by K. Thangaraj and D. Jayaraman, Popular Book Depot, Chennai(2004).
3. V.K Mehta, Principles of electronics, S.Chand Publishers- 11th edition (2010)
4. A.B Gupta and DipakGhosh, Atomic and nuclear Physics- Books & allied (sp) Ltd.,
5. Modern Physics by R. Murugesan, S.Chand & Co, New Delhi (2005).
6. Applied Electronics by A. Subramaniyam, National Publishing Co., 2nd Edition, Chennai (2001).

Books for Reference

1. Fundamentals of Physics by Resnick Halliday and Walker, John Willey and Sons, Asia Pvt.Ltd., 6th Edition, Singapore.
2. Concepts of Modern Physics by A.Beiser, Tata McGraw Hill Publication,New Delhi(1997).
3. Digital Fundamentals by Thomas L.Floyd, Universal Book Stall – New Delhi (1998).

Alllied Physics Practicals (20UHA21/20UHA41)

(Practical Examination at the end of even semester)

(Students admitted from 2020-21 onwards)

1. Young's Modulus by Non-uniform bending using Pin and Microscope
2. Young's Modulus by Non-uniform bending using Optic lever – Scale and telescope
3. Rigidity modulus by Static torsion method
4. Rigidity modulus by torsional oscillations without mass
5. Surface tension and interfacial tension – Drop Weight method
6. Comparison of viscosities of two liquids – Burette method
7. Specific heat Capacity of a liquid – Half time correction
8. Sonometer – Determination of a.c frequency
9. Newton's rings - Radius of curvature
10. Air wedge – Thickness of a wire
11. Spectrometer – Grating – Wavelength of Mercury lines – Normal Incidence
12. Potentiometer – Voltmeter Calibration
13. P.O. Box – Specific resistance
14. B.G. – Figure of merit
15. Construction of AND, OR, NOT gates – using diodes and Transistor
16. Zener Diode – Characteristics
17. NAND gate as a universal gate.
18. NOR gate as a universal gate.
19. Compound pendulum – g and k
20. Half Adder
21. Half Subtractor
22. Melde's String – frequency of vibration.

Note : Use of Digital Balance Permitted

The following procedure is to be followed for internal marks(40 marks)
Attendance : 5 marks

Practical test – best 2 out of 3 : 30 marks

Record : 5 marks

Books for Study and Reference :

1. Practical Physics by M.N.Srinivasan S. Chand & Co.,

2. Practical Physics by M. Arul Thalapathy Comptek Publishers.

B.Sc. PHYSICS (NON MAJOR ELECTIVE)

Out of the following four elective papers two electives are to be chosen, one each for I & II semester

1. **Astrophysics**
2. **Everyday Physics**
3. **Basic Physics**
4. **Non-Conventional energy sources**

PART - IV

ENVIRONMENTAL STUDIES (20UEN4A)

Unit 1

a. Definition

b. Scope and importance

c. Need for public awareness

Unit 2

a. Natural resources

b. Ecosystems

Unit 3

a. Environmental pollution

Unit 4

a. Social issues and the environment

Unit 5

a. Human population and the environment

Reference Books

a. Environmental studies – S.N. Chary

b. A text book of Ecology and Environmental Science – M. Prasanthrajan

PART IV (C)

Non Major Elective Papers

1. ASTROPHYSICS
(Students admitted from 2020-21 onwards)

Objectives: To discover how the universe works, explore how it begin and evolved, and search for life on planets around other stars.

Unit 1: Astronomical instruments

Optical telescopes-refracting telescope-reflecting telescope- types of reflecting telescopes – detectors and image processing.

Unit 2: Solar system

The Sun- physical and orbital data-photosphere-chromosphere-corona-solar prominences – sunspot - solar flare- mass of the sun- solar constant- temperature of the sun-sources of solar energy-solar wind.

Unit 3: Members of the solar system

Mercury – Venus- Earth – Mars – Jupiter- Saturn- Uranus- Neptune- Pluto- Moon – Bode's law – asteroids- comets – meteors.

Unit 4: Stellar evolution

Birth and death of a star –brightness of a star – stellar distance- Chandrasekar limit-white dwarfs- Neutron stars – black holes- Supernovae.

Unit 5: Theories of the Universe and Galaxies

Origin of the Universe - the big bang theory- the steady state theory- the oscillating universe theory – Hubble's law. Galaxies – types of galaxies- Milky way

Course Outcome:

1. Explain basic concepts of laws of physics and chemistry
2. Explain the birth, life and death of stars, planets, galaxies, nebulae and other objects in the universe

Books for study

1. Astrophysics - a modern perspective by K.S.Krishnaswamy, New Age International (P) Ltd, New Delhi (2002).
2. An introduction to Astro physics by Baidyanath Basu, second printing, Prentice – Hall of India (P) Ltd, New Delhi (2001).
3. Vindaimigu paerandam(Tamil), by Dr.P.Iyemperumal, Chennai (2002).
4. Tamizhaga vaanaviyal sindanaigal (Tamil), by World Tamil Research Centre, Chennai
5. Indriya Vinveli (Tamil) by Mohan Sundar rajan, NBT New Delhi (2003).
6. Topics in Physics Compiled by Dept.of.Physics, DGVC College, Rochouse & Sons, Chennai. (1977)

Books for reference

1. Modern Physics by R.Murugeshan, 11th edition, S.Chand & Company Ltd, New Delhi (2003).
2. Astronomy by S. Kumaravelu, Janki Calendar Corporation, Sivakasi (1993).

2. EVERYDAY PHYSICS - (20UHN1A)
(Students admitted from 2020-21 onwards)

Objective: To learn the physics behind our daily life

Unit 1:

Physics behind Home appliances – Light bulb – Fan – Hair drier – Television – Air conditioners – Microwave ovens- Vacuum cleaners – Dishwasher – Washing machines

Unit 2:

How things work – Basic principles – Tape recorder – Tapes – Lifts – Submarines – Jet planes – Helicopters – Rockets – FAX machines – pagers – Cellular phones

Unit 3:

Demonstration – making a switch board with multiple points – wiring – one lamp controlled by one switch/Two switches – fixing a fuse-soldering – P.C.B. preparation

Unit 4:

Study of resistors, chokes, Capacitors and Transformers – multimeter-Basic principles – measurement of resistance – Voltage AC & DC.

Unit 5:

Servicing of domestic appliances – iron box – mixie – grinder – motor – emergency lamp

Course Outcome:

1. It explain understanding of home appliances
2. It gives understanding of aeronautical vehicles.
3. It gives understanding of ordinary electrical appliances
4. It gives understanding of ordinary electrical devices

Books for study

1. The Learner's series – Everyday science – Published by Infinity Books, New Delhi
2. The Hindu speaks on science, Vol,. I & II, Kasturi Ranga Publishers, Chennai

Books for Reference

1. Fundamentals of Physics by D. Halliday, R. Resnick and J. Walker, 6^{th} Edition, Wiley NY (2001).
2. Physics, Vols. I, II, III by D. Halliday, R. Resnick and K.S. Krane, 4^{th} edition, Wiley, NY(1994)
3. The Feynmann Lectures of Physics Vols. I, II, III by R.P. Feynmann, R.B. Leighton & M. Sands, Narosa, New Delhi (1998)

3. BASIC PHYSICS – (20UHN2A)
(Students admitted from 2020-21 onwards)

Objective: To understand basic concept of physics.

Unit 1: Mechanics

Force – Weight – Work – Energy – Power – Horse Power – Centrifuge – Washing machine

Unit 2: Heat

Variation of boiling point with pressure – Pressure cooker – Refrigerator – Air conditioner – Principle and their capacities – Bernoulli's principle – Aeroplane.

Unit 3: Sound and Optics

Sound waves – Doppler effect – Power of lens – Long sight and short sight – Microscope – Telescope – Binocular – Camera.

Unit 4: Geophysics and Medical Physics

Earth quake – Richter scale – thunder and lightning – Lighting arrestors – Cosmic showers – X-rays – Ultrasound scan – CT scan – MRI scan

Unit 5: Space Science and Communication

Newton's law of gravitation – Weather forecasting and communication satellites – Indian satellites – Electromagnetic spectrum – Radio waver – AM and FM transmission and reception.

Course Outcome:

1. It provides understanding of the physical principles of the universe.
2. To empower them to think creatively and critically about scientific problems and experiments.

Books for study

1. The Learner's series – Everyday science - Published by Infinity Books, New Delhi
2. The Hindu speaks on Science, Vol. I & II, Kasturi & Sons, Chennai

Books for reference

1. Fundamentals of Physics, D. Halliday, R. Resnick and J. Walker, 6^{th} edition, Wiley, NY (2001).
2. Physics, Vols. I,II, III by D. Halliday, R. Resnick and K.S. Krane, 4^{th} edition, Wiley, NY (1994)
3. The Feynmann Lectures of Physics Vols. I, II, III by R.P. Feynmann, R.B. Leighton & M. Sands, Narosa, New Delhi (1998)

4. NON CONVENTIONAL ENERGY SOURCES
(Students admitted from 2020-21 onwards)

Objective:

To get the knowledge of non conventional source of energy

Unit 1: Solar energy

Conventional Energy sources – Renewable Energy sources- solar energy – solar radiation and its measurements- solar energy collectors- parabolic collector- storage of solar energy

Unit 2: Applications of solar energy

Solar water heater- solar driers- solar cells- solar electric power generation- solar distillation- solar pumping – solar cooking

Unit 3: Wind energy

Basic principles of wind energy conversion- power in the wind – forces in the Blades- wind energy conversion- Advantages and disadvantages of wind energy conversion systems (WECS) Energy storage- Applications of wind energy

Unit 4: Oceanic energy

Energy from the oceans- Energy utilization- Energy from tides- Basic principle of tidal power – Utilization of tidal energy

Unit 5: Energy from other sources

Chemical energy – Nuclear energy - Energy storage and distribution

Course Outcome:

1. It explains applications of solar energy
2. It demonstrate the generation of electricity from varies non conventional sources of energy
3. It estimates the solar energy utilization.

Books for study

1. Non-conventional sources of energy by G.D. Rai, 4th edition, Khanna Publishers, New Delhi (1996).
2. Solar Energy, Principles of thermal collection and storage by S.P.Sukhatme 2nd edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi (1997).
3. Energy by A.K.Bakhshi, National Book Trust, New Delhi (2006)
4. Topics in Physics Compiled by Dept.of.Physics, DGVC College, Rochouse & Sons, Chennai. (1977)

Book for reference

1. Energy Technology by S.Rao and Dr. Parulekar.

2. Energy Models for 2000 and beyond by Jyoti Parikh, Tata McGrawHill Publishers, New Delhi (1997).