Holy Cross College (Autonomous), Nagercoil-629004

Kanyakumari District, TamilNadu.

Nationally Re-Accredited with A+ by NAAC IV cycle – CGPA 3.35

Affiliated to

Manonmaniam Sundaranar University, Tirunelveli

DEPARTMENT OF PHYSICS

SYLLABUS FOR UNDERGRADUATE PROGRAMME

Issued from the Deans Office

(With effect from the Academic year 2020– 2021)

DEPARTMENT OF PHYSICS

Vision

Imbibing the spirit of the Holy Cross, the institution envisions a harmonious society by empowering women for global competency and ecological sustainability through holistic approach with innovative skills.

Mission

- To provide quality education and to promote scholarly activities catering to global competencies
- To nurture participatory leadership to enhance social consciousness and social responsibility
- To uphold ethical values of honesty, personal accountability and transparency through professional commitment
- To create global professionals and entrepreneurs with innovative spirit and zeal
- To create empowered women of competence, commitment and compassion.
- To instill in students the awareness of interconnectedness between man and nature

Programme Educational Objectivities (PEOs)

PEO - 1	The graduates will apply appropriate theory and scientific knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise.
PEO - 2	The graduates pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.
PEO - 3	The graduates will be equipped with technical and analytical skills in the field of physics developing innovative solutions to real life necessities and pursue diverse career path using novel technology.

Programme Outcomes (POs)

POs	Upon completion of B.Sc. Degree Programme, the graduates will be able to:
PO - 1	apply the acquired scientific knowledge to face day to day needs.
PO - 2	create innovative ideas through laboratory experiments.
PO - 3	carry out field works and projects in collaboration with other institution.
PO - 4	reflect upon green initiatives and take responsible steps to build a sustainable environment.
PO - 5	face challenging competitive examinations that offer rewarding careers in science and education.
PO - 6	impart communicative skills and ethical values.
PO - 7	equip students with hands on training through various courses to enhance entrepreneurship skills.

Programme Specific Outcomes (PSOs)

PSOs	Upon completion of B.Sc. Degree Programme, the graduates of Physics will be able to:
PSO - 1	understand the core theories and principles of physics which include mechanics, thermodynamics, electronics, material science etc.
PSO - 2	develop extensive comprehension of fundamental and diverse applications of Physics.
PSO - 3	apply knowledge of principles, concepts in Physics and analyze their local, national and global impact.
PSO - 4	apply the critical reasoning and computing skills to analyze and solve problems in physics.
PSO - 5	analyze the observed experimental data and relate the results with theoretical expectations.
PSO - 6	communicate appropriately and effectively, in a scientific context using present technology.
PSO - 7	develop entrepreneurial skills, empowered according to the professional requirement and become self-dependent.
PSO - 8	understand the professional, ethical, legal, security, social issues and responsibilities.

Eligibility: 10 + 2 pattern

(i) For Admission: A pass in the Higher Secondary Examination (10+2) (Academic / Vocational Stream) conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereto by the syndicate of Manonmaniam Sundaranar University, Tirunelveli, is eligible for admission.

(ii) Degree:

The candidates shall have subsequently undergone the prescribed course of study in Holy Cross College affiliated to the Manonmaniam Sundaranar University for a period of not less than three academic years (six semesters), passed the prescribed examinations and fulfilled such conditions as have been prescribed thereof.

iii). Duration

The Programme is for a period of three years. Each academic year shall comprise of two Semesters viz. Odd and Even semesters. Odd Semester shall be from June to October / November and Even Semester shall be from November / December to April. There shall be not less than 90 working days which shall comprise 450 teaching clock hours for each Semester (excluding the days for the conduct of end-semester examinations).

Components of the B.Sc. Physics Programme

Part III (Major and Allied)

Major	Core-Theory papers	10x100	1000
	Practical (Core Applied)	5 x 100	500
	Elective-Theory Papers/ Project	4x 100	400
	Total Marks		**1900**
Allied (I &II)	Theory	4x 100	400
	Practical	1x 100	100
	Total Marks		**500**
	Total Marks		**2400**

- **Major and Allied Practical carry 100 marks each.**
- **Practical examination will be conducted at the end of even semester for Major and Allied**

Course Structure

Distribution of Hours and Credits

Course	Sem. I	Sem. II	Sem. III	Sem. IV	Sem. V	Sem. VI	Total	
							Hours	Credits
Part I - Language	6 (4)	6 (4)	6 (4)	6 (4)	-	-	24	16
Part II-English	6 (4)	6 (4)	6 (4)	6 (4)	-	-	24	16
Part-III								
Major Core	6(4)	6(4)	6(4)	6(4)	6 (5) + 6 (5) + 6 (5) + 6 (5)	6 (6) + 6 (6) + 6 (5) + 6 (5)	72	58
Major Elective	-	-	4(3)	4(3)	-	4 (4)	12	10
Major Project	-	-	-	-	4 (4)	-	4	4
Allied	6 (4)	6(4)	6(4)	6(4)	-	-	24	16
Part IV								
Add-on Course (Professional English)	2 (2)	2 (2)	2 (2)	2 (2)	-	-	8	8
NME (Non-Major Elective)	2 (2)	2 (2)	-	-	-	-	4	4
SEC (Skill Enhancement Course)	2 (2)	2 (2)	-	-	-	2 (2)	6	6
AEC (Ability Enhancement Course)	-	-	-	-	2 (2)	-	2	2
Total	**30 (22)**	**30 (22)**	**30 (21)**	**30 (21)**	**30 (26)**	**30 (28)**	**180**	**140**
Non-Academic Course								
Part V								
FC – I (Values for Life)	-	(1)	-	-	-	-	-	1
FC – II (Personality Development)	-	-	-	(1)	-	-	-	1
FC–III (Human Rights Education)	-	-	-	-	(1)	-	-	1
FC –IV (Gender Equity Studies)	-	-	-	-	-	(1)	-	1
SLP- Community Engagement Course	-	(1)	(1)	-	-	-	-	2

SLP-Extension activity (RUN)	-	-	(1)	(1)	-	-	-	2
STP - Clubs & Committees / NSS	-	(1)	-	(1)	-	-	-	2

Courses Offered

Semester	Course	Subject code	Paper	Hours /week	Credit
I	Part I	TL2011/ FL2011	Language: Tamil/French	6	4
	Part II	GE2011 / GE2111	General English	6	4
	Part III	PC2011	Major Core I - Mechanics	4	4
		PC20P1	Major Practical I - Physics Lab I	2	-
		AP2011	Allied I- Allied Physics I for Mathematics	4	3
		AP20P1	Allied Practical – General Physics Lab	2	-
	Part IV	APS201	Add on Course - Professional English for Physical Sciences-I	2	2
		PNM201	Non Major Elective (NME) – Physics in Everyday Life I	2	2
		SEC201/ SEC202	SEC (Skill Enhancement Course) – Meditation and Exercise / Computer Literacy	2	2
	Part V	FCV201	Foundation Course I – Values for Life	-	-
		STP201	Student Training Programme (STP) – Clubs and Committees/NSS	-	-
II	Part I	TL2021/ FL2021	Language: Tamil/French	6	4
	Part II	GE2021/ GE2121	General English	6	4
	Part III	PC2021	Major Core II –Properties of matter and Sound	4	4
		PC20P1	Major Practical I - Physics Lab I	2	2
		AP2021	Allied II – Allied Physics II for Mathematics	4	3
		AP20P1	Allied Practical – General Physics Lab	2	2
	Part IV	APS202	Addon Course- Professional English for Physical Sciences-II	2	2
		PNM202	Non Major Elective (NME)– Physics in Every Day Life II	2	2
		SEC201/ SEC202	SEC (Skill Enhancement Course) – Meditation and Exercise / Computer Literacy	2	2
	Part V	FCV201	Foundation Course I – Values for Life	-	1
		SLP201	SLP(Service Learning Programme) - Community Engagement Course	-	-
		STP201	STP (Student Training Programme) – Clubs and Committees/NSS	-	-
III	Part I	TL2031/ FL2031	Language: Tamil/French	6	4
	Part II	GE2031/ GE2131	General English	6	4
	Part	PC2031	Major Core III – Heat and Thermodynamics	4	4

	III	PC2032 PC2033 PC2034	Major – Elective - I (a) Non Conventional Energy Sources (b) Fundamentals of Physics - I (c) Microprocessor Fundamentals	4	4
		PC20P2	Major Practical II - Physics Lab II	2	-
		AP2031	Allied I – Allied Physics I for Chemistry	4	3
		AP20P1	Allied Practical – General Physics Lab	2	-
	Part IV	APS203	Addon Course- Professional English for Physical Sciences-III	2	2
	Part V	FCV202	Foundation Course II – Personality Development	-	-
		SLP201	SLP(Service Learning Programme) - Community Engagement Course	-	2
		SLP202	SLP Extension Activity (RUN)	-	-
		STP201	STP (Student Training Programme) – Clubs and Committees / NSS	-	-
IV	**Part I**	TL2041/ FL2041	Language: Tamil/French	6	4
	Part II	GE2041/ GE2141	General English	6	4
	Part III	PC2041	Major Core IV – Optics and Spectroscopy	4	4
		PC2042 PC2043 PC2044	Major – Elective - II (a)Computer Programming in C++ (b) Medical Physics (c) Optoelectronics	4	4
		PC20P2	Major Practical II - Physics Lab II	2	2
		AP2041	Allied II – Allied Physics II for Chemistry	4	3
		AP20P1	Allied Practical – General Physics Lab	2	2
	Part IV	APS204	Addon Course- Professional English for Physical Sciences-IV	2	2
	Part V	FCV202	Foundation Course II – Personality Development	-	1
		SLP202	SLP Extension Activity (RUN)	-	2
		STP201	STP (Student Training Programme) - Clubs and Committees/NSS	-	2
V	**Part III**	PC2051	Major Core V – Classical and Statistical Mechanics	6	5
		PC2052	Major Core VI - Analog Electronics	6	5
		PC2053	Major Core VII - Solid State Physics	5	5
		PC20PR	Project	5	4
		PC20P3	Major Practical III - Physics Lab III	2	-
		PC20P4	Major Practical IV - Physics Lab IV	2	-
		PC20P5	Major Practical V - Physics Lab V	2	-
	Part IV	AEC201	AEC(Ability Enhancement Compulsory course):	2	2

			Environmental Studies		
	Part V	FCV203	Foundation Course III - Human Rights Education (HRE)	-	1
VI	**Part III**	PC2061	Major Core VIII – Relativity and Quantum Mechanics	6	5
		PC2062	Major Core IX – Digital and Communication Electronics	6	5
		PC2063	Major Core X - Nuclear Physics	5	5
		PC2064 PC2065 PC2066	Major – Elective – III (a) Mathematical Physics (b) Nanophysics (c) Astrophysics	5	4
		PC20P3	Major Practical III - Physics Lab III	2	2
		PC20P4	Major Practical IV - Physics Lab IV	2	2
		PC20P5	Major Practical V - Physics Lab V	2	2
	Part IV	SEP203	Skill Enhancement Course (*SEC) – Basic Electrical Circuits and Instruments	2	2
		FCV204	Foundation Course IV – Gender Equity studies	-	1
			TOTAL	**180**	**150**

In Part III, the number of courses vary between 16 to 24 for each Department.

Total number of Hours = 180

Total number of Compulsory Credits = 140 +10

Non-academic Courses are mandatory and conducted outside the regular working hours.

Skill Development Programme (Mandatory Certificate Course - 30 hours) is offered to all the I year students.

Courses offered

Self-Learning Courses- Extra Credit Courses

Semester	Course Code	Title of the Course	Credits
III /V	PC20S1	Physics for Competitive Examination – I	2
IV/VI	PC20S2	Physics for Competitive Examination – II	2

Value Added Courses

Semester	Course Code	Title of the Course	Total Hours
III /V	VAP201	Multimedia Training	30
IV/VI	VAP202	Domestic Appliance Service	30

Instruction for Course Transaction Distribution

Theory (Major Course) Paper Hours

Components	**Sem. I**	**Sem. II**	**Sem. III**	**Sem. IV**	**Sem. V**	**Sem. VI**
Lecture Hours	45	45	45	45	60/75	60/75
Continuous Internal Assessment (2)	5	5	5	5	5	5
Quiz (2)	1	1	1	1	1	1
Class Test (3)	3	3	3	3	3	3
Problem Solving/ Class Assignment / Open Book Test	6	6	6	6	6	6
Total Hours	60	60	60	60	75/90	75/90

Distribution of total hours for Theory (Elective / Allied)

Components	**Sem. I**	**Sem. II**	**Sem. III**	**Sem. IV**	**Sem. V**	**Sem. VI**
Lecture Hours	45	45	45	45	60/75	60/75
Continuous Internal Assessment (2)	5	5	5	5	5	5
Quiz (2)	1	1	1	1	1	1
Class Test (3)	3	3	3	3	3	3
Problem Solving / Class Assignment/ Open Book Test	6	6	6	6	6	6
Total Hours / Semester	60	60	60	60	75/90	75/90

Distribution of total hours for Practical

	Semester	Hours per Week	Total Hours / Semester
Major	**I / II / III / IV**	2	30
	V / VI	2+2+2 = 6	90
Allied	**I / II / III / IV**	2	30

Examination Pattern

Each paper carries an internal component.

There is a passing minimum for external component.

A minimum of 40% in the external examination and an aggregate of 40% is required.

i) a. Part I - Tamil

Ratio of Internal and External= 30:70

Continuous Internal Assessment(CIA)

Internal Components and Distribution of Marks

Components	Marks
Internal test (2)	15
Quiz (2)	4
Class Test (2)	6
Class assignment/ Home assignment/ Field assignment/ Article review/ Group discussion/ Problem solving	5
Total	**30**

Question Pattern

Internal Test	Marks	External Exam	Marks
Part A 4 x 1	4	Part A 10 x 1 (No choice)	10
Part B 3 x 4	12	Part B 5 x 4 (Internal choice)	20
Part C 3 x 8	24	Part C 5 x 8 (Internal choice)	40
Total	**40**	**Total**	**70**

b. Part I -French

Ratio of Internal and External= 30:70

Continuous Internal Assessment (CIA)

Internal Components and Distribution of Marks

Components	Marks
Internal test (2)	15
Quiz (2)	4
Class Test (2)	6
Class assignment/ Home assignment/ Field assignment/ Article review/ Group discussion/ Problem solving	5
Total	**30**

Question Pattern for I & II Semesters

Internal Test	Marks	External Exam	Marks
Part A (Translation)	5	Part A (Translation) 4x5	20
Part B (Grammar) 5x5	25	Part B (Grammar) 6x5 (Paragraph Writing) 15x1	30
Part C (Paragraph Writing)10x1	10	Part C (Translation, Comprehension) 2x5	10
		Part D 5x2	10
Total	**40**	**Total**	**70**

Question Pattern for III & IV Semesters

Internal Test	Marks	External Exam	Marks
Part A (Translation)	5	Part A (Translation)10x1	10
Part B (Grammar) 5x5	25	Part B (Comprehension) 10 x1 (Paragraph Writing) 15 x1	25
Part C (Paragraph Writing)10x1	10	Part C (Grammar) 7 x 5	35
Total	**40**	**Total**	**70**

ii. Part II - General English

Ratio of Internal and External= 30:70

Continuous Internal Assessment(CIA)

Internal Components and Distribution of Marks

Components	Marks
Internal test (2)	15
Quiz (2)	4
Class Test (3)	6
GD/Open Book Test/Role Play/Assignment/Article Review/Seminar	5
Total	**30**

Question Pattern

Internal Test	Marks	External Exam	Marks
Part A (Objective Type)	4 x 1 = 4	Part A (Objective Type)	10 x 1 = 10
Part B	3 x 4 =	Part B	5 x 4 =

	12		20
Part C	3 x 8 = 24	Part C	5 x 8 = 40
Total	**40**	**Total**	**70**

ii) Part III (Major/ Elective/ Allied)

Ratio of Internal and External= 30:70

Continuous Internal Assessment (CIA)

Internal Components and Distribution of Marks

Components	**Marks**
Internal test (2)	15
Quiz (2)	4
Class Test (3)	6
Class assignment/ Home assignment/ Field assignment/ Article review/ Group discussion/ Problem solving	5
Total	**30**

Question Pattern

Internal Test	**Marks**	**External Exam**	**Marks**
Part A 4 x 1	4	Part A 10 x 1 (No choice)	10
Part B 3 x 4	12	Part B 5 x 4 (Internal choice)	20
Part C 3 x 8	24	Part C 5 x 8 (Internal choice)	40
Total	**40**	**Total**	**70**

Practicals: Major Core & Allied papers

Ratio of Internal and External= 40:60

Total: 100 marks

Internal Components and Distribution of Marks

Internal Components	Marks
Performance of the Experiments	10
Regularity in attending practical and submission of records	10
Record	5
Model exam	15
Total	**40**

Question pattern

External Exam	Marks
Major Practical	60
Minor Practical / Spotters /Record	
Total	**60**

ii) Part IV

Ratio of Internal and External = **50: 50**

a) Add-on Course: Professional English for Physical Sciences

Internal Components and Distribution of Marks

Internal Components	Marks
Listening and speaking	25
Reading and Writing	25
Total	**50**

Question pattern

External Exam	Marks
Written Test : Open choice – 5 out of 7 questions (5 x 10)	50
Total	**50**

b) Non – Major Elective (NME)

Continuous Internal Assessment (CIA)

Internal Components and Distribution of Marks

Internal Components	Marks
Internal test (2)	20
Quiz (2)	15
Class assignment/ Home assignment/ Project report	15
Total	**50**

Question Pattern

Internal Test	Marks	External Exam	Marks
Part A 4 x 1 (No Choice)	4	Part A 5 x 1 (No Choice)	5
Part B 3 x 4 (Internal Choice)	12	Part B 5 x 3 (Internal Choice)	15
Part C 3 x 8 (Internal Choice)	24	Part C 5 x 6 (Internal Choice)	30
Total	**40**	**Total**	**50**

c) Skill Enhancement Course (SEC) - Computer Literacy

Internal Components

Component	Marks
Objective type questions (30x1)	30
Exercise (Book) compulsory (2x10)	20
Total	**50**

External Components

Component	Marks
Exercise 1	20
Exercise 2	10
Procedures for both Exercises	20
Total	**50**

d) Skill Enhancement Course (SEC) - Meditation and Exercise

Internal Components

Component	Marks
Objective type questions (20x1)	20
Exercise (2x10)	20
Assignment	10
Total	**50**

External Components

Component	Marks
Quiz	20
Written test :Open choice – 10 out of15 questions (10x3)	30
Total	**50**

e) Ability Enhancement Course (AEC) - Environmental Studies

Internal Component

Component	Marks
Project Report	30
Viva voce	20
Total	**50**

External Component

Component	Marks
Quiz	20
Written Test :Open choice – 10 out of15 questions (10x3)	30
Total	**50**

iii. Part V

i) Foundation course (Values for life, Personality development, Human rights education and Gender equity studies)

Ratio of Internal and External = 50: 50

a) Foundation Course I: Values for Life

Internal Components

Component	Marks
Song, Mime, Skit	20
Book Activities	20
A Kind Action	10
Total	**50**

External Components

Component	Marks
Quiz	20
Written Test : Open choice – 5 out of 7 questions (5 x 6)	30
Total	**50**

b) Foundation Course II: Personality Development

Internal Components

Component	Marks
Exercise from book	20
Skit	10
Group Album	20
Total	**50**

External Components

Component	Marks
Quiz	20
Written Test : Open choice – 5 out of 7 questions (5 x 6)	30
Total	**50**

c) Foundation Course III: Human Rights Education

Internal Components

Component	Marks
Album on current issues	20
Group Song/ Mime/ Skit	10
Open book test (Objective type questions)	20
Total	**50**

External Components

Component	Marks
Quiz	20
Written Test : Open choice – 5 out of 7 questions (5 x 6)	30
Total	**50**

d) Foundation Course IV: Gender Equity Studies

Internal Components

Component	Marks
Album on current issues	20
Group Song/ Mime/ Skit	10
Open book test (Objective type questions)	20
Total	**50**

External Components

Component	Marks
Quiz	20
Written Test : Open choice – 5 out of 7 questions (5 x 6)	30
Total	**50**

e) SLP -Community Engagement Course (CEC)

(Field Work – 15 hrs; Class Hours – 15 hrs)

Internal Components

Component	Marks
Assignment	10
Group Discussion	10
Attendance (Field work)	30
Total	**50**

External Components

Component	Marks
Project Report / Case Study(10-15 pages in print) Group project	50
Total	**50**

f) SLP –Service Learning Programme: Reaching the Unreached Neighbourhood (RUN)

- 60 Hours mandatory programme included in the curriculum (2 credits).

g) STP – Student Training Programme

- Compulsory for all I &II year students (2 credits).
- Clubs and Committees – Eco Club, YRC, Rotaract Club, NSS/ RRC, AICUF, Consumer Club, Sports, Legal Literacy and Women's Cell.
- Each student can opt for one club/ committee.

Semester I

Mechanics

Course Code: PC2011

No. of hours per week	Credit	Total no. of hours	Marks
4	4	60	100

Learning Objective

- To give the students fundamental ideas on conservation laws, rotational and vibrational motion of rigid bodies, Gravitational fields and some idea about fluid mechanics

Course Outcome

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO- 1	Understand and define the laws involved in mechanics	PSO-1	U
CO- 2	Apply conservation laws in collision experiments	PSO-3	Ap
CO- 3	Interpret the principles of gravitation and moment of inertia through theory and experiments	PSO-2	Ap
CO- 4	analyze the fundamentals of center of mass and rocket motion	PSO-4	An
CO-5	apply pressure-velocity relation in fluid flow in the field of fluid dynamics	PSO-2	Ap

Unit I: Laws of Motion **9 hours**

Laws of conservation of energy, linear momentum and angular momentum – work energy theorem – work done by gravitational force – work done by spring force – potential energy – conservative and non-conservative forces – potential energy curve.

Collision – Elastic and inelastic collision(Fundamental laws of impact) – Newton's law of impact – coefficient of restitution – Impact of a smooth sphere on a fixed plane – Direct impact between two smooth spheres – Oblique impact between two smooth spheres – Calculation of final velocities of the spheres – Loss of K.E due to impact.

Unit II: Dynamics of Rigid body **9 hours**

Moment of inertia – Theorems of perpendicular and parallel axes – M.I of a circular ring, disc, solid sphere, hollow sphere and cylinder about all axes – Compound pendulum – theory – equivalent simple pendulum – reversibility of centers of oscillation and suspension – determination of g and k.

Unit III: Gravitation **9 hours**

Newton's law of gravitation – Kepler's laws of gravitation – G by Boy's method – Mass and density of earth – Acceleration due to gravity – Variation of g with altitude, depth and rotation of earth – Value of g at poles and equator.

Gravitational field – Gravitational potential – Gravitational potential due to spherical shell – Gravitational potential due to a solid sphere (inside and outside).

Unit IV: **Central Force Motion** **9 hours**

Angular velocity, angular momentum and K.E of rotation – Torque and angular acceleration – Relation between them – Expression for acceleration of a body rolling down an inclined plane without slipping.

Center of mass – Velocity and acceleration of centre of mass – Determination of motion of individual particle – System of variable mass. Rocket motion – Satellite.

Unit V: **Statics and Hydrodynamics** **9 hours**

Friction-laws of friction – Angle of friction – Cone of friction – Centre of gravity – Solid and hollow tetrahedron – solid and hollow hemisphere – Centre of pressure – vertical rectangular lamina – vertical triangular lamina.

Hydrodynamics – Equation of continuity– Pitot's tube and Venturi meter – Euler's equation of unidirectional flow – Torricelli's theorem – Bernoulli's theorem and its applications.

Skill Development

1. Construct a scientific model/demo on conservation of Energy
2. Prepare a chart for streamline and turbulent flow of a liquid
3. Determine the viscosity and surface tension of different liquids through virtual lab

Books for Study

1. Daniel Kleppner and Robert Kolenkow, Cambridge University Press., Second Edition (2014)
2. Mechanics by D. S. Mathur, S. Chand & Co., Revised Edition (2012).
3. Mechanics by P. Duraipandian, Laxmi Duraipandian, Muthamizh Jayapragasam, S. Chand & Co., New Delhi (1995).
4. Properties of Matter by R. Murugeshan, S. Chand & Co., New Delhi., Revised Edition (2005).
5. Mechanics – Part I and II by Narayanamoorthy, National Publishing Company., 6th Edition (2001)

Book for Reference

1. Fundamentals of Physics by D. Halliday, R. Rensick and J. Walker, 6^{th} edition, Wiley, NY (2001).

Semester I

Allied Physics I for Mathematics

Course Code: AP2011

No. of hours per week	Credit	Total no. of hours	Marks
4	3	60	100

Learning Objectives

To understand the concept of strength of materials, viscous properties of liquids, heat transformation from one place to another, converting heat to do mechanical work and basic properties of light such as interference and diffraction.

Course Outcome

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO 1	Acquire knowledge on elementary ideas of electricity and magnetism, electronics, optics and nuclear physics.	PSO-1	U
CO 2	Analyze the concepts and study their applications in the field of electricity and magnetism, electronics, optics and nuclear physics.	PSO-2	An
CO 3	Apply their depth knowledge of Physics in day today life.	PSO-3	Ap
CO 4	Develop their knowledge and carry out the practical by applying these concepts	PSO-5	Ap

Unit I: Properties of Matter

9 hours

Young's modulus – Rigidity modulus – Bulk modulus – Poisson's ratio (definition alone) – Bending of beams – Expression for bending moment – Determination of Young's modulus – uniform and non-uniform bending.

Expression for Couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body– Rigidity modulus of a wire and M.I. of a disc by torsion pendulum.

Unit II: Viscosity **9 hours**

Viscosity – Viscous force – Co-efficient of viscosity – Units and dimensions – Poiseuille's formula for co-efficient of viscosity of a liquid – Determination of co- efficient of viscosity using burette and comparison of Viscosities – Bernoulli's theorem – Statement and proof – Venturi meter – Pitot tube.

Unit III: Conduction, Convection and Radiation **9 hours**

Specific heat capacity of solids and liquids – Dulong and Petit's law – Newton's law of cooling – Specific heat capacity of a liquid by cooling – Thermal conduction –Coefficient of thermal conductivity by Lee's disc method.

Convention process – Lapse rate – Greenhouse effect – Black body radiation – Planck's radiation law – Rayleigh Jean's law, Wien's displacement law – Stefan's law of radiation. (No derivations).

Unit IV: Thermodynamics **9 hours**

Zeroth and First Law of thermodynamics – Second law of thermodynamics – Carnot's engine and Carnot's cycle – Efficiency of a Carnot's engine – Entropy – Change in entropy in reversible and irreversible process – Change in entropy of a perfect gas – Change in entropy when ice is converted into steam.

Unit V: Optics **9 hours**

Interference – Conditions for interference maxima and minima – Air wedge – Thickness of a thin wire – Newton's rings – Determination of wavelength using Newton's rings.

Diffraction – Difference between diffraction and interference – Theory of transmission grating – Normal incidence – Optical activity – Biot's laws – Specific rotatory power – Determination of specific rotatory power using Laurent's half shade polarimeter.

Books for Study

1. Heat and Thermodynamics – Brijlal & Subramanyam, S. Chand & Co, 16th Edition 2005.
2. Heat and Thermodynamics – D. S. Mathur, Sultan Chand & Sons, 5th Edition 2014.
3. Optics and Spectroscopy – R.Murugeshan, S.Chand and co., New Delhi, 6th Edition 2008.
4. A text book of Optics – Subramanyam and Brijlal, S. Chand and co. New Delhi, 22nd Edition 2004.
5. Properties of Matter by R. Murugeshan, S. Chand & Co., New Delhi., Revised Edition (2005).
6. Mechanics by D. S. Mathur, S. Chand & Co., Revised Edition (2012).

Books for Reference

1. Ubald Raj and G. Jose Robin, Mechanics, Waves and Oscillations –1st Edn., Indira Publications, (2006).
2. R. Murugeshan, Allied Physics - Revised Edn., S. Chand & company private limited (2016).

Semester I

Part IV

Add on Course- Professional English for Physical Sciences-I

Course Code: APS201

Hours /week	Credits	Total Hours	Marks
2	2	30	100

Learning Objectives

1. To develop the language skills of students by offering adequate practice in professional contexts
2. To develop strategic competence that will help in efficient communication

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	recognise their own ability to improve their own competence in using the language	**PSO - 1**	U
CO - 2	use language for speaking with confidence in an intelligible and acceptable manner	**PSO - 6**	E
CO - 3	understand the importance of reading for life	**PSO - 1**	U
CO - 4	Understand the importance of writing in academic life	**PSO - 1**	U
CO - 5	Write simple sentences without committing error of spelling or grammar	**PSO - 7**	An

Unit I

Communication:

1. Listening to Audio Text & answering Questions
2. Pair Walk
3. Comprehension passage
4. Developing a story with pictures
5. Vocabulary

Unit II

Description:

1. Listening to Process Description – Online shopping
2. Speaking – Role play – sample 1
3. Reading Passages on Products
4. Process Description – Compare & Contrast
5. Vocabulary

Unit III

Negotiation Strategies:

1. Listening to interviews of specialists
2. Brain Storming (Mind mapping)
3. Economic System (Longer Reading Text)
4. Why learn the skill of writing an essay
5. Vocabulary

Unit IV

Presentation Skill:

1. Listening to Lecture – I
2. Short Talks – I
3. Reading comprehension – passage I
4. Writing Recommendations
5. Vocabulary

Unit V

Critical Thinking Skills:

1. Listening Comprehension
2. Speaking – Making Presentation – Task 1 & 2
3. Reading – Comprehension Passages, Note making
4. Writing - Problem & Solution Essays, Creative writing
5. Vocabulary

Reference Book

1. TANSCHE (2020).Professional English for Physical Sciences, *First* edition

Semester I

Non Major Elective Course - I

Physics in Everyday Life - I

Course Code: PNM201

Hours /week	Credits	Total Hours	Marks
2	2	30	100

Learning Objectives

1. To introduce the basic concepts in physics and their applications in everyday life.
2. To understand the physics concept applied in day to day life situations.

Course Outcome

COs	Upon completion of this course, students will be able to	PSO addressed	CL
CO – 1	Understand their knowledge of basic scientific principles and fundamental concepts in physics.	**PSO - 1**	**U**
CO – 2	Recall the various phenomena of sound waves applied in day today life	**PSO - 3**	**R**
CO – 3	Understand the basic laws of physics and different forces involved in nature.	**PSO - 1**	**Ap**
CO – 4	Explain the physics concepts behind the sports	**PSO - 3**	**E**
CO – 5	Categorize different characteristic nature of light and its properties like refraction, reflection and diffraction.	**PSO - 1**	**C**

Unit I 4 hrs

Properties of Matter, Heat and Thermodynamics: Introduction - Elasticity - Elastic behaviour of materials - Elastic energy - Elastic and Plastic Deformation - Polymers and elastomers - Application of Elastic behaviour of materials - Surface Tension - Concept behind

Surface Tension - Examples of surface Tension, Capillary action - Experiment - Examples of capillary action - Viscosity - definition - Applications of Viscosity.

Unit II **4 hrs**

Sound: Introduction - frequency spectrum of Sound waves - The Human voice - How does the ear hears? - Amazing Abilities of Sound - Basic characteristics of sound - Reflection of Sound - echo- Interference -Application of reflection of sound wave - Ultra sound: Properties and applications of ultrasound - Applications of sound in human life.

Unit III **4 hrs**

Mechanics: Introduction - terms used in mechanics - Centripetal and centrifugal forces - Contact and non-contact forces - Friction and its types - Newton's laws of motion – gravity - mass and weight - mechanics in everyday life

Unit IV **4 hrs**

Biomechanics in Sports: Introduction – Forces and torques in Bio Mechanics – Centre of gravity - Biomechanics of gait - Physics of walking – Physics of cycling – Physics of long jump, swimming, volleyball, and basketball

Unit V **4 hrs**

Renewable energy: Introduction - solar power – Applications - Wind power and applications - hydroelectric power and uses - Biogas plant and its advantages - Advantages and disadvantages of renewable energy sources.

Text Book

1. Gerardin Jayam. (2019). Physics in Everyday Life.Published by the Department of Physics, Holy Cross College (Autonomous), Nagercoil.

Semester II

Properties of matter and Sound

Course Code: PC2021

No. of hours per week	Credit	Total no. of hours	Marks
4	4	60	100

Learning Objectives

To expose students to the fundamentals of properties of matter and sound.

Course Outcome

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO- 1	identify the materials suitable for construction of buildings, based on the moduli of elasticity.	PSO-4	Ap
CO- 2	paraphrase the properties of liquids and its determination.	PSO-1	U
CO- 3	analyze the physics of sound and its applications	PSO-2	An
CO- 4	integrate the concepts of acoustic comfort and better understanding of the theories used in building acoustics	PSO-3	Ap

Unit I: **9 hours**

Elasticity : Elasticity –- Hooke's law – Elastic moduli – Poisson's ratio – Beams – Bending of beams – Expression for bending moment – Cantilever- Theory of uniform and non – Uniform bending - Determination of Young's modulus - Koenig's method – Torsion of a body – Expression for couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body - Rigidity modulus by dynamic torsion method (Torsional pendulum) and static torsion method.

Unit II **9 hours**

Surface Tension : Surface tension – definition – Molecular forces – Explanation of surface tension on kinetic theory – Surface energy – Work done in increasing the area of a surface – Excess pressure inside a curved liquid surface – Excess pressure inside a spherical and cylindrical drops and bubbles - Drop weight method - Angle of contact - Quincke's method- variation of surface tension with temperature - Experimental determination - Jaegar's method.

Unit III: **9 hours**

Viscosity : Viscosity – Co efficient of viscosity – Streamlined and turbulent motion – Critical velocity – Rate of flow of liquid in a capillary tube – Poiseuille's formula – Viscosity of highly viscous liquid-terminal velocity - Stoke's method - Ostwald Viscometer - Viscosity of gas - Mayer's formula - Rankine 's method

Unit IV: **9 hours**

Sound : Simple harmonic motion – Differential equation of motion executing S.H.M. – Solution of the differential equation of motion – Composition of two S.H.M. along the same direction and at right angles – Lissajous figure – Free, damped and forced vibration – Frequency of vibrating string- Melde's experiment and verification of the laws of transverse vibration of a string- Sonometer – Loudness level- Sound Intensity measurement.

Unit V: **9 hours**

Ultrasonics and Acoustics : Ultrasonics – Production – Piezoelectric crystal method – Magnetostriction method – Properties and Applications.

Acoustics of building – Reverberation - Sabine's Reverberation formula (No derivation) - Factors affecting acoustics of building - Sound distribution in an auditorium - Requisites for good acoustics.

Skill development

1. Experimentally determine the elasticity of different materials (fibre, wood, glass).
2. Display a model / demo for proving surface tension of liquids.
3. Exhibit science models for simple harmonic motion.
4. Make a chart showing the factors affecting architectural acoustics.

Books for Study

1. Elements of properties of matter – D. S. Mathur – S. Chand & Co., 2004.
2. Ghosh, M., Bhattacharya, D. A text book of Oscillations, Waves and Acoustics. (3rd Ed.) New Delhi: S.Chand &Company Ltd. 2006.
3. Palanisamy, P.K. Engineering Physics. India: Schitech Publications Pvt. Ltd. 2012.

Books for reference

1. Properties of matter – R. Murugesan – S. Chand & Co., 2004.
2. Properties of matter – Brijlal and Subramanian S. Chand & Co., 2006.
3. Fundamental of Physics, D. Hallidary , Resnick and J Walker, 6^{th} Edition, Wiley, New York 2001.

Semester I

Major Practical I – Physics Lab – I

Course Code: PC20P1

No. of hours per week	Credit	Total no. of hours	Marks
2	2	30	50

Learning Objectives

- To understand the concepts in Mechanics and Properties of matter through simple experiments.

Any twelve experiments

1. Young's Modulus – Uniform bending – Pin & Microscope
2. Young's Modulus – Non uniform Bending – Scale & Telescope
3. Young's Modulus – Cantilever depression – Pin & Microscope
4. Rigidity Modulus – Torsion pendulum
5. Determination of 'g' – Compound Pendulum
6. Verification of perpendicular axes theorem – Bifilar Pendulum
7. Viscosity – Variable pressure head
8. Viscosity – Stoke's method
9. A.C. frequency – Sonometer
10. Melde's string – Determination of frequency of the vibrator
11. Thermal conductivity of bad conductor Lee's Disc method
12. Specific heat capacity of liquid
13. q, n, σ Searle's Method
14. Latent heat of ice
15. Newton's Law of Cooling – verification
16. Surface tension and interfacial surface tension

Books for Reference

Lab Manual – Edited by Dr.M.Mary Freeda, Dr.M.Priya Dhrashini & Ms.P.Aji Udhaya, Department of Physics, Holy Cross College (Autonomous), Nagercoil.

Semester II

Allied Physics II for Mathematics

Course Code: AP2021

Hours /Week	Credit	Total no. of hours	Marks
4	3	60	100

Learning Objectives

To understand the concepts of resistance of materials, capacity of conductors, effect of magnetic field due to passage of current, idea about the atom models and energy released in breaking of atom, basic semi-conductor diodes, transistor and basic logic gates.

Course Outcome

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO 1	Acquire knowledge on elementary ideas of electricity and magnetism, electronics, optics and nuclear physics.	PSO-1	U
CO 2	Analyze the concepts and study their applications in the field of electricity and magnetism, electronics, optics and nuclear physics.	PSO-2	An
CO 3	Apply their depth knowledge of Physics in day today life.	PSO-3	Ap
CO 4	Develop their knowledge and carry out the practical by applying these concepts	PSO-5	Ap

Unit I: Current Electricity **9 hours**

Ohm's law – Law of resistance in series and parallel – Specific resistance – Capacitors – capacitors in serial and parallel – Kirchoff's laws – Wheatstone's network – Condition for balance

Carey - Foster's bridge – Measurement of resistance – Measurement of specific resistance – determination of temperature coefficient of resistance – Potentiometer – Calibration of Voltmeter.

Unit II: Electromagnetism **9 hours**

Electromagnetic Induction – Faraday's laws – Lenz law – Self Inductance – Mutual Inductance – Coefficient of Coupling

A.C. Circuits – Mean value – RMS value – Peak value – LCR in series circuit – impedance – resonant frequency – sharpness of resonance.

Unit III: Atomic and Nuclear Physics **9 hours**

Bohr's atom model – radius energy – Atomic excitation – Ionization potential – Frank and Hertz Method – Nucleus – Nuclear properties – Mass defect – Binding energy.

Radio isotopes – Uses of radio isotopes – Nuclear fusion and nuclear fission – X-rays – Production – properties –Derivation of Bragg's law – uses in industrial and medical fields.

Unit IV: Analog Electronics **9 hours**

Semiconductor – PN junction diode – Bridge rectifier – Zener diode – Regulated power supply.

Transistor – Working of a transistor – CE Configuration – current gain relationship between transistor α and β – Transistor Characteristics (CE Configuration only) – CE amplifier – feedback – Hartley oscillator – Colpitt's oscillator.

Unit V: Digital Electronics **9 hours**

Number system – Decimal – Binary – Octal and Hexadecimal system – Double Dabble method – Binary addition, subtraction and multiplication – conversion of one number system to another number system.

Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables – Half adder and Full adder – Laws and theorems of Boolean's algebra – De Morgan's theorems.

Books for Study

1. Electricity and Magnetism – R. Murugesan, S. Chand & Co,2017.
2. Modern Physics – R. Murugesan & Kiruthiga Sivaprasath, S. Chand & Co,2016.
3. Basic Electronics – B. L. Theraja, S. Chand & Co,2003.

Books for Reference

1. A. Ubald Raj and G. Jose Robin, Mechanics, Waves and Oscillations –1st Edn., Indira Publications, (2006).
2. R. Murugeshan, Allied Physics - Revised Edn., S. Chand & company private limited (2016).

Allied Practical – General Physics Lab

Course Code: AP20P1

No. of hours per week	Credit	Total no. of hours	Marks
2	2	60	100

Learning Objectives

To elucidate theory through simple experiments in physics.

Any twelve experiments

1. Uniform bending – Optic Lever
2. Non- Uniform bending – Microscope
3. Newton's law of cooling – verification
4. Specific heat capacity of liquid – cooling
5. Thermal conductivity – Lee's Disc
6. Compound Pendulum – to find g
7. Torsion Pendulum – Rigidity modulus
8. Comparison of viscosities of two liquids
9. Surface tension and Interfacial surface tension –Drop weight method
10. Newton's Rings – R and n
11. Air wedge – thickness of a wire
12. Carey Foster Bridge – Specific resistance
13. Calibration of voltmeter – Potentiometer
14. LCR Series Resonance Circuit
15. Logic gates – AND, OR and NOT

Books for Reference

Lab Manual – Edited by M.Abila Jeba Queen, Ms. P.Aji Udhaya, & R. Krishna Priya, Department of Physics, Holy Cross College (Autonomous), Nagercoil.

Semester II

Part IV

Add on Course- Professional English for Physical Sciences-II

Course Code: APS202

Hours /Week	Credits	Total Hours	Marks
2	2	30	100

Learning Objectives

1. To develop the language skills of students by offering adequate practice in professional contexts
2. To develop strategic competence that will help in efficient communication

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	recognise their own ability to improve their own competence in using the language	**PSO - 1**	U
CO - 2	use language for speaking with confidence in an intelligible and acceptable manner	**PSO - 6**	Ap
CO - 3	understand the importance of reading for life	**PSO - 1**	U
CO - 4	Understand the importance of writing in academic life	**PSO - 1**	U
CO - 5	Write simple sentences without committing error of spelling or grammar	**PSO - 7**	An

Unit I

Communication:

1. Listening to instruction
2. Small Group Work
3. Comprehension- Difference between facts & opinions
4. Developing a short poem with pictures
5. Vocabulary

Unit II

Description:

1. Listening to Process Description - Cartographic Process
2. Speaking – Role play – sample 2
3. Reading Passages on Equipments & gadgets
4. Paragraph: Sentence Definition & Extended Definition, Free writing
5. Vocabulary

Unit III

Negotiation Strategies:

1. Listening to interviews of inventors in fields
2. Small Group Discussion – Specific
3. Longer reading text –The Art of Loving
4. Essay Writing – Solidarity
5. Vocabulary

Unit IV

Presentation Skill:

1. Listening to Lecture – 2
2. Short Talks – Poverty and the need to alleviate it
3. Reading comprehension – passage 2
4. Interpreting Visual Inputs
5. Vocabulary

Unit V

Critical Thinking Skills:

1. Listening for Information
2. Making Presentation task 3& 4
3. Motivational Articles on Professional Competence, Professional Ethics & Life Skill
4. Problem & Solution Essays, Summary Writing
5. Vocabulary

Reference Book

1. TANSCHE (2020).Professional English for Physical Sciences, *First* edition

Semester II

Non Major Elective Course - II

Physics in Everyday life – II

Course Code: PNM202

Hours /week	Credits	Total Hours	Marks
2	2	30	100

Learning Objectives

1. To provide basic knowledge on the concepts of light, Electromagnetism and Electronics along with some applications.
2. To explain the wonders in universe using the principles of physics.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	understand the principle and working of simple devices used in day to day life.	**PSO - 1**	**U**
CO – 2	identify the symbols used for various electronic components and infer the electronic tools.	**PSO - 3**	**R**
CO – 3	distinguish different heavenly bodies (star, planet, comets, galaxies)	**PSO - 3**	**R**
CO - 4	recall various applications of physics concepts in everyday life	**PSO - 3**	**K**

Unit I 4 hrs

Light: Introduction - Nature and properties of light - Reflection - Colours of light - Colours of objects- Reflection in everyday life - Refraction - Dispersion - Rainbow formation - Refraction in everyday life - Laser: principle and applications - Fiber optics and its applications - Applications of light in day to day life.

Unit II **4 hrs**

Electromagnetic Radiation: Introduction- Properties of Electromagnetic waves - EM Spectrum- Radio sub spectrum - Cell phones, Microwaves - Microwave oven and sensor, Terahertz radiation and its applications - Infra red rays in everyday life - InfraRed and microwaves - comparison - visible light waves - UV rays and its applications

Unit III **4 hrs**

Electromagnetism: Introduction - Magnetic materials - Magnetic Field in and around a bar Magnet, Magnetic Fields in and around Horseshoe magnet, Magnetic lines of force - Electric charge - Ohm's Law - Practical Applications of Ohm's Law in Daily Life - Electromagnetism - Applications of electricity and magnetism: Credit card machine, Use of electromagnetism in daily life.

Unit IV **4 hrs**

Basic Electronics: Introduction - Electronic components - Electronic tools - Semiconductors and integrated circuits - Application of electronic devices - Smart phones - Digital - Glucose meter - Sphygmomanometer.

Unit V **4 hrs**

Space Physics: Introduction - The big bang theory - Stars-Star system, multiple stars, supernova, black hole - solar system - Terrestrial and Jovian planets - Asteroids- Meteoroids - Meteors - Comets: parts of a comet, Galaxy - Eclipse: solar and lunar - seasons

Text Book

1. GerardinJayam.(2019). *Physics in Everyday Life.*Published by the Department of Physics, Holy Cross College (Autonomous), Nagercoil.

Semester I & II

Foundation Course I

Values for Life

Course Code: FCV201

No of hours per week	No of credits	Total no of hours	Marks
-	1	15	100

Learning Objectives

1. To inculcate values and value system in real life situations.
2. To enable the students to understand the social realities and to lead a better life.
3. To impart human, social, moral, cultural, spiritual values and to build overall character of the students.

Unit: I **2 hours**

Values – meaning – definition – value education – meaning – importance – objectives – essence – components – process – issues to be taught – benefits – significance of values in the present scenario – core value concerns – role of educators.

Unit: II **2 hours**

Personal values – importance – purpose –factors that form personal values – components – assistance, truth, hard work, perseverance, respect for elders and teachers.

Unit: III **2 hours**

Family values – types – selfless love and service, affection, sacrifice, gratitude, sharing humanity, kindness, peace, obedience. Infatuation – love – marriage – relationship. Familial love – brotherly love – sisterly love – parental love – definition – quotes from title.

Unit: IV **2 hours**

Social values – function – benefits. Components – honesty, integrity, compassion, empathy commitment, responsibility, discipline, punctuality, respect, courtesy, dedication, attitude.

Unit: V **2 hours**

Religious values – faith, belief, forgiveness, surrender. Prayer – Definition – components – types – benefits. God's love and protection – relevant quotes and reflections.

Books for Reference

1. Fr. Anthonysamy, St. Paul's Press, Nagasandra, Bombay, 1994.
2. Value Based Education, Arumugam. N, Mohana Palkani, Saras Publications, Fourth Edition, 2017.
3. Fr. Alphonse, Mera Printers, Mullanginavilai, Fourth Edition, 1993.

Semester II & III
Service Learning Programme (SLP): Community Engagement Course

Course Code: SLP201

Credits	Total no. of hours	Total marks
2	30 (15 classroom + 15 field)	100 (50 + 50)

Objectives

- To develop an appreciation of rural culture, life-style and wisdom among students
- To learn about the status of various agricultural and rural development programme
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and there by improve quality of learning

Learning Outcomes

After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bond so mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

Credit: 2credits, 30hours, atleast 50% in field, compulsory for all students.

Contents:

Course Structure:

2 Credits Course (1Credit for Classroom and Tutorials and 1 Credit for Field Engagement)

S. No.	Module Title	Module Content	Assignment	Teaching/ Learning Methodology	No.of Classes
1	**Appreciation of Rural Society**	Rural lifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages'(Gandhi),	Prepare a map (physical, visual or digital) of the village you visited and write an essay about inter-family relations in that village.	- Class room discussions - Field visit** - Assignment Map	2 4 2

		rural infrastructure			
2	**Understanding rural economy & livelihood**	Agriculture, farming, land ownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets	Rural household economy, its challenges and possible pathways to address them	- Field visit** - Group discussions in class -Assignment	3 4 1
3	**Rural Institutions**	Traditional rural organisations, Self-help Groups, Panchayatiraj institutions (GramSabha, GramPanchayat, Standing Committees), local civil society, local administration	How effectively are Panchayatiraj institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio-visual)	Classroom - Field visit** - Group presentation of assignment	2 4 2
4	**Rural Development Programmes**	History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana ,Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.	Describe the benefits received and challenges faced in the delivery of one of these programmes in the rural community; give suggestions about improving implementation of the programme for the rural poor.	- Classroom - Each studentselect soneprogram for fieldvisit** Written assignment	2 4 2

****Recommended** field-based practical activities:

- Interaction with SHG women members, and study of their functions and challenges; planning for their skill building and livelihood activities
- Visit MGNREGS project sites, interact with beneficiaries and interview functionaries at the worksite
- Field visit to Swachh Bharat project sites, conduct analysis and initiate problem solving measures
- Conduct Mission Antyodaya surveys to support under Gram Panchayat

Development Plan(GPDP)

- Interactive community exercise with local leaders, panchayat functionaries, grass-root officials and local institutions regarding village development plan preparation and resource mobilization
- Visit Rural Schools/ mid-day meal centres, study Academic and infrastructural resources and gaps
- Participate in Gram Sabha meetings, and study community participation
- Associate with Social audit exercises at the Gram Panchayat level, and interact with programme beneficiaries
- Attend Parent Teacher Association meetings and interview school dropouts
- Visit local Anganwadi Centre and observe the services being provided
- Visit local NGOs, civil society organisations and interact with their staff and beneficiaries,
- Organize awareness programmes, health camps, Disability camps and cleanliness camps
- Conducts oil health test, drinking water analysis, energy use and fuel efficiency surveys
- Raise understanding of people's impacts of climate change, building up community's disaster preparedness
- Organise orientation programmes for farmers regarding organic cultivation,rational use of irrigation and fertilizers and promotion of traditional species of crops and plants
- Formation of committees for common property resource management, village pond maintenance and fishing

Teaching & Learning Methods

A large variety of methods of teaching must be deployed:
UGC will prepare an ICT based MOOC for self-paced learning by students for the1 credit to be conducted in the classroom.
Reading & classroom discussions, Participatory Research Methods & Tools, Community dialogues, Oral history, social and institutional mapping, interactions with elected panchayat leaders and government functionaries, Observation of Gram Sabha, Field visits to various village institutions.

Recommended Readings

Books:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, NewDelhi,2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015 un.org/sdgs/
4. M.P. Boraian, Best Practices in Rural Development**,** Shanlax Publishers, 2016.

Journals:

1. Journals of Rural development, (published by NIRD & PR Hyderabad)
2. Indian Journal of Social Work, (byTISS,Bombay)

3. Indian Journal of Extension Education (by Indian Society of Extension Education)
4. Journal of Extension Education (by Extension Education Society)
5. Kurukshetra (Ministry of Rural Development, GoI)
6. Yojana (Ministry of Information and Broadcasting, GoI)

Semester III

Major Core III - Heat and Thermodynamics

Course Code: PC2031

Hours /Week	Credits	Total Hours	Marks
4	4	60	100

Learning Objectives

1. To understand the phenomena connected with various units of measurement of temperature, knowing the concept of specific heat capacities of matter and transmission of heat.
2. To introduce the concept of lowering the temperature, liquefying gases and process of making heat to do mechanical work.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	understand experimental methods to determine the transmission of heat.	PSO - 4	U
CO-2	analyze the work and heat interactions associated with a prescribed process path and to perform a analysis of a flow system	PSO - 1	An
CO-3	understand the basic concepts of thermodynamics like system, properties, equilibrium, pressure, specific volume, temperature and the laws of thermodynamics	PSO - 4	U
CO-4	evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations.	PSO - 3	An
CO-5	analyze Maxwell's thermo dynamical relations and their applications	PSO - 5	E

Unit I **9 hrs**

Thermometry and Calorimetry: Platinum resistance thermometer - Calendar and Griffith's bridge - Thermoelectric effect – Seebeck effect - Thermoelectric thermometers- International temperature scale – Thermistor- Specific heat capacity of solids – Regnault's method of mixtures(solid) – specific heat capacity of liquids – Callendar and Barnes method – Specific heat capacity of gases – Cp and Cv – Meyer's relation – Cv by Joly's differential steam calorimeter method – Cp by Regnault's method.

Unit II **9 hrs**

Low Temperature Physics: Joule - Kelvin effect - Liquefaction of Air-Linde's Process –liquefaction of hydrogen - liquefaction of helium-Kammerling - Onne's method - Helium I and II - Lambda point - production of low temperatures - adiabatic demagnetization - practical applications of low temperature - refrigerators and air-conditioning machines - super fluidity - application of super fluidity.

Unit III **9 hrs**

Transmission of Heat: Conduction – coefficient of thermal conductivity – Rectilinear flow of heat along a bar – convection – lapse rate – Stability of the atmosphere – Newton's law of cooling – determination of specific heat capacity of liquid - Radiation - black body – Kirchhoff's law – Stefan – Boltzmann law - energy distribution in black body spectrum - Wien's law – Rayleigh Jean's law– Planck's law - solar constant – water flow pyroheliometer.

Unit IV **9 hrs**

Kinetic Theory of Gases: Kinetic Theory of gases- assumptions - Molecular collisions – mean free path – expression for mean free path – Transport phenomenon – Brownian motion and its features - expression for viscosity, Diffusion and thermal conductivity of gas. Experimental verification -Vander walls equation of state - Determination of Vander walls constant - Relation between Vander Wall's constant and critical constants.

Unit V **9 hrs**

Thermodynamics : Zeroth and first law of thermodynamics – reversible and irreversible processes – isothermal process-adiabatic process-gas equation during adiabatic process - work done during adiabatic and isothermal process - second law of thermodynamics – Carnot's

engine – its efficiency. Entropy – change of entropy in reversible and irreversible processes – temperature – entropy diagrams – physical significance of entropy - change of entropy when ice converted into steam - third law of thermodynamics – Extensive and Intensive thermodynamic variables – distinction between them – Maxwell thermodynamical relations – derivation and application - Clausius - Clapeyron equation and specific heat relation .

Text Books

1. Brijlal, Subrahmanyam, Hemne, P.S. (2014). *Heat, Thermodynamics and Statistical Physics.* New Delhi: S. Chand & Company Ltd.

2. Mathur D.S. (2014). *Heat and Thermodynamics*. 5th Edition. New Delhi: Sultan Chand & Sons.

3. Gupta, A.B. (2014). *Thermal Physics*. H.P. Roy Books and Allied (P) Ltd.

4. Murughesan. R and Kiruthiga Sivaprasath. (2008). *Thermal Physics.* II Edition. New Delhi: S.Chand& Co.

Reference Books

1. Rajan.J.B. (1985). *Heat & Thermodynamics*. New Delhi: SC Publisher.

2. Varma.H.C. (2015). *Concepts of Physics* Volume I and II. New Delhi: Bharati Bhawan Publishers.

3. Narayanamoorthy.M and Nagarathinam.N. (1987).*Heat.* Eight edition. Chennai: National publishing Co.

Semester IV

Non-Conventional Energy Sources - Elective I (a)

Course Code: PC2032

Hours /Week	Credits	Total Hours	Marks
4	4	60	100

Learning Objectives

1. To provide an understanding of the present energy crisis and various available energy sources.
2. To make the students to understand the present day crisis of need for conserving energy and their alternatives.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO- 1	Apply the solar energy in various sectors. (Industry, agriculture and domestic purposes)	PSO-3	Ap
CO- 2	Explain the basic principles of wind energy conversion, various Biomass conversion Processes and its classification.	PSO- 1	U
CO- 3	Discuss the geothermal energy resources and chemical energy resources. (fuel cells)	PSO-2	An
CO- 4	Solve the present and future energy crisis.	PSO- 8	C

Unit I 9 hrs

Introduction to Energy Sources: World's reserve of Commercial energy sources and their availability-India's production and reserves-Conventional and non-conventional sources of energy, comparison – Coal- Oil and natural gas –applications - merits and demerits.

Unit II **9 hrs**

Solar Thermal Energy : Solar constant -Solar Spectrum-Solar radiations outside earth's atmosphere –at the earth surface- on tilted surfaces -Solar Radiation Geometry-Basic Principles of Liquid flat plate collector –Materials for flat plate collector -Construction and working- Solar distillation- Solar Drying-Solar cooker (box type)-Solar water heating systems – Swimming pool heating.

Unit III **9 hrs**

Photovoltaic Systems: Introduction-Photovoltaic Principle-Basic Silicon Solar cell-Power output and conversion efficiency-Limitation to photovoltaic efficiency-Basic photovoltaic system for power generation-Advantages and disadvantages-Types of solar cells-Application of solar photovoltaic systems - PV Powered fan – PV powered area - lighting system – A Hybrid System.

Unit IV **9 hrs**

Biomass Energy: Introduction-Biomass classification- Photosynthesis - Biomass conversion technologies-Bio-gas generation-Factors affecting bio-digestion -Working of biogas plant- floating and fixed dome type plant -advantages and disadvantage-Bio-gas from plant wastes-Methods for obtaining energy from biomass. Advantage & disadvantages of biomass as energy source

Unit V **9 hrs**

Wind Energy and Other Energy Sources : Wind Energy Conversion-Classification and description of wind machines, wind energy collectors-Energy storage-- Energy from Oceans and Chemical energy resources-Ocean thermal energy conversion-tidal power, advantages and limitations of tidal power generation-Energy and power from waves- wave energy conversion devices- Fuel cells- and application of fuel cells- batteries- advantages of battery for bulk energy storage- Hydrogen as alternative fuel for motor vehicles.

Text Books

1. D.P. Kothari, K.C. Singal& Rakesh Ranjan, (2008). *Renewable energy sources and emerging Technologies*, New Delhi :Prentice Hall of India Pvt. Ltd.
2. Rai G. D, (2010). *Non-conventional Energy sources*, 4th Edition, Khanna Publishers.
3. Suhas P Sukhatme,(2012). *Solar energy -- Principles of thermal collection and storage*, Second edition, New Delhi: Tata McGraw-Hill Publishing company.

Reference Books

1. Chetan Singh Solanki, (2011). *Solar Photovoltaics Fundamentals, Technologies and Applications*, 2nd Edition, New Delhi:PHI Learning Private Limited.
2. Jeffrey M. Gordon,(2013). *Solar Energy*: The State of the Art, Earthscan.
3. Kalogirou S.A, (2013). *Solar Energy Engineering: Processes and Systems*, 2nd Edition, Academic Press.
4. ZobaaA.F.and Ramesh Bansal, (2011). *Handbook of Renewable Energy Technology, World Scientific.*
5. S.A. AbbasiandNasema Abbasi, (2008).*Renewable Energy sources and their environmental impact*, New Delhi:PHI Learning Pvt. Ltd.

Semester III

Fundamental of Physics- I -Elective I (b)

Course Code: PC2033

Hours /Week	Credits	Total Hours	Marks
4	4	60	100

Learning Objective

- To introduce the basic concepts of Physics like measurement of physical quantities, states of matter, kinds of energies and energy sources to students studying other than Physics.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	Understand the fundamentals of dynamics.	**PSO – 1**	**U**
CO-2	Determine the behavior of a ray at any optical surface (lenses, Prisms).	**PSO – 6**	**E**
CO-3	Outline the extraction of useful energy from Earth, Ocean, Wind and Sun.	**PSO- 3**	**Ap**
CO-4	Determine the significance of steady current and alternating current.	**PSO-2**	**E**
CO-5	Apply Kirchoff's laws to simple electrical circuits.	**PSO - 5**	**A**

Unit I **9 hrs**

S.I. Units: Measurements of length, mass, time and other physical quantities – Dimensional formula for area, volume, density and force – Uses of dimension. Matter – Solid, Liquid, Gas and Plasma – Application of Plasma – change of state – specific heat capacity – specific latent heat of ice and steam.

Unit II **9 hrs**

Kinds of energy: Mechanical energy, Thermal energy, Optical energy, Sound energy, Electrical energy, atomic and nuclear energy, (Examples) – Conservation of energy. Renewable and non – renewable energy – Fossil fuel – coal Oil – Solar – Wind – Biomass – OTEC.

Unit III **9 hrs**

Light: Mirror – Laws of reflection – Image formation (Concave and Convex mirror) Lens – Law's of refraction – Image formation (Concave and Convex lens) – Defects of eye and rectification. Prism -Determination of refractive index of the prism.

Unit IV **9 hrs**

Current: Electric current- voltage and resistance- Ohm's law- Kirchhoff's law- Resistances in series and in parallel. DC Source – Primary cells – Leclanche and Daniel cell – Secondary cells – Lead Acid Accumulator – DC generator. Alternating current generation by hydro, thermal and atomic power stations– RMS value – Peak value (Quantitative) – AC generator – no derivation.

Unit V **9 hrs**

Measurement: Measurement of Electric power by Wattmeter- simple calculations- Induction coil- Wattless current- Power factor. Simple electrical circuits – resistor, capacitor and inductor connected to AC source (independently) – Relationship between emf and current in each case- Diode – Bridge Rectifier.

Text Books

1.Narayan Rao,B,V. (1998) *Physics B. Sc 1* –New Age International (P) Lt,

Reference Books

1. Mathur, D, S.(2002). *Mechanics.* S.Chand& Co

2. Mathur, D, S. (2002). *Properties of matter.* S. Chand & Co

3. Brijlal Subramanian. (2006). *Properties of matter.* S. Chand & Co

4. Murugesan, R. (2004). *Electricity and Magnetism*. S. Chand & Co

Semester- III

Elective I: Microprocessor Fundamentals (c)

Subject code: PC2034

Hours /week	Credits	Total Hours	Marks
4	4	60	100

Learning Objectives

1. To provide an extensive knowledge about basic concepts of microprocessor, programming instructions and interfacing concepts.
1. To attain hands on experience to perform simple programs using microprocessor.

Course Outcome

COs	Upon completion of this course students will be able to:	PSO addressed	CL
CO-1	know the basic ideas on microprocessor, memory and I/O devices	**PSO-1**	**U**
CO-2	be familiar with the basic concepts of microprocessor architecture and interfacing	**PSO-1**	**U**
CO-3	acquire skills in the programming instruction sets of microprocessors	**PSO-2**	**A**
CO-4	apply the programming instructions to perform simple programs using microprocessor	**PSO-2**	**C**

Unit I **9 hrs**

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 II **9 hrs**

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 III **9 hrs**

Interfacing memory to 8085: Memory interfacing – Interfacing 2kx8 ROM and RAM, Timing diagram of 8085 (MOVRd, Rs – MVI Rd,data(8)) .

Unit IV **9 hrs**

Interfacing I/O Ports to 8085: Interfacing input port and output port to 8085 – Programmable peripheral interface 8255– flashing LEDs.

Unit V **9 hrs**

Interrupts: Interrupts in 8085 - hardware and software interrupts – RIM, SIM instructions –priorities – simple polled and interrupt controlled data transfer.

Text Books

1. Gaonkar R.S. (1992)*Microprocessor Architecture programming and application with 8085 / 8080A.* Wiley Eastern Ltd.
2. Vijayendran,V. (2003).*Fundamental of microprocessor 8085*. Chennai: S. Viswanathan Publishers.
1. Ram,B. (2013).*Fundamentals of Microprocessors and microcomputers*. Dhanpat RAI publication.

Reference Books

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

Semester: III

Allied Physics I for Chemistry

Course code: AP2031

Hours /Week	Credits	Total Hours	Marks
4	3	60	100

Learning Objectives

1. To understand the concept of strength of materials, viscous properties of Liquids, heat transformation from one place to another, converting heat to do mechanical work.

2. To understand basic properties of light such as interference and diffraction.

Course Outcome

COs	Upon completion of this course students will be able to:	PSO addressed	CL
CO- 1	Understand to know, various modulus involved in the materials, flow of liquids due to viscous forces, transmission of heat due to process of conduction, convection and radiation and various laws involved in heat transformation, various thermodynamic laws and.	**PSO-1**	**U**
CO -2	Analyze the concepts and study the concept of entropy, and the phenomenon like interference and diffraction, optical activity of liquids and its uses.	**PSO -3**	**An**
CO- 3	Apply their depth knowledge of Physics in day today life.	**PSO -2**	**Ap**
CO- 4	Develop their knowledge and carry out the practical by applying these concepts	**PSO -4**	**R**

Unit I **9 hrs**

Properties of Matter: Young's modulus – Rigidity modulus – Bulk modulus – Poisson's ratio (definition alone) – Bending of beams – Expression for bending moment – determination of young's modulus – uniform and non-uniform bending. Expression for Couple per unit twist – work done in twisting a wire – Torsional oscillations of a body– Rigidity modulus of a wire and M.I. of a disc by torsion pendulum.

Unit II **9 hrs**

Conduction in solids: Thermal conductivity – Lee's disc method – Relation between thermal and electrical conductivities - Widemann – Franz law – Convection : Newton's law of cooling – Determination of specific heat capacity of liquid – Radiation: Distribution of energy in the spectrum of black body – Results.

Unit III **9 hrs**

Viscosity: Viscosity – Viscous force – Co-efficient of viscosity – units and dimensions – Poiseuille's formula for co-efficient of viscosity of a liquid – determination of coefficient of viscosity using burette and comparison of Viscosities - Bernoulli's theorem – Statement and proof – Venturimeter – Pitot tube.

Unit IV **9 hrs**

Thermodynamics: Zeroth and I Law of thermodynamics – II law of thermodynamics – Carnot's engine and Carnot's cycle – Efficiency of a Carnot's engine – Entropy – Change in entropy in reversible and irreversible process – change in entropy of a perfect gas – change in entropy when ice is converted into steam.

Unit V **9 hrs**

Optics: Interference – conditions for interference maxima and minima – Air wedge – thickness of a thin wire – Newton's rings – determination of wavelength using Newton's rings. Diffraction – Difference between diffraction and interference – Theory of transmission grating – normal incidence – optical activity – Biot's laws – Specific rotatory power – determination of specific rotatory power using Laurent's half shade polarimeter.

Text Books

1. Brijlal and Subramanyam. (1983).*Properties of matter*.III Edition.New Delhi: Eurasia Publishing co.

2. Mathur,D.S. (1976).*Element of properties of matter*.10th Edition.New Delhi:S.Chand& Company Ltd.

3. Brijlal& Subramanyam. (2005).*Heat and Thermodynamics.*16th Edition. New Delhi:S.Chand& Co.

4. Mathur,D.S. (2014).*Heat and Thermodynamics*.5th Edition. New Delhi:SultanChand& Sons.

5. Murugeshan,R. (2008).*Optics and Spectroscopy.*6th Edition. New Delhi:S.Chand and co.

6. Subramanyam and Brijlal. (2004).*A text book of Optics.*22nd Edition.New Delhi:S.Chand and co.

7. Sathyaprakash, Ratan PrakashanMandhir. (1990).*Optics*.VII Edition. New Delhi.

8. Ubald Raj,A. and Jose Robin,G. (2006).*Mechanics, Waves and Oscillations*. 1stEdn. Indira Publications.

Reference Books

1. AjoyGhatak. (2009).*Optics*. Fourth edition . New Delhi: TMH publishing co.

2. Halliday,D. Resnick,R. and Walker,J. (2001).*Fundamentals of Physics*, 6thEdition,New York: Wiley.

Semester III

Part IV

Add on Course- Professional English for Physical Sciences-III

Course Code: APS203

Hours /Week	Credits	Total Hours	Marks
2	2	30	100

Learning Objectives

1. To develop the language skills of students by offering adequate practice in professional contexts
2. To develop strategic competence that will help in efficient communication

Course Outcome

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	recognise their own ability to improve their own competence in using the language	**PSO - 1**	U
CO - 2	use language for speaking with confidence in an intelligible and acceptable manner	**PSO - 6**	Ap
CO - 3	understand the importance of reading for life	**PSO - 1**	U
CO - 4	Understand the importance of writing in academic life	**PSO - 1**	U
CO - 5	Write simple sentences without committing error of spelling or grammar	**PSO - 7**	An

Unit I

Listening – Answering comprehension exercises

Speaking – Reading passages – open ended questions

Reading – One subject based reading of text followed by comprehension activities / exercises

Writing – Summary writing based on the reading passages (semi-guided)

Unit II

Listening – Announcement

Speaking – Just a minute activities

Reading – Analyzing Ads

Writing –Dialogue writing

Unit III

Listening – Listening to interviews (subject based)

Speaking – Interview with subject teachers / professionals

(Using video conferencing skills)

Reading – Selected sample of web page

Writing – Creating web pages

Reading Comprehension – Essay on Digital competence for academic and professional life

Unit IV

Listening – General videos (lifestyle and values)

Speaking –Movie review, book review

Writing – Poster making – writing slogans / captions (subject based)

Reading –Essay on creativity and imagination

Unit V

Speaking – Presentation using Power Point

Reading / Writing – Circulars, minutes of meeting, paraphrasing

Reference Book

1. TANSCHE (2020).Professional English for Physical Sciences, *First* edition

Semester III & IV
Foundation Course II - Personality Development
Course Code: FCV202

Hours/ week	Credit	Total no. of hours	Marks
1	1	30	100

Objectives

1. To practice personal and professional responsibility.
2. To develop and nurture a deep understanding of personal motivation.

Course Outcome

CO No.	*Upon completion of this course, the students will be able to:*	PSO Addressed	Cognitive Level
CO-1	identify various dimensions and importance of effective personality	PSO-	A
CO-2	apply the models of positive thinking in real life situations	PSO-	A
CO-3	To overcome shyness and loneliness and cope up with the society.	PSO-	Y

Unit I

Personality – Factors influencing personality – Theories on personality – Types of personality. Self acceptance – self awareness–self concept – elements - self esteem – types of self esteem - impact of self esteem – importance – low self esteem.

Unit II

Self actualization– characteristics – Positive thinking – The profile of a positive thinker – Positive attitude – Models of positive thinking. Worry – Why to worry – ways to overcome – ways to turn negative thinking into positive.

Unit III

Motivation – Sources of motivation – Types of motivation – Factors determining motivation – characteristics of motivation. Goal setting – Types of goals – ways to achieve goals. Decisionmaking – Steps for decision making.

Unit IV

Time Management – Definition – Controversies regarding time management – importance – Ways to manage time – controlling interruption – Leisure. Leadership and team building – types –qualities of a good leader – group formation – types- responsibilities of group members – instructions to form groups. Communication – classification – verbal and non verbal – rules – hindrance to communication.

Unit V

Process of coping or adjustments – coping – mal adjustment – frustration – types – techniquesto overcome frustration. Mental stress – types – mechanism of coping – positive and negative mechanism –steps for adjustment in life – coping with shyness – loneliness – techniques to overcome shyness and loneliness.

Textbook

AazhumaiVazhampera– Dr. Sr. Mary Jhonsy, Dr. M. Mary Helen Stella and Dr.AnithaMalbi

Reference books

1. Personality Development (1999). Selvaraj, Palayamkottai Community College, V.M.Chattram, Tirunelveli.
2. Resource book for Value Education (2002). Mani Jacob, Institute of Value Education,New Delhi
3. You can win (1998).Shiv Kheera, published by Rajive Beri, Macmillan India Ltd, NewDelhi.
4. The seven habits of highly effective people (1990). Covey Stephen, R. Simon andSchuster, New York.
5. Change or be changed (2008). Dr. Xavier Alphonse, S. published by ICRDCE, Chennai.

Semester IV

Major Core IV: Optics and Spectroscopy

Course Code: PC2041

Hours /week	Credits	Total Hours	Marks
4	4	60	100

Learning Objectives

1. To provide knowledge on the concept of aberrations in lenses, prisms and Spectroscopy.

2. To understand the phenomenon like interference, diffraction, polarization through wave nature of light and its applications.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO – 1	The knowledge of geometric optics is helps in the practical design of many optical systems and instruments including aberrations in lens system.	**PSO - 2**	**U**
CO – 2	determine the behavior of a ray and wave at any optical surface.	**PSO - 1**	**R**
CO - 3	analyze the intensity variation of light due to polarization, interference and diffraction.	**PSO - 4**	**An**
CO - 4	The study of phenomena interference, diffraction, and polarization lays the foundation for an understanding of concepts such as holograms, interferometers.	**PSO -5**	**E**
CO - 5	The knowledge of Spectroscopy helps to extract the dynamic information about the molecule .	**PSO - 3**	**Ap**

Unit I 9 hrs

Geometrical optics: Lens – Spherical aberration in lenses – Methods of minimizing spherical aberration —Dispersion – Angular and Chromatic dispersion – combination of prisms to produce i)dispersion without deviation ii) deviation without dispersion –Direct vision

spectroscope –Eyepieces – Ramsden's and Huygens's eyepieces – simple microscope (magnifying glass)– compound microscope.

Unit II **9 hrs**

Interference: Conditions for interference – Theory of interference fringes – interference due to reflected light (thin films) -colours of thin films – wedge shaped thin film – theory – determination of diameter of a thin wire by Air wedge – test for optical flatness – Newton's rings by reflected light – Determination of wavelength of light - Michelson's Interferometer – theory and its Application (Measurement of wavelength) –

Unit III **9 hrs**

Diffraction: Fresnel's diffraction –Rectilinear propagation of light – zone plate – action of zone plate - Fraunhofer diffraction at single slit – Double slit – Plane diffraction grating – theory of plane transmission grating - experiment to determine wavelength(Normal incidence method) –resolving power– Rayleigh's criterion for resolution – resolving power of a telescope – resolving power of a microscope – resolving power of a prism - resolving power of grating.

Unit IV **9 hrs**

Polarization: Double refraction –Nicol Prism – Nicol Prism as polarizer and analyzer – Huygens's explanation of double refraction in uniaxial crystals– Plane, elliptically and circularly polarized light– Quarter wave plates and Half wave plates – Production and detection of plane, circularly and elliptically polarized light- Optical activity– Fresnel's explanation of optical activity

Unit V **9 hrs**

Spectroscopy: Infrared spectroscopy – sources and detector – uses – ultraviolet spectroscopy – sources – quartz spectrograph - applications - Raman Spectroscopy– Nuclear magnetic resonance –Nuclear quadrupole resonance -– Electron spin resonance spectroscopies- (Qualitative study)

Text Books

1. Subramanyam, Brijlal. (2004). *A text book of Optics.*25th Edition. New Delhi: S. Chand and co.

2. Murugeshan, R. (2008). *Optics and Spectroscopy*. 6th Edition. New Delhi: S. Chand and co.

3. Gupta,S.L., Kumar, V. and Sharma Pragati Prakashan, R.C. (1997). *Elements of Spectroscopy.*13th Edition, Meerut.

4. Aruldhass, G. (2007). *Molecular structure and spectroscopy.*II Edition. New Delhi: PHI Pvt Ltd.

Reference Books

1. Sathyaprakash, Ratan Prakashan Mandhir. (1990). *Optics*. VII Edition, New Delhi.

2. Banewell, C.N. (2006). *Introduction to Molecular Spectroscopy.* IV Edition. New Delhi: TMH publishing co.

3. Ajoy Ghatak. (2009).*Optics*. Fourth edition . New Delhi: TMH publishing co.

4. Singh & Agarwal, Pragati Prakashan, R.C. (2002).*Optics and Atomic Physics*. Nineth edition. Pragati Prakashan Meerut.

5. Halliday, D. Resnick, R. and Walker, J. (2001).*Fundamentals of Physics*, 6th Edition, New York: Wiley.

Semester IV

Elective II - Computer Programming in C++

Course Code: PC2042

Hours /Week	Credits	Total Hours	Marks
4	4	60	100

Learning Objectives

1. To provide knowledge about the basics of Computer programming in C++ and to solve problems by writing programs.
2. To enable the students developing their own applications using C++.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	understand the different types of operators and expressions in C++ language.	PSO - 4	U
CO-2	implement different operation an arrays and use function to solve the given problem	PSO - 4	Ap
CO-3	understand member functions and constructors	PSO - 4	U
CO-4	analyze pointers, operator overloading and inheritance.	PSO - 4	An
CO-5	analyze input/output operations	PSO- 4	An

Unit I **9 hrs**

C++ - An Introduction: Introduction - tokens - keywords - identifiers and constants - declaration of variables - basic data types - user defined data types-derived data types - symbolic constants - operators in C++ -expressions and their type-hierarchy of arithmetic operators- scope resolution operator – declaring, initializing and modifying variables-special assignment operators - all control structures structure of a simple C ++ program

Unit II **9 hrs**

Arrays and Functions in C++: Introduction - one dimensional and two dimensional arrays-initialization of arrays-array of strings -Functions-introduction-function with no argument and no return values -function with no argument but return value - function with argument and no return values- function with argument and return values- call by reference return by reference- function prototyping - inline functions - local, -global and static variables--function overloading - virtual functions-main function-math library functions.

Unit III **9 hrs**

Classes and Objects: Introduction - specifying a class - defining member functions-C++ program with class - nesting of member functions - private member functions - objects as function arguments - arrays within a class-array of objects-static class members-friend functions-constructors - parameterized constructors-multiple constructors - constructors with default arguments - copy constructor.

Unit IV **9 hrs**

Operator Overloading, Inheritance and Pointers: Introduction -defining operator overloading - overloading unary operators -binary operators Inheritance - single inheritance - multiple inheritance - multilevel inheritance -hybrid inheritance - hierarchical inheritance-virtual base class-abstract class -Pointers- definition-declaration- arithmetic operations

Unit V **9 hrs**

Managing Console, I/O Operations: Introduction - C++ stream - C++ stream classes - unformatted I/O Operations -formatted console I/O operations - working with files - classes for file steam operations - opening and closing a file - file pointers and their manipulations.

Text Book

1. Balagurusamy, E. (2015*). Object Oriented Programming with C++*. 6th edition. New Delhi: McGraw Hill Education (India) Private Limited.

Reference Books

1. Ravichandran, D. (2008). *Programming with C++*.3rd edition. New Delhi: TataMcGraw Hill Publishing company Ltd.

2. Byron S. Gottfried. (2007). Schaum'sOutlines : *Programming with C*.New Delhi:Tata McGraw Hill Pub. Co Ltd.

3. YashvantKanetkar. (1998). *Programming with C*. 2nd edition.New Delhi: Tata McGraw Hill.

Semester IV

Medical Physics- Elective I (b)

Course Code: PC2043

Hours /Week	Credits	Total Hours	Marks
4	4	60	100

Learning Objectives

1.To understand the basics about the biological systems in our body, their Behaviour, and the diagnostic devices. To impart the physics principles involved in the living body and the functioning of medical instruments.

2. To develop the skills in medical diagnostic systems.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand the Anatomical terms of the body.	**PSO - 2**	**U**
CO - 2	Explain the physical dynamics of the body.	**PSO - 2**	**Ap**
CO - 3	Analyse the heat and pressure system of the body.	**PSO - 5**	**An**
CO - 4	Discuss the optical and electrical behavior of the human body.	**PSO - 3**	**An**
CO - 5	Gain knowledge and application ideas regarding diagnostic systems.	**PSO - 2**	**Ap**

Unit I **9 hrs**

Anatomical terms of the Human body: Basic Anatomical Terminology: Standard anatomical position, Planes, Familiarity with terms like - Superior, Inferior, Anterior, Posterior, Medial, Lateral, Proximal, Distal.

Mechanics of the body: Skeleton - forces and body stability. Muscles and dynamics of body movement. Physics of Locomotors Systems: joints and movements - Stability and Equilibrium. Forces on and in the Body - Physics of the Skeleton - Heat and Cold in Medicine- Energy work and Power of the Body.

Unit II **9 hrs**

Dynamics of the Human body: Pressure system of the body: Physics of breathing, Physics of Cardiovascular system- Electricity within the Body - Applications of Electricity and Magnetism in Medicine. Sound in medicine- Physics of the Ear and Hearing- Light in medicine- Physics of eyes and vision.

Energy household of the body: Energy balance in the body - Energy consumption of the body - Heat losses of the body - Thermal Regulation. Optical system of the body: Physics of the eye. Electrical system of the body: Physics of the nervous system - Electrical signals and information transfer.

Unit III **9 hrs**

Basic Principles in Human body: Transducers- performance of characteristics of transducer- static and dynamic - active transducers - (a) magnetic induction type (b) piezoelectric type (c) photovoltaic type (d) thermoelectric type. Passive transducer- (a) resistive type - effect and sensitivity of the bridge (b) capacitive transducer (c) linear variable differential transducer (LVDT)

Unit IV **9 hrs**

Electrical behaviour of the human body: X-rays: Electromagnetic spectrum - production of X-rays - X-ray spectra - Brehmsstrahlung - Characteristic X-ray. X-ray tubes & types: Coolidge tube - X-ray tube - Design - Tube cooling stationary mode - Rotating anode X-ray tube - Tube rating - Quality and intensity of X-ray. X-ray generator circuits - Half wave and full wave rectification - Filament circuit - Kilo voltage circuit - Types of X-Ray Generator - High frequency generator - Exposure timers and switches - HT cables - HT generation.

Unit – V 9 hrs

Diagnostic systems: Electro Cardio Graph (ECG) - Block diagram- ECG Leads- Unipolar and bipolar-ECG recording set up. Electro Encephalo Graph (EEG) - origin- Block diagram- Electro Myogragh (EMG) - Block diagram- EMG recorder- Computer Tomography (CT) principle- Block diagram of CT scanner.Evolution of Medical Imaging - X-ray diagnostics and imaging - Physics of nuclear magnetic resonance (NMR) - NMR imaging - MRI Radiological imaging - Ultrasound imaging - Physics of Doppler with applications.

Text Books

1.John R. Cameron and James G.Skofronick, (1978), *Medical Physics* –John Willy & Sons.

2.Arumugam, M. (1997). *Bio medical instrumentation*, Edi. II, Chennai: Anuradha Agencies.

3.Thayalan, K. (2009). *Basic Radiological Physics ,2nd ed,* New Delhi: Jaypee Brothers Medical Publishing Pvt. Ltd.

4. Irving P. Herman. (2007). *Physics of the human body*, 1sted, Atlanta, NewYork: Springer.

Reference Books

1. Muhammad Maqbool, (2017).*Introduction to Medical Physics*, Springer International Publishing.

2. Bushberg, J, T. Seibert J,A. Leidholdt E,M. Boone J,M. (2002).*The essential physics of Medical Imaging.2nd ed*, Philadelphia, USA: Lippincott Williams &Wilkins.

3. Cameron. J,R. Skofronick J,G. (1978). *Medical Physics, 1st ed*, New York: Wiley.

4. Curry T,S. Dowdey J,E. Murry R,C. (1990). *Christensen's Physics of Diagnostic Radiology, 4 thed*, Philadelphia, USA: Lippincot Williams & Wilkins.

5. Khan F,M. (2003). *Physics of Radiation Therapy, 3rd ed*, USA: Lippincot Williams & Wilkins.

6. Livingstone R,S. (2007) *Handbook of Physics in Diagnostic Imaging. 1sted,* Chennai: B.I. Publication Pvt Ltd.

7. Johns, H,E. Cunningham J,R.(1983). *The Physics of Radiology, 4thed,*Springfield,U.S:Charles C Thomas Pub Ltd.

Semester IV

Optoelectronics- Elective I (c)

Course Code: PC2044

Hours /week	Credits	Total Hours	Marks
4	4	60	100

Learning Objectives

1. To give an introductory account of the basic principles of Optoelectronic devices

2. To gain information about fibre optic communication system and thereby impart the basic knowledge of optical fibres and its application in communication

Course Outcome

COs	Upon completion of this course the students will be able to:	PSO addressed	CL
CO-1	Explain the various methods of propagation of light waves through various types of fibres.	PSO-4	U
CO - 2	Understand the basic concepts of fiber optics and types of fibers	PSO-4	U
CO-2	Explain the structure and performance of LEDS and Lasers.	PSO-2	U
CO-3	Classify the optical sources and detectors and to discuss their principle.	PSO-1	U
CO-4	Discuss the channel impairments such as losses and dispersion.	PSO-5	C
CO-5	Analyse various coupling losses.	PSO-5	An

Unit I **9 hrs**

Optical Fibers: What are optical fibres - importance of optical fibres - principle of optical fibre - Propagation of light waves in an optical fibre - Basic structure of an optical fibre and propagation of light wave through it. Acceptance angle and acceptance cone of a fibre - Numerical aperture (General), numerical aperture of a G.I. fibre - comparison of step and graded index fibres - application of fibres – Classification of fibre - stepped index fibre, stepped index monomode fibre – disadvantage- Graded Index multimode fibre, plastic fibres.

Unit II **9 hrs**

Light Sources: Introduction - LED - The processes involved in LED - LED materials- Advantages- LCD - Characteristics and action of LCD - Advantages- LASER - Laser operation -characteristics of Laser - Spontaneous and Stimulated emission - Einstein coefficients- condition for population inversion -Types of Lasers - semiconductor laser diode

Unit III **9 hrs**

Photodetectors: Photo Detectors - Characteristics of Photo detectors -Photo Emissive - Photo - detectors, PN junction photo detector- PIN photodiode, Avalanche photo diode (APD), Photo transistor, Bit-Error rate.

Unit IV **9 hrs**

Fibre fabrication, fibre losses and dispersion: Fibre fabrication - external CVD-AVD-ICVD- characteristics of these methods - fibre drawing and coating - double crucible method. Attenuation in optic fibres - material loss - absorption loss - leaky modes - bending losses - radiation induced losses - Inherent defect losses - inverse square law losses - Transmission losses - Dispersion in optical fibres - intermodal dispersion - material chromatic dispersion - wave guide dispersion.

Unit V **9 hrs**

Optical couplers, splicing techniques and Fibre optic communication system: Types of optical couplers (Biconically tapered directional coupler, beam splitting directional couplers, T couplers). Calculators on couplers - splicing - mechanical splicing - steps involved in splicing procedure - losses in splices and connectors- Fibre optic communication system (block diagram)

Text Books

1. Subir kumar Sarkar. (2008). *Optical fibres and fibre optic communication systems*. New Delhi: S. Chand & Company Ltd.

2. Palanisamy, P, K (2002).*Semiconductor physics and Optoelectronics,* Chennai: SCITECH Publication.

Reference Books

1. Wilson & Hawker, (2004).*Opto Electronics*. New Delhi: Prentice Hall of India.

2. Wilson, Hawker. (2005). *An Introduction to Optoelectronics*. New Delhi: Prentice Hall of India.

3. Battacharya, P. (2002). *Semiconductor Optoelectronics*. New Delhi: PHI.

Semester: IV

Allied Physics II for Chemistry

Course code : AP2041

Hours /week	Credits	Total Hours	Marks
4	3	60	100

Learning Objectives

1. To understand the concepts of resistance of materials, capacity of conductors, effect of magnetic field due to passage of current, idea about the atom models and energy released in breaking of atom.
2. To make an awareness in physical concepts behind electricity , electronics, basic semiconductor diodes, transistor and basic logic gates.

Course Outcome

COs	Upon completion of this course students will be able to:	PSO addressed	CL
CO -1	Acquire knowledge on elementary ideas of electricity and magnetism, electronics, atomic and nuclear physics.	**PSO-1**	**U**
CO- 2	Analyze the concepts and study their applications in the field of electricity and magnetism, electronics and nuclear physics.	**PSO -3**	**An**
CO- 3	Apply their depth knowledge of Physics in day today life.	**PSO -2**	**Ap**
CO- 4	Develop their knowledge and carry out the practical by applying the concepts of a rectifier, amplifiers and oscillator, basic digital electronics principles through logic gates and the laws governing them.	**PSO -4**	**R**

Unit I **9 hrs**

Current Electricity: Ohm's law – Law of resistance in series and parallel – Specific resistance – capacitors – capacitors in serial and parallel – Kirchoff's laws – Wheatstone's network – condition for balance Carey-Foster's bridge – measurement of resistance – measurement of specific resistance –determination of temperature coefficient of resistance – Potentiometer – calibration of Voltmeter.

Unit II **9 hrs**

Electromagnetism: Electromagnetic Induction – Faraday's laws – Lenz law – Self Inductance – Mutual Inductance – Coefficient of Coupling A.C. Circuits – Mean value – RMS value – Peak value – LCR in series circuit – impedance – resonant frequency – sharpness of resonance.

Unit III **9 hrs**

Atomic and Nuclear Physics: Bohr's atom model – radius energy – Atomic excitation – Ionization potential – Frank and Hertz Method – Nucleus – Nuclear properties – Mass defect – Binding energy. Radio isotopes – Uses of radio isotopes – Nuclear fusion and Nuclear fission – X-rays – Production – properties –Derivation of Bragg's law – uses in industrial and medical fields.

Unit IV **9 hrs**

Analog Electronics: Semiconductor – PN junction diode – Bridge rectifier – Zener diode – Regulated power supply. Transistor – Working of a transistor – CE Configuration – current gain – Transistor Characteristics – CE Configurationβ and αrelationship between only – CE amplifier – feedback – Hartley oscillator.

Unit V **9 hrs**

Digital Electronics: Number system – Decimal – Binary – Double Dabble method – Binary addition, subtraction and multiplication – conversion of one number system to another number system- Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables – Laws and theorems of Boolean's algebra – De Morgan's theorems.

Text Books

1.Murugesan,R. (2017).*Electricity and Magnetism.* New Delhi:S. chand& co.

2.Murugesan,R. (1998). *Modern Physics.* New Delhi:S. chand& co.

3. Theraja,B.L.(2003). *Basic Electronics.* New Delhi:S. chand& co.

Reference Books

1. Murugesan,R. KiruthigaSivaprasath. (2016). *Modern Physics.* New Delhi:S. chand& co. 2. Ubald Raj,A. and Jose Robin,G. (2006). *Mechanics, Waves and Oscillations*. 1stEdn. Indira Publications.

3. Murugeshan,R.(2016).*Allied Physics.* Revised Edn.New Delhi*:* S. Chand & company private limited

Semester IV

Part IV

Add on Course- Professional English for Physical Sciences-IV

Course Code: APS204

Hours /Week	Credits	Total Hours	Marks
2	2	30	100

Learning Objectives

1. To develop the language skills of students by offering adequate practice in professional contexts
2. To develop strategic competence that will help in efficient communication

Course Outcome

COs	Upon completion of this course, students will be able to:	PSOs addressed	CL
CO - 1	recognise their own ability to improve their own competence in using the language	**PSO - 1**	U
CO - 2	use language for speaking with confidence in an intelligible and acceptable manner	**PSO - 6**	Ap
CO - 3	understand the importance of reading for life	**PSO - 1**	U
CO - 4	Understand the importance of writing in academic life	**PSO - 1**	U
CO - 5	Write simple sentences without committing error of spelling or grammar	**PSO - 7**	An

Unit I

Listening – Listening to two talks / Lectures by specialists on selected subjects

Speaking – Small Group Discussions

Reading – One Subject Based Reading text followed by comprehension activities / exercises

Writing – Summary writing based on the reading passages (Free Writing)

Unit II

Listening – Product Launch

Speaking – Debates

Reading – Reading Texts on advertisements (On products relevant to the subject areas) and answering inferential questions

Writing – Writing an argumentative / persuasive essay

Unit III

Listening – Interview by a famous celebrity

Speaking –Interviewing any professional / Creating Vlogs (How to become vloger and use vloging to nurture interest – subject related)

Reading – Blog

Writing – Blog Creation

Unit IV

Listening – Listening academic videos (Prepared by EMRC Other MOOC videos on Indian academic sites)

Speaking – Making oral presentations through short films – subject based

Reading – How is creativity possible in Science (Continuation of essay in semester III)

Writing – Creating flyers and Brochures (Subject Based)

Unit V

Speaking – Presentation (Without Aids)

Reading & Writing – Product Profiles / Writing an Introduction.

Reference Book

1. TANSCHE (2020).Professional English for Physical Sciences, *First* edition

Semester III and IV

Major Practical II- Physics Lab II

Course Code: PC20P2

Hours /Week	Credits	Total Hours	Marks
2	2	30	100

Learning Objectives

1. To demonstrate the working of deflection magnetometer, BG, Desauty's and Owen's bridge.
2. To enhance the understanding of the principles of electricity, magnetism, electronics and light through some basic experiments.
3. To enable the students to understand the principle and working of analog electronic circuits like Zener diode and op-amp through some basic experiments.

Learning Outcome

LOs	Upon completion of this course, students will be able to:	PSOs addressed	CL
LO - 1	understand the scientific method and an ability to apply the scientific method in practice.	**PSO - 1**	**U**
LO - 2	recall the basic experiments; improve the basic skills and attitude which help them to apply these skills in their field of physics	**PSO - 3**	**R**
LO - 3	rstand the practical knowledge of various bridges (Desauty's and Owen's bridge) by demonstration of experiments	**PSO - 1**	**U**
LO - 4	verify the Thevenins and Nortons theorem.	**PSO - 2**	**Ev**
LO - 5	compile a record of an experiment in a clear and logical written form (e.g., lab manual report, Record) augmented with figures and graphs where appropriate.	**PSO - 5**	**C**
LO - 6	analyze the physical principle involved in the various instruments and design simple circuits	**PSO - 5**	**An**

Any fourteen experiments

1. Spectrometer – Determination of A and μ
2. Spectrometer – Dispersive power of prism
3. Spectrometer Grating- Normal Incidence
4. Air wedge- Thickness of the thin wire
5. Newton's rings- R and μ
6. Measurement of absolute capacitance – B.G.
7. Figure of merit – B.G.
8. Deflection and vibration magnetometer
9. Potentiometer – Calibration of Ammeter
10. Potentiometer – Calibration of Voltmeter (low range)
11. De Sauty's bridge – Capacitance in series and parallel
12. Owen's bridge – Inductance in series and parallel
13. LCR-Series resonance circuit
14. Field along the axis of a coil – Dipole moment
15. V-I Characteristics of Zener diode
16. Zener – Voltage regulator
17. Bridge rectifier- with and without filter
18. Verification of Thevinins and Nortons theorem.
19. Addition of two DC voltages using Op-amp in inverting and non-inverting modes

Reference: Material prepared by the department.

Allied Practical

Semester: IV

Name of the Course : General Physics Lab

Course code : AP20P1

Hours /Week	Credits	Total Hours	Marks
2	2	60	100

Learning Objectives

1. To elucidate theory through simple experiments in physics.
2. To make the students more innovative, in hands on experiments.

Course Outcome

LOs	Upon completion of this course students will be able to:	PSO addressed	CL
LO - 1	understand the basic principles of Physics through experiments.	**PSO - 1**	**U**
LO - 2	measure and determine the various physical parameters.	**PSO - 5**	**An**
LO - 3	develop an idea about the handling of various instruments.	**PSO - 7**	**C**
LO - 4	get an idea about basic Scientific knowledge and implications of its broad working principle.	**PSO - 3**	**Ap**
LO - 5	analyzing, interpreting and evaluating data.	**PSO - 5**	**E**
LO - 6	build a foundation in Scientific Career.	**PSO - 2**	**Ap**

Any twelve experiments

1. Uniform bending – Optic Lever
2. Non- Uniform bending – Microscope
3. Newton's law of cooling – verification
4. Specific heat capacity of liquid – cooling
5. Thermal conductivity – Lee's Disc

6. Compound Pendulum – to find g
7. Torsion Pendulum – Rigidity modulus
8. Comparison of viscosities of two liquids-Burette method
9. Surface tension and Interfacial surface tension –Drop weight method
10. Spectrometer – Dispersive power
11. Spectrometer- Grating normal incidence
12. Newton's Rings – R and n
13. Air wedge – thickness of a wire
14. Carey Foster Bridge – Specific resistance
15. Calibration of voltmeter – Potentiometer
16. LCR series Resonance Circuit
17. Logic gates – AND, OR, NOT
18. AC frequency – Sonometer
19. LCR – Parallel Resonance circuit.
20. Characteristics of Zener diode

Reference: Material prepared by the department.

Practical

Major Practical II - Physics Lab II , Electronics and Non – Electronics Practical, Allied Practical – General Physics Lab

Performance of the experiments	: 10
Regularity in attending practical and Submission of records	:10
Record	: 5
Model exam	: 15
Internal	**40**

Formula and Circuit	10
Knowledge (Oral Questions)	10
Observation and Tabulation	25
Calculation, Result, Accuracy and Unit	15
External	**60**

Total (Internal + External) 40+60 = 100 marks

Computer Practical

Performance of the experiments	: 10
Regularity in attending practical and Submission of records	:10
Record	: 5
Model exam	: 15
Internal	**40**

For writing programme and flow chart / Algorithm	20
Knowledge (oral questions)	10
Debugging and Execution	15
For input and output	15
External	**60**

Total (Internal + External) 40+60 = 100 marks

Semester V: Group Project (5members)

External Assessment		**Internal Assessment**	
Project Report	– 20 marks	Choice of Project	– 10 marks
Presentation	– 10 marks	Regular and Systematic Execution	– 20 marks
Viva voce	– 30 marks	Result	– 10 marks
Total	**– 60 marks**	**Total**	**- 40 marks**

Practical

Major Practical II - Physics Lab II , Electronics and Non – Electronics Practical, Allied Practical – General Physics Lab

Performance of the experiments	: 10
Regularity in attending practical and Submission of records	: 10
Record	: 5
Model exam	: 15
Internal	**40**

Formula and Circuit	10
Knowledge (Oral Questions)	10
Observation and Tabulation	25
Calculation, Result, Accuracy and Unit	15
External	**60**

Total (Internal + External) 40+60 = 100 marks

Computer Practical

Performance of the experiments	: 10
Regularity in attending practical and Submission of records	: 10
Record	: 5
Model exam	: 15
Internal	**40**

For writing programme and flow chart / Algorithm	20
Knowledge (oral questions)	10
Debugging and Execution	15
For input and output	15
External	**60**
Total (Internal + External) 40+60 = 100 marks	

Semester V: Group Project (5members)

External Assessment		**Internal Assessment**	
Project Report – 20 marks		Choice of Project	– 10 marks
Presentation – 10 marks		Regular and Systematic Execution	– 20 marks
Viva voce – 30 marks		Result	– 10 marks
Total – 60 marks	**Total**		**- 40 marks**

Semester V

Major Core V- Classical and Statistical Mechanics

Course Code: PC2051

Hours/Week	Credits	Total Hours	Marks
6	5	90	100

Learning Objectives

1. To understand the mechanics of systems of particles and their equations of motion
2. To study the concept of statistics of molecules.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO- 1	understand the basic mechanical concepts related to system of particles	PSO-1	U
CO-2	apply various mechanical principles to find solution for physical problem	PSO-4	Ap
CO- 3	solve the equations of motion using Hamiltonian formalism	PSO-6	C
CO- 4	explain the fundamental postulates of statistical mechanics and Maxwell Boltzmann statistics	PSO-1	R
CO- 5	understand and develop a scientific knowledge in quantum statistics	PSO-7	U

Unit I **15 hrs**

Mechanics of a System of Particles: External and internal forces, center of mass- Conservation of linear momentum- Conservation of angular momentum- Conservation of energy- work- energy theorem- Conservative forces- examples- Constraints-Types of constraints- Examples- Degree of freedom- Generalized

coordinates (transformation equations) – Generalized Velocities-Generalized Momentum.

Unit II **15hrs**

Lagrangian Formulations: Principle of virtual work, D'Alembert's principle, Lagrange's equation of motion for conservative and nonconservative systems-Simple applications- simple pendulum- Atwood's machine- compound pendulum-Hamilton's principle- Deduction of Lagrange's equation of motion from Hamilton's principle-Deduction of Hamilton's principle from D'Alembert's principle.

Unit III **15 hrs**

Hamiltonian Formulations: Phase space- The Hamiltonian function H-Hamilton's Canonical equation of motion- Physical significance of H-Deduction of Canonical equation from a variational principle- Applications- Harmonic Oscillator-Planetary motion- Compound pendulum

Unit IV **15hrs**

Classical Statistics: Micro and macro states- The mu-space and gamma space-fundamental postulates of statistical mechanics- Ensembles- different types-Thermodynamical probability - entropy and probability- Boltzmann's theorem-Maxwell- Boltzmann statistics- Maxwell- Boltzmann energy distributive law-Maxwell- Boltzmann velocity distributive law.

Unit V **15hrs**

Quantum Statistics: Development of Quantum statistics- Bose- Einstein and Fermi- Diracstatistics- Derivation of Planck's radiation formula from Bose–Einstein statistics - Free electrons in metal- Fermi Gas-Difference between classical and quantum statistics

Textbooks

1. Upadhyaya,J.C. (2005).*Classical Mechanics*, Mumbai: Himalya Publishing House
2. Brijlal& Subramaniam (1998).*Heat& Thermodynamics*, NewDelhi: S.Chand&CompanyLtd
3. Agarwal (1996). *Statistical Physics***,** New Delhi: S.Chand&CompanyLtd

Reference Books

1. Herbert Goldstein. (1980). *Classical Mechanics*, 2nd edition, Addison-wesley publications.
2. Arul dhas, G. (2008). *Classical Mechanics*, PHI learning publications.
3. Gupta,B.D. Satya prakash.(1991).*Classical Mechanics*, 9th Edition,Meerut: KadernathRamnathPublications.
4. Gupta, Kumar &Sharma. (2005). *Classical Mechanics*, Meerut: Pragati Prakashan Publications.
5. Murray Spiegal, R.(1981). *Theoretical Mechanics*, New Delhi: McGrawHillPublications.

Semester: V

Core VI- Analog Electronics

CourseCode:PC2052

Hours / Week	Credits	Total Hours	Marks
6	5	90	100

Learning Objectives

1. To impart in depth knowledge about Semiconductors, diodes, Transistors, Operational Amplifiers, oscillators etc
2. To enable the students to understand the aspects of analog electronics in a lucid and comprehensive manner.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	understand the fundamental principles of semiconductors including P-N junctions and zener diode	PSO-1	U
CO-2	illustrate network theorems like Thevenin's theorem, Norton's theorem etc.,	PSO-2	U
CO-3	analyzethe operation of transistor , amplifier, oscillator and multivibrator	PSO-3	E
CO-4	demonstrate practical skills in the simulation, construction and testing of simple electrical and electronic circuits.	PSO-6	Ap

Unit I **15 hrs**

Linear circuit analysis and semiconductor diodes: Constant voltage source - constant current source - Maximum power transfer theorem - Thevenin's theorem - procedure for finding Thevenin Equivalent circuit - PN junction theory - V-I characteristics of a PN junction diode - Half wave rectifier - Bridge rectifier - Efficiency - filters - Shunt capacitor filter – pi filter - Zener diode - equivalent circuit - voltage regulator - LED - V-I characteristics – advantages - applications - photo diode - characteristics applications.

Unit II **15 hrs**

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 amplifiers using h parameters (CE only) - RC coupled amplifier - transformer coupled amplifier - power amplifier -classification of amplifiers - Class A, Class B and Class C - Push pull amplifier – Emitter follower.

Unit III **15 hrs**

Oscillators and Multivibrator: Feedback principle -effect negative feedback-and Barkhaussen criterion - Phase shift and Wien Bridge oscillators using transistors –Expression for frequency- Multivibrators-Astable ,Monostable and Bistable multi vibrators using transistors - Schmitt trigger.

Unit IV **15 hrs**

Special Semiconductor Devices: Clipping and clamping circuits - Differentiating circuit - Integrating circuit- -Field effect Transistor FET-MOSFET- UJT-SCR -characteristics - FET as a VVR-UJT relaxation oscillator-SCR as a switch and rectifier.

Unit V **15 hrs**

Operational Amplifier: Operational Amplifier- characteristics-parameters-applications-Inverting amplifier - Non inverting amplifier - Voltage follower- Adder -Subtractor - Integrator – Differentiator- Solving simultaneous equations-comparator -square wave generator -Wien bridge oscillator -Schmitt trigger

Text Books

1. Gupta and Kumar, (2002). *Hand Book of Electronics*, Meerut: PragatiPrakashan publications.
2. Mehta, V.K, RohitMehta,(2006). *Principles of Electronics*,New Delhi: S Chand & Co.
3. M. Arul Thalapathi,M (2005). *Electronics*, ComptekPublishers.
4. Bagde, M.K and Singh S.P.(1990). *Elements of Electronics*,New Delhi: S Chand & Co..

5. Subramanyam,A (1997).*Applied Electronics*, National Publishing Co.
6. Ramakant A. Gayakwad, (1994).*OP - AMPs and Linear Integrated Circuits* , PrenticeHall of India .
7. 7.Malvino Leach, (1992). *Digital Principles and Application*, Tata McGraw Hill, 4th Edition.

Reference Books

1. Mittal.G.K,(1993). *Electronic Devices*, G.K. Publishers Pvt. Ltd.
2. Theraja,B.L (2008). *Basic Electronics*, S. Chand & Co.
3. Sedha, R.S (1990), *Applied Electronics*, S. Chand & Co.

Semester V

Major Core VII: Solid State Physics

Course Code: PC2053

Hours/Week	Credits	Total hours	Marks
5	5	75	100

Learning Objectives

1. To impart knowledge on the structure of crystals and the different types of materials.
2. To develop a scientific attitude at micro and nano scales of materials

Course Outcomes

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	illustrate various types of bonding present in solids with example.	**PSO - 1**	**U**
CO - 2	explain the various crystal parameters and structures.	**PSO - 3**	**E**
CO - 3	discuss the various theories involved in magnetic materials. (dia, para, ferro, ferri and antiferro magnetism)	**PSO - 3**	**C**
CO - 4	describe polarization processes and analyze the information contained in the temperature and frequency dependence of dielectric materials.	**PSO - 1**	**C**
CO - 5	analyze the structure and physical properties of semiconductors.	**PSO - 5**	**An**
CO - 6	describe and discuss the theory of superconductivity and superconducting materials.	**PSO - 2**	**C**

Unit I **12hrs**

Bonding in Solids: Types of bonds in crystals - Ionic, covalent, Metallic, Vander waal's and Hydrogen Bonding - Bond energy of sodium chloride molecule - variation of inter atomic force with inter atomic spacing -cohesive energy - cohesive energy of ionic solids - application to sodium chloride crystal - evaluation of Madelung constant for sodium chloride.

Unit II **12hrs**

Crystal Structure and Crystal Diffraction: Crystal Lattice -Primitive and unit cell-seven classes of crystal-Bravais Lattice- Miller Indices-Structure of crystals-- Simple cubic, Face centered cubic, Body centered cubic and Hexagonal close packed structure -Sodium Chloride, Zinc Blende and Diamond Structures. Crystal Diffraction – Bragg's Law-Experimental methods-Laue method, powder method and rotating crystal method-Reciprocal lattice- Intensity and structure factor.

Unit III **12hrs**

Magnetic Properties: Spontaneous Magnetization – Weiss Theory – Temperature dependence of Magnetization -classical Theory of Diamagnetism – Weiss theory of Para magnetism – Ferromagnetic domains – Bloch wall – Basic ideas of anti- ferromagnetism – Ferri magnetisms – Ferrites in computer Memories.

Unit IV **12hrs**

Dielectric Properties: Band theory of solids –classification of insulators, Semiconductors, conductors – intrinsic and extrinsic semiconductor – Carrier concentration for electron - Barrier Potential Calculation – Rectifier Equation Dielectrics - Polarization – frequency and temperature effects on polarization-dielectric loss-Clausius Mosotti relation-determination of dielectric constants.

Unit V **12hrs**

Super Conductivity: Introduction - General Properties of Superconductors - effect of magnetic field -Meissnereffect-effectofcurrent-thermalproperties-entropy-specificheat -energy gap - isotope effect - London equations - AC & DC Josephson effects - applications - Type–I and Type–II Superconductors - Explanation for the Occurrence of Super Conductivity - BCS theory - Application of Superconductors - High TCsuperconductors.

Text Books

1. Arumugam,M. (2002). *Materials Science,* Anuradha Agencies Publishers.
2. Singhal,R.L. (2003). *Solid State Physics*, Kedarnath Ram Nath& Co., Meerut.
3. Kittel. (2003). *Introduction to Solid State Physics*, Willey EasternLtd.

4. Raghavan,V. (2004). *Materials Science and Engineering*, Prentice Hall of India Private Limited, NewDelhi.

Reference Books

1. Pillai,S.O. (2002). *Solid State Physics*, New Age International (P)Ltd.

2. .Dekker,A. J. (1985). *Solid State Physics*, MacmillanIndia.

3. Gupta,H.C. (2001). *Solid State Physics*, Vikas Publishing House Pvt. Ltd., New Delhi.

Semester V

Project

Course code: PC20PR

Hours/Week	Credits	Total Hours	Marks
5	4	75	100

Learning Objectives

1. To enable students to design experiment, analyze data and interpret results.
2. To develop skills to identify subject related problems in the neighborhood and report to the scientific community.

Course Outcome

COs	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	Explore new areas of research in physics	PSO - 7	Ap
CO - 2	Analyze a research problem and construct tools for data collection.	PSO - 5	An
CO - 3	Write research reports and present results in the scientific community.	PSO - 8	Ap
CO - 4	Develop skills to serve in science related industries and agencies.	PSO - 2	Ap

Guidelines

- All the students must undertake Project work at the final year (V semester) as a group (4 to 5 students per group)

Distribution of marks for project

Internal : External = 40:60

Internal Components

Internal Viva = 20 marks

Regularity and Systematic work = 20 marks

External Components

Project Report = 30 marks

Presentation and Viva = 30 marks

Project Report framework

1. The Report format should be in:

- Font - Times New Roman
- Heading - Font size 14 (Bold) - Uppercase
- Sub headings - Font size 12 (Bold) — Lowercase; should be numbered.
  (Eg: Introduction 1;Subheading 1.1; 1.2 ....)
- Text, the content of the dissertation — Font size -12 (Normal).
- Line space - 1.5
- Margin - 2" on the left and 1" on the right, Gutter -0.5.
- Page Numbering — Bottom middle alignment; excluding initial pages and reference
- **Total number of pages - Minimum 30 - Maximum 40** (excluding initial pages and reference).
- The Tables and Figures should be included subsequently after referring them in the text of the report.

The report will have two main parts:

I. Initial Pages - in the following sequence

i. Title Page
ii. Certificate from the Supervisor
iii. Declaration by the candidate endorsed by the Supervisor and HOD.
iv. Acknowledgement (within one page - signed by the candidate).
v. Table of Contents
vi. List of abbreviations

II. Main body of the report

i. Introduction and Objectives
ii. Methodology
iii. Results
iv. Discussion
v. Summary
vi. References

The guidelines for reference

Journal Article : with Single Author

Waldron, S 2008, "Generalized Welch bound equality sequences are tight frames", IEEE Transactions on Information Theory, vol. 49, no. 9, pp. 2307-2309.

Journal Article : with Two Authors

Conley, TG &Galeson, DW 1998, "Nativity and wealth in mid-nineteenth century cities", Journal of Economic History, vol. 58, no. 2, pp. 468-493.

Journal Article : with more than two Authors

Alishahi, K, Marvasti, F, Aref, VA & Pad, P 2009, "Bounds on the sum capacity of synchronous binary CDMA channels", Journal of Chemical Education, vol. 55, no. 8, pp. 3577-3593.

Books

Holt, DH 1997, Management Principles and Practices, Prentice-Hall, Sydney.

Semester: V &VI

Major Practical III-Physics Lab III (Non-Electronics)

Course code: PC20P3

Hours/Week	Credits	Total Hours	Marks
2	-	30	100

Learning Objectives

1. To acquire knowledge about basic concepts of physics and to calculated the related physical parameters.
2. To demonstrate the fundamental principle of optics, potentiometer and B.G.

Course Outcome

LOs	Upon completion of this course, students will be able to:	PSO addressed	CL
LO - 1	demonstrate the experimental techniques and develop competence in handling optical instruments.	PSO - 1	U
LO - 2	analyze the diffraction and dispersion phenomena in optical elements (grating or prism) using spectrometer.	PSO - 4	An
LO - 3	develop practical hands-on experience applying widely used techniques to investigate optical phenomena. (Oblique incidence, i – d curve)	PSO - 2	Ap
LO - 4	record, analyze, interpret and critically evaluate Cauchy's constant and Hartmann's interpolation formula experimentally.	PSO - 6	C
LO - 5	Evaluate thermal parameters using M.G, B.G and potentiometer.	PSO - 7	Ap

Any fourteen experiments

1. Spectrometer-Cauchy's constant.
2. Spectrometer- Hartmann's interpolation formula.
3. High Resistance by leakage using B.G
4. Potentiometer- Calibration of high range Voltmeter
5. Potentiometer-Emf of thermocouple
6. Potentiometer- Temperature Coefficient of Resistance
7. Determination of wavelength of Laser source by diffraction grating
8. Diameter of a thin wire by diffraction method (using Laser).
9. Wavelength determination of different sources
10. Spectrometer- Hollow prism.
11. Carey Foster's Bridge-Temperature coefficient of Resistance
12. Spectrometer-i – d curve.
13. Spectrometer-i – i' curve.
14. Spectrometer-Wavelength of spectral lines of Mercury light with grating in oblique incidence.
15. Thermoemf using M.G
16. Comparison of Mutual inductance of the two pair of coils using B.G
17. Thermoemf of Thermocouple-B.G
18. Characteristics of solar cell
19. Study of Power versus load characteristics of Solar Photovoltaic panel.

Semester: V &VI

Major Practical IV- Physics Lab IV (Electronics)

Course code: PC20P4

Hours/Week	Credits	Total Hours	Marks
2	**-**	**30**	**100**

Learning Objectives

1. To understand and analyze the working of electronic devices.
2. To acquire skills in designing electronic circuits.

Course Outcome

LOs	Upon completion of this course, students will be able to:	PSO addressed	CL
LO - 1	develop knowledge and skills relating to electricity and electronics through hands-on learning experience.	PSO - 4	Ap
LO - 2	understand the fundamental concepts and mechanisms used in Digital Electronics. (Logic gates and Flip – Flops)	PSO - 2	U
LO - 3	design and analyse digital systems / logical circuits. (De Morgans theorems using IC)	PSO - 1	An
LO - 4	analyse and design various combinational and sequential circuits. (Flip flop, Encoder, Decoder, Op-amp etc.)	PSO - 5	An/E
LO - 5	infer the operation of basic logic gates, understand Boolean algebra and simplify simple Boolean functions by using basic Boolean properties.	PSO - 6	Ap

Any fourteen experiments

1. IC – 555 – Astablemultivibrator
2. IC – 555 – Monostablemultivibrator
3. Half Adder& Full Adder
4. Half Subtractor& Full Subtractor
5. Universality of NOR
6. Universality of NAND
7. Flip – Flop (RS)
8. Flip – Flop (JK)
9. Verification of Boolean expressions and DeMorgan's Laws.
10. Decoder
11. Encoder
12. Regulated Power Supply Using IC's
13. Hartley Oscillator
14. Colpitt's Oscillator
15. Emitter Follower
16. Single Stage Amplifier-With and Without Feedback
17. Op-amp-Inverting and Non inverting amplifier
18. Op-amp-adder and Subtractor
19. Op-amp-Differentiator and Integrator

Semester: V &VI

Major Practical V- Physics Lab V (Computer)

Course code: PC20P5

Hours/Week	Credits	Total Hours	Marks
2	**-**	**30**	**100**

Learning Objectives

1**.** To apply object oriented programming techniques to solve physics problems.

2**.** To develop programs using functions and classes (objects, array of objects, friend functions, passing and returning objects).

Course Outcome

LOs	Upon completion of this course, students will be able to:	PSO addressed	CL
LO - 1	understand the principles of object oriented program to construct computer programs and modeling of experimental data for the solution of problems in physics. (period of a pendulum and Young's modulus of a material).	PSO - 1	**U**
LO - 2	apply object oriented programming techniques to solve computing problems. (addition, subtraction, multiplication and division)	PSO - 3	Ap
LO - 3	develop programs using functions and classes. (objects, array of objects, friend functions, passing and returning objects, function declaration with/without using the return statement).	PSO - 2	Ap/C
LO - 4	formulate the applications of pointers and virtual functions. Distinguish formatted and unformatted I/O operations.	PSO - 6	E
LO - 5	develop programs using constructor, destructor, operator overloading and inheritance. (generate a series of Fibonacci numbers using constructor in the scope of class definition / out of the class definition using the scope resolution operator).	PSO - 4	C
LO - 6	analyze the concepts trained in the computer lab activities and provide an understanding of data acquisition and analysis.	PSO - 5	An

Any fourteen experiments

1. To read any two numbers through the key board and to perform simple arithmetic operation (addition, subtraction, multiplication and division) and display the results using C_{in} and C_{out} functions. Use do-while loop.

2. To display the name of the day in a week, depending upon the number entered through key board using Switch-Case statement

3. To test the validity of any entered character whether it belongs to the alphabetical set or a number or a special character

4. To find the sum of the series using for loop.

a) Sum = 1 + 3 + 5 + ……. n

b) Sum = $x - x^3/3! + x^5/5! - x^7/7! + \ldots\ldots x^n/n!$

c) Sum = $1 + 2^2 + 4^2 + \ldots\ldots\ldots + n^2$

5. To find the factorial of a number by using function declaration with/without using the return statement

6. To read a set of numbers from a standard input device and to find out the largest number in the given array using function declaration. Also sort them in the ascending or the descending order.

7. To read the elements of the given two matrices of order m x n and to perform the matrix addition and display the transpose of the result.

8. a) To display the content of any array using pointer arithmetic
b) To read the data variables (such as Day, Month, Year) of a class by the member function and display the content of class objects on the screen in the format DD/MM/YYYY

9. To generate a series of Fibonacci numbers using constructor where the constructor member function has been defined in the scope of class definition / out of the class definition using the scope resolution operator.

10. To read the following information from the keyboard in which basic class consists of Name, Roll No. and Sex. The derived class contains the data members height and weight. Display the contents of the class using inheritance concept.

11. To write a LOOP programme to find the period of a pendulum of given length L, in a gravitational field. Accept the required values using the keyboard. Also display the result.

12. Develop a program in C++ to calculate the Young's modulus of a material from the data obtained from uniform bending method.

13. Define a class to represent a bank account Data member:

1. Name of the depositor
2. Account Name
3. Type of Account
4. Balance amount in the account.

Member function

1. To assign initial values
2. To deposit an amount
3.To withdraw an amount
4.To display name and balance.

14. Solve quadratic equation

15. Multiplication of two matrices

16. Write a program that uses functions to compare two strings input by the user. The program should state whether the first string is less than, equal or greater than the second string.

17. Write a program to find the smallest and biggest element in an array.

18. Write a simple C++ program to find the path travelled by a body.

Semester V

Ability Enhancement Course

Environmental Studies

Course Code: AEC201

Hours per Week	Credits	Total Hours	Marks
2	2	30	100

Learning Objectives

1. To understand the ecosystem, biodiversity and their conservation
2. To make them identify the impact of pollution , disaster and population

Course outcome

CO	Upon completion of this course the students will be able to:	CL
CO - 1	understand the multidisciplinary nature of environmental studies	U
CO - 2	recall the components of different ecosystems	R
CO - 3	interpret the levels of diversity and its conservation	A
CO - 4	analyze the impact of population, pollution and disasters	An

Unit I (6 hrs)

Multidisciplinary nature of environmental studies – scope of environmental studies- natural resources - renewable and nonrenewable resources – land, water, forest and energy resources.

Unit II (6 hrs)

Ecosystem – components –types – structure and function – food chain – food web – major ecosystems- forest, grass land, desert and aquatic - pond, marine and river ecosystems.

Unit III (6 hrs)

Biodiversity and conservation Definition – magnitude of biodiversity - levels of diversity – biogeographical classification of India – Biodiversity hotspots in India – Himalayas, Indo Burma, Western Ghat and Sunderland, Endemic, Endangered Red Data Book - Insitu and Exsitu conservation.

Unit IV (6 hrs)

Environmental Pollution: Pollution – types, sources and effects of air, water, soil, noise, radioactive and plastic pollutions - Role of an individual in prevention of pollution.

Unit V (6 hrs)

Social Issues and Environment: Disaster - cyclone, flood, drought, earthquake and management - Population explosion – impact of population, growth on environment and social environment.

Reference books

1. Sharma R.C, Gurbirsangha, (2018). *Environmental Studies*. New Delhi: Kalyani Publishers,

2. Murugeshan. R, (2014).*Environmental studies*, Madurai: Millennium publishers and distributors,

3. Arumugam.N, Kumaresan.V, (2012). *Environmental Studies*. Nagercoil: SARAS Publication.

4. Dr.Asthana.D.K.,Dr.MeeraAsthana, (2010). *Environmental Studies*. New Delhi: S.Chand& Company Ltd.,

5. Beny Joseph, (2018). *Perspectives in Environmental Studies*. New Age International Publishers.

Semester V

Foundation Course Ill - Human Rights Education (HRE)Course. Code: FCV203

Objectives

1. Make them to identify issues, problems and violation of human rights.
2. Resolve the problems of human rights in their own life and society.

Course outcome

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	explains the historical growth of the idea of human rights.		U
CO - 2	interpret the problems of human rights and find solution.		A
CO - 3	analyze the importance of women and child rights		An
CO - 4	evaluate concepts and ideas of human rights		E

Unit I

Social Justice - Need for Social Justice, Parameters of Social justice. Untouchability - problems, causes, casteism. Social reformers - contributions of Dr. B.R. Ambedkar and E.V. Ramasamy. Role of Mandal commissions in Social justice - Social, educational, economic indicators and recommendations

Unit II

Human Rights - approaches and concept of human rights. United Nations - UN commission on Human rights, other UN bodieson Human rights. Fundamental rights of Indian Citizen.Fundamental duties of Indian Citizen. Political rights of Indian Citizen. Human rights concern in India.

Unit III

Women Rights - History and need of women rights. United Nation on women rights - issuesby identified United Nation. Women and climate change. Women rights and problems. Problem faced by women during medieval and modern India.

Unit IV

Gender inequality - seven types of inequality. Constitutional and legal provision for womenin India. Special initiatives for women. Women struggle and reforms. Women today.

Unit V

Child Rights: History and declaration of rights of children. Convention on rights of child, Child rights in India. National commission on women rights. Issues faced by women. Constitutional and Legal provision in India. Child rights in Indian Constitution.

Reference Book

1. Dr. Arymugam, N., Dr. Mohana., & Lr. Palkani. (2017). Value Based Education. (4th ed.).TamilNadu, Saras Publication

Semester VI

Major Core VIII: Relativity and Quantum Mechanics

Course Code: PC2061

Hours/Week	Credits	Total Hours	Marks
6	5	90	100

Learning Objective

1. To acquire sufficient knowledge in the concept of Relativity, dual nature of matter waves,
2. To apply the Quantum mechanics principles, Operator formalisms and derive Schrodinger equation and its applications.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	gain knowledge in the concepts of special and theory of relativity	PSO - 1	**U**
CO - 2	evolve ideas about dual nature of matter	PSO - 2	**E**
CO - 3	recognize basic terms in Quantum Mechanics and different operator mechanism	PSO - 3	**C**
CO - 4	apply of Schrödinger's equation to micro system	PSO - 4	**Ap**

Unit I **15 hrs**

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 II **15 hrs**

Wave Theory: Wave Nature of Matter Phase and group velocity - wave packet - expression of De Brogile's wave length -Davisson and Germer's experiment - G.P.Thomson's experiment - Heisenberg's uncertainty principle and its consequences.

Unit III **15 hrs**

Fundamentals of quantum mechanics: Schrodinger Equation Inadequacy of classical mechanics - Basic postulates of quantum mechanics - Schrodinger equation - Properties of wave function - Probability interpretation of wavefunction - linear operators - self adjoint operators - expectation value - eigenvalues and eigenfunctions - commutativity and compatibility.

Unit IV **15 hrs**

Operators: 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 V **15 hrs**

Applications of Schrodinger Equation: Solutions of Schrodinger Equation – Time dependent and time independent Schrodinger equation - Free particle solution - Particle in a box - Potential well of finite depth (one dimension) - linear harmonic oscillator - rigid rotator and hydrogen atom.

Text Books

1. P.M.Mathews and S.Venkatesan, (2005). *A Text book of Quantum mechanics,*TataMcGraw - Hill, New Delhi.

2. V.K.Thankappan, (2003). *Quantum Mechanics*, New Age International (P) Ltd. Publishers, New Delhi.

3. K.K.Chopra and G.C. Agrawal, (1998). *Quantum mechanics,* Krishna PrakasamMedia(P) Ltd., Meerut First Edition.

4. R. Murugeshan and KiruthigaSivaprasath, (2008).*Modern Physics,* S. Chand &Co.

Reference Books

1. BrijlalSubramanyam, (1990). *Mechanics and Relativity,*S.Chand& Co., New Delhi.

2. A.Beiser, (1997). *Concepts of modern physics*, Tata McGraw - Hill, 5th edition, NewDelhi.

3. Pauling and Wilson, (2000) *Introduction to quantum mechanics*, McGraw – Hill.

4. A.Ghatak and Loganathan, (2012)*Quantum mechanics*, Macmillan India Pvt. Ltd.

Semester: VI

Core IX - Digital and Communication Electronics

Course code: PC2062

Hours/Week	Credits	Total Hours	Marks
6	5	90	100

Learning Objectives

1. To understand the structure of various number system and basic Logic gates.
2. To design and solve the Boolean Algebra simplification and Karnaugh Maps.
3. To construct sequential circuits and to design counters.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO -1	Understand the basic operation, and features related to Logic gates and interprets their applications.	PSO-1	U
CO -2	Acquire knowledge on number system, arithmetic building blocks, and memories.	PSO-3	E
CO -3	Understand the fundamental concepts of logic gates, counters, registers, fiber optics, etc.	PSO-1	U
CO -4	Develop skill to build and troubleshoot combinational digital circuits.	PSO-7	Ap
CO-5	Understand AM, FM and PM modulation and demodulation techniques.	PSO-1	U
CO-6	Assess the basic concepts of fiber optics and types of fiber diodes, transistor, op-amps and converters.	PSO-2	E
CO-7	Learn the working principle of satellite communication system.	PSO-6	C

Unit I **15hrs**

Digital Fundamentals: Number Systems and Conversions - Binary-Coded Decimal (BCD) Code - Gray code - 1's and 2's complements - Basic logic gates - NAND, NOR and EX-OR gates - NAND and NOR as Universal Building blocks - Laws and theorems of Boolean algebra - NAND-NAND circuits - Karnaugh's map- Sum of Product (SOP) and Product of Sum (POS) - applications.

Unit II **15hrs**

Sequential Logic: RS-Flip flop, Clocked RS Flip flop, D-Flip flop, J-K and J-K Master-Slave Flip-flop - Shift registers and Counters - Multiplexers and Demultiplexers - Decoders and Encoders - Memory Circuits - D/A and A/D converters - applications.

Unit III **15hrs**

Modulation and Demodulation: Amplitude modulation - Frequency modulation, Phase Modulation and Pulse Width Modulation - Detectors of Amplitude Modulation (AM), Frequency Modulation (FM), Phase modulation (PM) and Pulse width modulation (PWM), Phase locked loop (PLL) - Noise in Communication Systems.

Unit IV **15hrs**

Digital and Satellite Communication: Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK) Modulation and Demodulation, Advantages and disadvantages of digital communication. Communication Satellite Systems - Telemetry - Tracking and Command System-Satellite Links - Commonly Used frequency in Satellite Communication - Multiple access - Error Detection.

Unit V **15hrs**

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.

Text Books

1. Jain, R. P. (2007). *Modern Digital Electronics*. New Delhi: Tata McGraw Hill.2.
2. Malvino Leach, (1992). *Digital Principles and Application*, Tata McGraw Hill, 4th Edition.
3. Thomas L. Floyd, (1998). *Digital Fundamentals,* Universal Book Stall, New Delhi.
4. Vijayendran. V, Viswanathan. S, (2005). *Introduction to Integrated Electronics*, Printer sand Publishers Pvt. Ltd., Chennai.
5. Gerd Keiser, (2003). *Optical communications Essentials,*Tata McGraw Hill, 5th Edition.

Reference Books

1. Mehta V. K., Rohit Mehta. (2016). *Principles of Electronics*. New Delhi: S. Chand and Company.
2. Vijayendran. V. Viswanathan. S. (2011). *Introduction to Integrated Electronics Digital and Analog*. (1st Ed.). Chennai: (printers and Publishers) Pvt. Ltd.
3. Thomas L. Floyd. (1999). *Digital Fundamentals*. (3rded.). New Delhi: UBS-Publishers Distributers LTD.
4. Albert Malvino, David J Bates. (2007). *Electronic Principles*, 7th Edition, New Delhi: McGraw Hill.
5. Mehta, V.K. (2001). *Principles of Electronics.* 6th Revised Edition, S. Chand and Company.

Semester: VI

Core X –Nuclear Physics

Coursecode:PC2063

Hours/Week	Credits	Total Hours	Marks
5	5	75	100

Learning Objectives

1. To acquire knowledge on static properties of nuclei and its stability.
2. To understand the background of various nuclear models.
3. To know about different modes of decay and interaction of nuclear radiations with matter

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO 1	understanding on the basics of nuclear physics that treats atomic nuclei as self-bound many-body quantum systems	**PSO-1**	**U**
CO2	ledge about particle- antiparticle, decay processes and their outcomes.	**PSO-2**	**U**
CO 3	basic interaction between fundamental particles.	**PSO-4**	**An**

Unit I **12 hrs**

Properties and structure of Nuclei: General properties of nucleus- binding energy – BE/A curve - significance - proton electron theory- proton neutron theory -nuclear forces – characteristics –Meson theory of nuclear forces – Yukava Potential- Nuclear models.

Unit II **12 hrs**

Radio Activity: Fundamental laws of radio activity –theory of α ,β and Υ decay- properties of alpha, beta and gamma rays - neutrino and its properties-electron capture. - nuclear isomers-Mossabauer effect - applications- Radio carbon dating- radio isotopes – uses.

Unit III: **12 hrs**

Nuclear Reactions: Kinematics of nuclear reaction-nuclear fission –Nuclear fusion – Nuclear reactor-uses - atom bomb - hydrogen bomb-fusion reactor –plasma confinement – artificial transmutation-Q value of nuclear reaction-types of nuclear reaction

Unit IV **12 hrs**

Nuclear Detectors and Particle Accelerators: Neutron sources and properties-Detectors-G.M.Counter-scintillation counter- bubble chamber-Wilson cloud chamber-Accelerators-cyclotron- synchrocyclotron-betatron-synchrotrons

Unit V **12 hrs**

Cosmic Rays and Elementary Particles: Cosmic rays-introduction-discovery-latitude, altitude and azimuth effects- longitudinal effect-north –south effect-seasonal and diurnal changes-primary and secondary cosmic rays-nature of cosmic rays- cosmic ray showers-Van Allen belt- origin of cosmic radiation. Elementary particles-introduction-particles and antiparticles-antimatter-the fundamental interaction-elementary particle quantum numbers-conservation laws and symmetry-the quark model

Text Books

1. N.Subrahmanyam and Brijlal. (1996) *Atomic and Nuclear Physics*,1st Edition, New Delhi: S Chand & Co.

2. Tayal D.C. (2006).*Nuclear Physics,* Mumbai: Himalaya Publishing House.

3. R.C.Sharma. (2000).*Nuclear Physics,* Meerut: Nath& Co

4. Irving Kaplan.(2002).*Nuclear Physics*, 2nd Edition New Delhi: Narosa Publishing house.

Reference Books

1. R.R.Roy and B.P.Nigam. (1997).*Nuclear Physics*, 1st Edition, NewDelhi: New Age International (P) Ltd.

2. Longo. (1973). *Fundamentals of Elementary ParticlePhysic*s, 1st Edition, US: McGraw-Hill.

3. W.A. Benjamin. (1997).*Nuclei and Particles*,1st Edition, USA

Semester: VI

Major – Elective- III (a)- Mathematical Physics

Course code: PC2064

Hours/Week	Credits	Total Hours	Marks
5	4	75	100

Learning Objectives

1. To understand the various mathematical methods used in Physics.
2. To employ mathematical tools to solve various problems in Physics.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	Illustrate linear dependence and combination of vectors as quantities in Physics.	PSO-4	U
CO-2	Solve ordinary and partial differential equations related to Physical Science.	PSO-2	C
CO-3	Evaluate problems in matrices.	PSO-4	E
CO-4	Adapt Laplace transform technique to obtain the Laplace series of periodic functions of Physics.	PSO-5	C
CO-5	Understand and manipulate random variables using the theory of probability including tools of probability transformation and characteristic functions.	PSO-6	U

UnitI 12 hrs

Vectors: Vectors and scalars-Vector algebra-The scalar product-The vector (cross or outer) product-The triple scalar product-The triple vector product-The linear vector space Vn- Vector differentiation -Space curves - Motion in a plane - A vector treatment of classical orbit theory - Vector differential of a scalar field and the gradient - Conservative vector field - The vector

differential operator - Vector differentiation of a vector field - The divergence of a vector - The operator A^2, the Laplacian - The curl of a vector.

Unit II **12 hrs**

Differential Equation: First-order differential equations - Separable variables -Exact Equations-Integrating factors -Bernoulli's equation- Second-order equations with constant coefficients - Nature of the solution of linear equations - General solutions of the second-order equations - Finding the complementary function - Finding the particular integral - Rules for D operators - The Euler linear equation - Solutions in power series.

Unit III **12 hrs**

Matrix: Definition of a matrix - Four basic algebra operations for matrices - Equality of matrices - Addition of matrices - Multiplication of a matrix by a number - Matrix multiplication - The commutator - Powers of a matrix - Functions of matrices - transpose of a matrix - Symmetric and skew-symmetric matrices - The matrix representation of a vector product - The inverse of a matrix - A method for finding A-1 - Systems of linear equations and the inverse of a matrix - Complex conjugate of a matrix - Hermitian conjugation - Hermitian/anti-Hermitian matrix - Orthogonal matrix (real) - Unitary matrix - Rotation matrices - Trace of a matrix.

Unit IV **12 hrs**

Laplace Transformation: Definition of the Laplace transform - Existence of Laplace transforms - Laplace transforms of some elementary functions - Shifting (or translation) theorems - The first shifting theorem - The second shifting theorem - The unit step function - Laplace transform of a periodic function - Laplace transforms of derivatives - Laplace transforms of functions defined by integrals - A note on integral transformations.

Unit V **12 hrs**

Partial Differential Equations: Linear second-order partial differential equations - Solutions of Laplace's equation: separation of variables - Solutions of the wave equation: separation of variables - Solution of Poisson's equation. Green's functions - Laplace transform solutions of boundary-value problems

Text Books

1. Tai L. Chow. (2000). *Mathematical Methods for Physicists: A concise introduction*. Cambridge University Press.

2. R.Murugesan. (2014). *Mechanics and Mathematical Physics*. Sultan Chand & Co.

Reference Books

1. Piyoosh Kumar Tyagi. (2018). *Mathematical Physics*.RBSA Publishers.

2. SatyaPrakash. (2021). *Mathematical Physics*. Sultan Chand & Co.

3. Gupta. (2009). *Mathematical Physics*. Sultan Chand & Co.

4. James Nearing. (2010). *Mathematical Tools for Physics*. New York. Dover Publications.

Semester VI

Major – Elective- III (b)-Nanophysics

Course Code: PC2065

Hours /Week	Credits	Total hours	Marks
5	4	75	100

Learning Objectives

1. To gain knowledge on synthesis and characterization of nanomaterials.
2. To understand the advancements and applications of nanostructures.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	infer the history of nanotechnology and explain the synthesis of nanomaterials.	**PSO - 1**	**U**
CO - 2	Interpret quantum well, quantum wires and quantum dots.	**PSO - 5**	**E**
CO - 3	explain the carbon nanotubes and its applications.	**PSO - 6**	**E**
CO - 4	discuss the applications of nanotechnology in various fields.	**PSO - 4**	**C**

Unit I: 12 hrs

Nanomaterials: History of Nanotechnology- Background - Conceptual origins - Experimental advances - Nanostructures-Nanomaterials -Synthesis of oxide nanoparticles-Sol-gel processing - Synthesis of semiconductor nanoparticles-Arrested precipitation - Synthesis of metallic nanoparticles -Sonochemical reduction process - Electrochemical deposition method - Biosynthesis of nanoparticles.

Unit II: **12 hrs**

Quantum Hetero structure: Super lattice - Preparation of Quantum nanostructure - Quantum well lasers - Quantum cascade laser - Application -Quantum wire - production of nanowires - Structure of nanowires - Use of nanowires - Quantum dot - Application of Quantum dots - Quantum dot information storage - Quantum dot infrared photo detectors - Quantum dot lasers.

Unit III: **12 hrs**

Carbon Nanotubes: Discovery of Nanotubes - Carbon Allotropes - Diamond - Graphite - Carbon Nanotubes - Types of carbon Nanotubes- Single walled carbon nanotubes - Multiwalled carbon nanotube - Fullerite - Torus - Nanobuds - Graphene sheet to a single walled nanotube - Electronic structure of Carbon Nanotubes - Synthesis of Carbon Nanotube - Electric Arc Discharge method - Laser method.

Unit IV: **12 hrs**

Magneto Electronics: Nanocrystalline soft material - Permanent magnet material - Theoretical background - Super paramagnetism - Coulomb blockade - Quantum cellular Automata - Spintronics - Giant magneto resistance (GMR) - Types of GMR.

Unit V: **12 hrs**

Application of Nanotechnology: Chemistry and Environment - Energy applications of nanotechnology - Information and Communication - Heavy Industry – Consumer goods - Nanomedicine - Medical application of Nanotechnology- Biomarkers and Bioimaging - Targeted drug delivery - Nanorobots.

Text Books

1. Sr. GerardinJayam (2019), *Nanophysics,* Department of Physics.

2. RamachandraRao,M.S, Shubra Singh. (2013). *Nanomaterials,* New Delhi: Wiley India pvt. Ltd.

Reference Books

1. T. Pradeep, (2007),*Nano the Essentials*, Tata Mc.Graw Hill Company. Ltd.
2. RaoC. N. R, Muller. A,CheethamA.K, (2004). *TheChemistryofNanomaterials:Synthesis,PropertiesandApplications*,Germany.
3. Charles P. Poole, Frank J. Owens. (2008). *Introduction to Nanotechnology*, (1st ed.), Germany:Wiley publications
4. Mohankumar, G. (2016). *Nanotechnology-Nanomaterials and Devices*, (1sted.).New Delhi:Narosa publishing House

Semester VI

Major – Elective- III (c)-Astrophysics

Course Code: PC2066

Hours / Week	Credits	Total Hours	Marks
5	4	75	100

Learning Objectives

1. To enable the students to understand and realize the historical evolution of Universe and principles involved in Astrophysics
2. To provide knowledge on Solar system, History of Earth, Earth atmosphere, Astronomical telescopes, Classification of Stars, galaxy nomenclature which play a key role in the future employability and global progress of students.

Course Outcome

COs	Upon completion of this course, the students will be able to :	PSO addressed	CL
CO- 1	**Perceive** the historical evolution of solar system and planets	PSO-2	E
CO- 2	**Describe** the principles of physics in the formation of astronomical objects like planets-Satellites - Asteroids and Comets	PSO-3	U
CO- 3	**Examine** the requirements and limitations of instrumentation for modern astrophysical observations (Optical telescopes and Radio telescopes)	PSO-5	An
CO- 4	**Analyse**the formation of stars, pulsars, Neutron stars and Black holes	PSO-5	An
CO -5	**Interpret** the observations of Galaxies, star clusters, Galactic clusters.	PSO-2	E
CO -6	Distinguish between some cosmological models of the universe and its observational tests.	PSO-6	Ap

Unit I **12 hrs**

Birth of Modern Astronomy: Geocentric and Heliocentric theories —– Kepler's laws of planetary motion – Newtonian gravitation – Celestial sphere – Planets – Terrestrial and Jovian planets (Planets individual description is not required in detail) - Asteroids- Meteorites – Comets.

Unit II **12 hrs**

Telescopes : Elements of telescope – Properties of images – Types of Optical telescopes – Refracting and Reflecting telescopes- Radio telescope – Spectrograph – Limitations – Photographic photometry – Photoelectric photometry – Spectrophotometry – Detectors and image processing.

Unit III **12 hrs**

Sun : Physical properties – Composition – Core – Nuclear Reactions – Photosphere – Chromosphere – Corona – Sunspots – Sunspot cycle – Solar Wind – Auroras – space weather effects – History of the Earth – Temperature of a planet – The atmosphere – Pressure and Temperature distribution – Magnetosphere – Eclipses – Solar and Lunar Eclipses.

Unit IV **12 hrs**

Classification of Stars : The Harvard Classification system – Luminosity of a Star – Hertzprung-Russel Diagram – Stellar evolution using the HR diagram – Theoretical evolution of stars – White Dwarfs – Neutron stars-Black holes – Event horizon – Basic physics of Black Holes.

Unit V **12 hrs**

Galaxy nomenclature : Types of Galaxies – Spiral – Elliptical – irregular galaxies – Milky Way Galaxy and its structure – Rotation and Mass Distribution – Rotation curve and Doppler shift – Star clusters – Galactic clusters – Pulsars – Cosmological Models – Big bang theory – Steady state theory – Hubble's law – Olber's paradox.

Text Books

1. Niclolas. A. Pananides and Thomas Arny, (1979). *Introductory Astronomy*, Addison Wesley Publ. Co.
2. MujiberRahman.A. (2018).*Concepts to Astrophysics*, Scitech Publications, Chennai.

Reference Books

1. Abell, Morrison and Wolf, (1987). *Exploration of the Universe*, 5th ed., Saunders College Publ.
2. Carrol and Ostlie, (2007). *Introduction to Modern Astrophysics*, 2nd ed., Pearson International.
3. William J. Kaufmann, III, (1977). *Relativity and Cosmology*, Macmillan Publishing company, London.
4. Abhyankar, K.D., (2001). Astrophysics: Stars and Galaxies, Universities Press.

Semester VI

Skill Enhancement Course

Basic Electrical Circuits and Instruments

Course code: SEP203

Hours/Week	Credits	Total hours	Marks
2	2	30	100

Learning Objectives

1. To acquire knowledge on the basic electrical parameters, circuits and wiring.
2. To understand the concept of electronic devices and to develop basic trouble shooting skills.

Course Outcome

COs	Upon completion of this course, students will be able to	PSO Addressed	Cognitive Level
CO-1	Recall the basic definitions and units of electrical quantities	PSO-1	R
CO-2	Analyze the circuit elements and their connections	PSO-2	An
CO-3	Develop their own circuits using electrical wiring	PSO-5	Ap
CO-4	Compare the Physics concepts behind various electrical instruments and appliances (Voltmeter, Ammeter, Incandescent lamp, fluorescent bulb, Choke and Starter)	PSO-3	Ev
CO-5	Demonstrate uses of tester &Multimeter, LDR, Microphone, loudspeaker, etc.,	PSO-6	U
CO-6	Test for the working of electrical circuits and appliances (music bell, lamp controlled by switch, etc.,)	PSO-5	An

Unit I 15 hrs

Electrical quantities: Introduction to Electricity - Current - Voltage - Resistance - Ohm's Law - DC Circuit - Series Circuits - Parallel Circuits- AC Voltage – Alternating Current (AC) - Sine Waves - AC vs. DC - Electric Power- Units of Power.

Unit II I5 hrs

Basic Electrical Circuits and Components: Symbols of electrical elements - Resistors - Conductors - Inductor – Capacitor and transformer - Single phase and three phase - Star and delta connections - Rules of electric connections - Study of motors and Generators.

Unit III I 5 hrs

Electrical Wiring: Systems of supply – Systems of wiring – Testing of wiring installation – Materials used for wiring – A lamp controlled by a switch – Number of lamps each controlled by its switch –Earthing - Lamp holders, sockets - Fuse base - Distribution box –Trip switches

Hands on training

a. Uses of tester &Multimeter.
b. A lamp controlled by a switch with fuse circuit and lamp controlled by two switches.
c. Calling bell. (demo)
d. Florescent lamp wiring and testing.
e. Music bell.
f. LDR application.
g. Working of a relay.
h. Microphone – amplifier – Loudspeaker setup.
i. Blinking LED
j. Domestic sensors

Text Book

Course material prepared by the Department of Physics, Holy Cross College (Autonomous), Nagercoil..

Reference Books

1. Arnold, R.B. (1986). *A first electronics course*. (1st ed.). Cheltenham, England: Stanley Thornes (Publishers) Ltd.
2. Theraja, B. L. *A text book in Electrical Technology* (23rd ed.). New Delhi: S. Chand and Company.

Self – Learning Course

Physics for Competitive Examination - I (PC20S1)

Credits	Marks
2	100

Learning Objectives

1. To have clear idea on the basics of physics principles to face challenges / competitive exams.
2. To motivate the students for career opportunities.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	recall the principles of mechanics and conservation laws.	**PSO - 1**	**R**
CO - 2	understand the concept of fluid dynamics.	**PSO - 2**	**U**
CO - 3	categorize different kinds of oscillations.	**PSO - 3**	**An**
CO - 4	examine the various aberrations and geometry involved in optics.	**PSO - 7**	**An**
CO - 5	apply the laws of thermodynamics on heat phenomena.	**PSO - 4**	**Ap**

Unit I

Mechanics and waves: Dimensional analysis – Newton's laws of motion and applications – Variable mass systems – Projectiles – Rotational dynamics – Moment of inertia – Conservative forces and frictional forces – Gravitational potential and field intensity – Central forces – Kepler's Laws – Escape velocity and artificial satellite (including GPS) – Streamline motion – Viscosity – Poiseuille's equation – Application of Bernoulli's equation – Stokes law – Special theory of relativity – Lorentz transformation – Mass – Energy relation – Waves and

simple harmonic motion – Lissajous figures – Damped oscillation – Undamped oscillation - Resonance – Beats – Stationary waves – Vibration of strings and air coloumns – Logitudinal waves in soul ultrasonics and applications.

Unit II

Geometrical and physical optics: Laws of reflection and refraction from Fermat's principle – Matrix – Method in paraxial optics – Chromatic and spherical aberration – Optical instruments – Huygen's principle – Reflection and refraction of waves – Interference of light – Young's double slit experiment – Interference by thin films – Interferometers – Diffraction of light – Fraunhoffer diffraction – Fresnel diffraction – Polarization of light – Double refraction – Quarter – Wave plates and Half-wave plates – Polarizing sheets – Optical activities and its applications – Elements of fibre – Optics – Pulse – Dispersion in optical fibers – Material dispersion - Lasers – Applications of laser.

Unit III

Heat and thermodynamics: Terminologies of thermodynamics – Thermal equilibrium and temperature (Zeroth Law of Thermodynamics) – Heat and the first law of thermodynamics – Kinetic theory and equation of state of an ideal gas – Mean free path – Distribution of molecular speeds and energies – Transport phenomena – Andrew's experiments – Vander - Waal's equation of state – Joule – Kelvin effect Brownian motion – Thermodynamic potential and Maxwell relation – Phase transition – Kirchhoff's laws of heat radiation – Black – body radiations – Stefan – Boltzmann's law – Spectral radiance and application to the cosmic microwave background radiation – Wien's displacement law – Planck's radiation law.

Text Books

1. Nayyar, N.K. (2009).*Unique Quintessence of Physics* (For M.Sc. Entrance Examinations (All Universities) &other Competitive Examinations). New Delhi: Unique Publishers.
2. Daniel Gebresselasie. (2015).*Mechanics, Thermodynamics, Oscillations and Waves*, College Physics I.1st Edition. www.bookboon.com.

Self – Learning Course

Physics for Competitive Examination - II (PC20S2)

Credits	Marks
2	100

Learning Objectives

1. To have clear idea on the basics of Physics principles to face challenges/competitive exams.
2. To motivate the students for career opportunities.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	discuss the principles and generation of electric charges.	**PSO - 1**	**R**
CO - 2	classify the different types of magnetic materials.	**PSO - 2**	**U**
CO - 3	correlate the mechanisms involved between magnetism and electricity.	**PSO - 3**	**An**
CO - 4	discuss the principles behind the phenomena of atomic physics and nuclear reactions.	**PSO - 2**	**An**
CO - 5	differentiate metals, conductors and insulators.	**PSO - 4**	**Ap**
CO - 6	recognize the elements of microprocessors and computers	**PSO - 2**	**U**

Unit I

Electricity and magnetism: Electric charge : Coulomb's law – Electric field : Gauss's law – Electric potential – Van-De-Graff generator (High Voltage Generator) – Capacitors – Dielectric and polarization – Ohm's law – Kirchhoff's laws – Application of Kirchhoff's law : Two loop circuits – Combination of resistances – Magnetic field – Gauss's law for magnetism

– Magnetic behaviour of matter – Magnetic susceptibility (Xm) and permeability. – Classification of magnetic materials – Circulating charges and Lenz's law – Cyclotron – Synchrotron – Hall effect – Biot-Savart's law – Ampere's circuital law – Inductance – Alternating current circuits – R.C., L.R., Single-loop, L.R.C. circuits – Impedance – Resonance – power in A.C. circuit – Displacement current – Maxwell's equations – Electromagnetic waves – Energy transport and Poynting vector.

Unit II

Atomic and nuclear physics: Photoelectric effect – Einstein's photoelectric equation – Bohr's theory of hydrogen atom – Stem-Gerlach experiment – Quantisation of angular momentum – Electron spin – Pauli's exclusion principle – Zeeman effect – X-ray spectrum – Bragg's law – Bohr's theory of the Mosley plot – Compton effect – Compton wavelength – Wave nature of matter – Wave particle duality – The de-Broglie wavelength – Heisenberg's uncertainty relationship – Schrödinger's equation – Potential step and barrier penetration – Radioactivity – Binding energy of nuclei – Nuclear fission and fusion – Classification of elementary particle and their interactions.

Unit III

Electronics: Conductors, semiconductors and insulators – Diodes in half-wave and full-wave rectification – Qualitative ideas of semiconductors – *p*-type and *n*-type semiconductor – Junction diode – Transistors – Number systems – Logic gates and truth-tables – Elements of microprocessors and computer

Text Books

1. Nayyar, N.K. (2009). *Unique Quintessence of Physics* (For M.Sc. Entrance Examinations (All Universities) & other Competitive Examinations). New Delhi: Unique Publishers.
2. Griffiths, D.(2008). *Introduction to Elementary Particles*. 2nd Ed. Wiley-Vch.

Value Added Course

I B.Sc. Physics

Multimedia Training (Photoshop, Premiere Pro)

Course Code: VAP201

Credits	Total Hours	Marks
2	30	100

Learning Objectives

1. To enable students to create images for web design, logos, graphics, layouts, image touch-ups and color enhancement.

Unit I

Starting Photoshop CS2: Getting Started with Photoshop CS2 – Opening an Existing File – The photoshop Program Window – Guidelines for Working with Toolbox – Screen Modes – Creating a New File – Saving Files – Removing Files – Closing File.

Unit II

Working with Images: Vector and Bitmap Images – Opening Recently used Files – Image Size – Image Resolution – Editing Images – Opening Files Created in Illustrator or Freehand – Color Modes – Setting a Current Foreground and Background Colors – File Formats.

Unit III

Making Selections: Making Selection – The Grow and Similar Commands – Moving a Portion of an Image – Editing Selections – Copying a Selection into another Image – Filling a Selection – Transforming Selections.

Unit IV

Painting, Drawing and Retouching Tools: The painting Tools – The Drawing Tools – The Retouching Tools – Layers – Layers Palette – Working with Layers

Unit V

Filters: The Filter Menu – Filter Gallery – Extract Filter – Liquify Filter - Vanishing Point Filter – Artistic Filters – Blur Filters – Brush Stroke Filters.

Value Added Course

II B.Sc. Physics

Domestic Appliance Service

Course Code: VAP202

Hours /week	Credits	Total Hours	Marks
-	2	30	100

Unit I

Basic Electrical

1. Working Principle of Tester, EB meter, Iron Box
2. Connection of one Bulb with one switch and Bed switch
3. Extension box Assembling
4. Two way switch- Same Position and different Position
5. Blinking of 2 AC bulbs with an automatic bulb
6. Difference of Series connection and Parallel connection

Unit II

Basic Electronics

1. Functions of Transistors
2. Transistors working as a switch
3. Working of LDR , Water Tank low level - High level alarm , LED Blinking Circuits
4. Transistor working as Amplifier
5. Musical Circuit using UM66 IC

Unit III

Computer Hardware

1. Parts of the Computer

2. Parts of the CPU
3. Fittings of the computer
4. How to assemble a CPU
5. Laptop Servicing
6. Networking
7. Operating System (Windows) Installation
8. Software Installation
9. Trouble shooting of Computer and Laptop

Semester VI

Foundation Course IV- Gender Equity StudiesCourse Code: FCV204

No. of Hours per Week	Credits	Total No. of Hours	Marks
1	1	15	100

Objectives:

1. To understand the historical background and trace the position of women down the ages.
2. To make the students aware of the legitimate rights and laws that aid women to march towards emancipation and empowerment.

Course outcome

CO	Upon completion of this course the students will be able to:	PSOs addressed	CL
CO-1	develop a critical judgment regarding the views of religions, epics and literary imagination about women	PSO-4	U
CO-2	analyze the socio-cultural and religious practices that subjugate women	PSO-4	An
CO-3	probe deep into the root cause of marginalization of women	PSO- 4	U
CO-4	understand the implementation of feministic concepts in practical life	PSO- 3	U
CO-5	examine how women are exploited as commercial commodities in advertisements and media	PSO-4	An

Unit I

Women in Historical BackgroundWomen through the Ages

Unit II

Feminism – An Explanation Feminist Thoughts in Practical Life

Unit III

As Religions see WomenWomen in Christianity Women in Islam

Unit IV

The Rights of Women Women and the Constitution

Unit V

The Portrayal of Women inAdvertisements The End of Enslavement of Women Empowerment of Women: Need of the Hour

Reference Book

1. *Women in My Perspective.* (2012). Nagercoil: HCC Women's Study Centre.