A.VEERIYA VANDAYAR MEMORIAL

SRI PUSHPAM COLLEGE (AUTONOMOUS)

POONDI-613 503, THANJAVUR (DT)

SYLLABUS

B.Sc., Physics

(From 2020 - 2021 onwards)

Programme Outcomes of B.Sc.Physics

Undergraduate students acquire the capability of transferring and applying the knowledge of basic concepts and principles of various branches of Physics in their every-day life. They will be able to translate physical descriptions into mathematical equations and vice versa. Students can understand and appreciate the physical meaning of mathematical equations representing physical systems, represent and describe key aspects of physical states and systems through graphs, diagrams and solve problems using arguments based on the geometry of the systems. Students will acquire analytical and logical skills to solve problems in various branches of Physics, in higher studies and will be able to be independent learners, embracing real-time changes in the socio-technological scenario and promoting continuous improvement of the knowledge and skills needed for employment and personal development.

Programme Specific Outcomes ofB.Sc.Physics

On completion of B.Sc., Physics, students will acquire knowledge in various areas of Physics, such as Electricity, Magnetism, Electronics, Atomic &Nuclear Physics, etc. Students will be equipped with the experiments they study in theory. Students will be aware on fields such as material science, medical physics and bio-instrumentation which benefits them to do Post graduate degree.

B.Sc., Physics (2020-2021) onwards

S. No	Semester	Category	Paper Code	Title of the Paper	Maximum Marks			Minimum Marks For Pass			Hours Week	Credits
					CIA	E.E	Total	CIA	E.E	Total		
1		Language	20U1T1/H1	Tamil-I/Hindi-I	25	75	100	10	30	40	6	3
2		Language	20U1E1	English-I	25	75	100	10	30	40	6	3
3		Core	20U1PHC1	Properties of Matter and Sound	25	75	100	10	30	40	7	5
4	I	Core	20U1PHCP1	Major Practical -I	40	60	100	16	24	40	3	4
5		Allied	20U1PHMAA1	Allied Mathematics-I	25	75	100	10	30	40	5	3
		Allied	20U2PHMAA2	Allied Mathematics-II (NS)	-	-	-	-	-	-	3	-
6		ES	20U1PHES	Environmental studies	25	75	100	10	30	40	SS	1
7		Language	20U2T2/H2	Tamil-II/Hindi-II	25	75	100	10	30	40	6	3
8		Language	20U2E2	English-II	25	75	100	10	30	40	6	3
9		Core	20U2PHC2	Mechanics and Special theory of Relativity	25	75	100	10	30	40	5	4
10	II	Core	20U2PHC3	Electricity & Electromagnetism	25	75	100	10	30	40	4	4
11		Allied	20U2PHMAA2	Allied Mathematics-II (NS)	25	75	100	10	30	40	3	4
12		Allied	20U2PHMAA3	Allied Mathematics-III	25	75	100	10	30	40	5	3
13		SBE	20U2PHS1	Skill Based Elective-I Electrical Wiring Fundamentals	25	75	100	10	30	40	1	1
14		VBE	20U2PHVE	Value Based Education	25	75	100	10	30	40	SS	-
15		Language	20U3T3/H3	Tamil-III/Hindi-III	25	75	100	10	30	40	6	3
16		Language	20U3E3	English-III	25	75	100	10	30	40	6	3
17		Core	20U3PHC4	Thermal Physics	25	75	100	10	30	40	5	5
18	III	Core	20U3PHC5	Laser Physics	25	75	100	10	30	40	5	4
19		Allied	20U3PHCHA1	Allied Chemistry-I	25	75	100	10	30	40	5	4
		Allied	20U4PHCHAP1	Allied Chemistry Practical- I(NS)	-	-	-	-	-	-	3	-
20		GS	20U3PHGS	Gender Studies	25	75	100	10	30	40	SS	
		Extra Credit Course		Massive Open Online Course	-	-	-	-	-	-	-	

S. No	Semester	Category	Paper Code	Title of the Paper	Maximum Marks			Minimum Marks For Pass			Hours Week	Credits
					CIA	E.E	Total	CIA	E.E	Total		
21	IV	Language	20U4T4/H4	Tamil-IV/Hindi-IV	25	75	100	10	30	40	6	3
22		Language	20U4E4	English-IV	25	75	100	10	30	40	6	3
23		Core	20U4PHC6	Optics	25	75	100	10	30	40	6	5
24		Core	20U4PHCP2	Major Practical-II	40	60	100	16	24	40	3	4
25		Allied	20U4PHCHA2	Allied Chemistry-II	25	75	100	10	30	40	5	4
26		Allied	20U4PHCHAP1	Allied Chemistry Practical NS)	40	60	100	16	24	40	3	2
27		SBE	20U4PHS2	Skill Based Elective-II Domestic Electrical Appliances and Measuring Instruments	25	75	100	10	30	40	1	1
				Massive Open Online Course (MOOC)	-	-	-	-	-	-	-	-
28	V	Core	20U5PHC7	Atomic Physics and Wave Mechanics	25	75	100	10	30	40	5	6
29		Core	20U5PHC8	Basic Electronics	25	75	100	10	30	40	4	5
30		Core	20U5PHC9	Material Science	25	75	100	10	30	40	4	4
31		Core	20U5PHCP3	Major Practical-III	40	60	100	16	24	40	6	6
32		ME - I	20U5PHEL1A/ 20U5PHEL1B	Energy Physics/ Information Technology	25	75	100	10	30	40	4	3
33		ME - II	20U5PHEL2A/ 20U5PHEL2B	Digital Electronics/ Bio Physics	25	75	100	10	30	40	4	4
34		NME	20U5PHNME	Non-Major Elective Non-Conventional Energy Sources	25	75	100	10	30	40	2	1
35		LSD	20U5PHLSD	Life Skill Development	-	-	100	-	-	40	1	-
36	VI	Core	20U6PHC10	Nuclear Physics	25	75	100	10	30	40	5	5
37		Core	20U6PHC11	Nanoscience	25	75	100	10	30	40	5	5
38		Core	20U6PHC12	Linear Integrated Circuits	25	75	100	10	30	40	4	4
39		Core	20U6PHCP4	Major Practical-IV	40	60	100	16	24	40	6	6
40		ME - III	20U6PHEL3A/ 20U6PHEL3B	Programming in C/ History of Physics	25	75	100	10	30	40	4	3

41	ME - IV	20U6PHEL4A/ 20U6PHEL4B	8085 Microprocessor & Applications/ Communication Electronics	25	75	100	10	30	40	4	4
42	GK	20U6PHGK	General Knowledge	-	100	100	-	40	40	1	-
43	Comp. Test	20U6PHCN	Comprehensive Test	-	100	100	-	40	40	1	1
	Extra Credit Courses		Project	-	-	-	-	-	-	-	-
			Field Visit	-	-	-	-	-	-	-	-
			Value Added Course	-	-	-	-	-	-	-	-
	EA	20U6PHEA	Extension Activities	-	-	-	-	-	-	-	1
						4300				**180**	**140**

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Skill Based ELective

(Offered by Dept. of Physics)

Paper I   20U2PHS1- Electrical Wiring Fundamentals

Paper II 20U4PHS2- Domestic Electrical Appliances and Measuring Instruments

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Non-Major Elective

(Offered by Dept. of Physics)

V Semester: 20U5PHNME-Non-Conventional Energy Sources

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Abbreviations

ES: Environmental Studies	LSD: Life Skill Development
VBE: Value Based Education	GK: General Knowledge
SBE: Skill Based Elective	NME: Non-Major Elective
GS: Gender Studies	MOOC: Massive Open Online Course
ME: Major Elective	EA: Extension Activity
CC: Certificate Course	SS: Self Study

Paper Code	Total No. of Papers	Total Marks	Total Credits	Classification
Part – I	04	400	12	✓
Part – II	04	400	12	✓
Part – III Core Allied Major Elective	16 06 04 26	1600 600 400 2600	76 20 14 110	✓
Part – IV Environmental Studies Value Based Education Skill Based Elective Gender Studies Non-Major Elective Life Skill Development GK Comprehensive Test	01 01 02 01 01 01 01 01 09	100 100 200 100 100 100 100 100 900	01 -- 02 -- 01 -- -- 01 05	✓
Part - V	Extension Activity		01	X
Total	43	4300	140	✓

Comprehensive Knowledge Test: Objective type question pattern with 100 compulsory questions carrying 100 marks to be answered **in** 3 Hours with 2 credits. The portion is entire core courses.

MOOC: Massive Open Online Course is introduced in the third and fourth semester as an extra credit course from this academic year 2020-2021. Students can avail any one or more of the courses available in MOOC to equip their skills and knowledge themselves.

Field Visit / Industrial Visit / Hands on Training Programme having minimum 15 hours of contact time as an Extra credit course is introduced for II-year UG students to gain experiential learning.

Evaluation of the visit report will be held at the end of IV Semester

Components of Evaluation

Internal Marks	40
External Marks	60
Total	100

Project is introduced for III-year students to cater for the needs of advanced learners as extra credit course

Components of Evaluation

Internal Marks	40
External Marks	60
Total	100

Soft Skill Development course prescribed in V semester is changed as **Life Skill Development**.

This course will be handled by both Internal Staff and External Experts.

Mode of Assessment for this course is oral examination

Components of Evaluation

Internal Marks	40
External Marks	60
Total	100

Skill Based Elective offered by the Physics Department
1. Electrical Wiring Fundamentals
2. Domestic Electrical Appliances and Measuring Instruments

Certificate Courses offered by the Physics Department
1. Solar Energy Utilization for II UG students as anExtra credit course
2. MOOC online course – Extra credit course

Non-Major Electiveoffered by the Physics Department
Non-Conventional Energy Sources

**A.VEERIYA VANDAYAR MEMORIAL SRI PUSHPAM COLLEGE (AUTONOMOUS),
POONDI, THANJAVUR DIST.**

Question Pattern for UG and PG Programmes for students to be admitted during 2020 – 2021 and afterwards

Total Marks: 75

QUESTION PATTERN

SECTION – A
(Question 1 to 10)

10 x 2 = 20 Marks

1.   Short Answer Questions

2.   Two Questions from each units (All are answerable)

SECTION – B
(Question 11 to 15)

5 x 5 = 25 Marks

1.   5 Paragraph type questions with "either / or" type choice.

2.   One question from each unit of the Syllabus.

3.   Answer all the questions.

SECTION – C
(Question 16 to 20)

3 x 10 = 30 Marks

1.   5 Essay type questions – any three are answerable.

2.   One questions from each unit of the Syllabus.

Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
I	20U1PHT1	**இக்கால இலக்கியம்** (செய்யுள் , உரைநடை, சிறுகதை, புதினம், நாடகம் இலக்கிய வரலாறு)	6	3

நோக்கம்

1. இக்கால இலக்கிய வகைகளைக் கண்டறிவர்
2. எழுத்து,சொல் இலக்கணங்களின் அடிப்படைகளைக் கண்டறிவர்.
3. புதுக்கவிதை வாயிலாக வெளிப்படும் சமூக,அரசியல்விழுமியங்களை மதிப்பிடுவர்.
4. இக்கால இலக்கியத்தின் மீதான விருப்பத்தை மிகுவித்தல்.

கூறு:1 செய்யுள்   நேரம்:18

1. பாரதியார் : கண்ணன் என் காதலன்,கண்ணம்மா என் காதலி
   (முதல்பாடல் மட்டும்)
2. பாரதிதாசன் : தமிழின் இனிமை,தமிழ் உணர்வு
3. கவிமணி   : ஒற்றுமையே ,உயர்நிலை-நாட்டுக்குழைப்போம்
4. சுரதா   : சிக்கனம்

கூறு: 2 செய்யுள்   நேரம்:18

1. பட்டுக்கோட்டை கல்யாணசுந்தரம்:நாட்டுக்கொரு வீரன்
2. கண்ணதாசன் : காலக்கணிதம்
3. மு.மேத்தா: கண்ணீர் பூக்கள் ,ஊர்வலம்,தாய் ,வெளிச்சம் வெளியே இல்லை
4. அப்துல் ரகுமான் : தேவகானம் - தேர்ந்தெடுக்கப்பட்ட 5 பாடல்கள்

கூறு: 3 சிறுகதை   நேரம்:18

1. கேட்டிவி : குரல்கொடுக்கும் வானம்பாடி (1-10)
2. கேட்டிவி : மனோரஞ்சிதம் (1-10)

கூறு:4 புதினம்   நேரம்:18

புதினம் : துணிந்தவன் - வல்லிக்கண்ணன்

கூறு:5 நாடகம் ,இலக்கிய வரலாறு   நேரம்:18

1.நாடகம் : மாமன்னன் இராசராசன் - கு.வெ.பாலசுப்பிரமணியன்
2.இலக்கிய வரலாறு : இருபதாம் நூற்றாண்டு இலக்கியங்கள்

பயன்கள்

1. தமிழ் இலக்கியத்தின் மீதான ஆர்வம் மிகும்.
2. புதிய இலக்கிய வளங்களை அறிவர்.
3. கவிதை, சிறுகதை ஆகியவற்றைப் படைக்க முயல்வர்.
4. போட்டித் தேர்வுகளுக்குச் செல்பவர்கள் பயன் பெறுவர்.
5. நாடகக் கலைத்திறனை அறிவர்

Semester	Course Code	Title of The Course	Hours of Teaching/ Week	No. of Credits
I	20U1PHE1	**PART – II - Prose, Poetry and Communication Skills**	6	3

Objective
> ➢ **To initiate the students to understand English through Prose, Poetry and Basic Communicative Grammar.**

Unit – I

Shakespeare   - Shall I Compare Thee to a Summer's Day?
John Milton   – On His Blindness
William Wordsworth – The Solitary Reaper
P.B.Shelley   – Song to the Men of England
Robert Frost   – The Road not Taken
Nissim Ezekiel   - Night of the Scorpion

Unit – II

1) The Running Rivulets of Man,   2) Parliament is Marking Time
3) The Lady in Silver Coat,   4) Mr. Applebaum at Play

Unit – III

1) The Feigning Brawl of an Impostor,   2) Thy Life Is My Lesson
3) Solve the Gamble,   4) The Stoic Penalty

Unit – IV

1) Nobility in Reasoning,   2) Malu the Frivolous Freak
3) Bharath! Gird Up Your Loins!   4) Honesty is the Cream Of Chastity

Unit – V

Parts of Speech, Nouns, Pronouns, Conjunctions, Adjectives, Articles, Verbs, Adverbs, Interjection – sentence.

Course outcomes:
After the completion of this course, students will be able to
> ➢ **understand and appreciate the English Prose, Poetry and basic functional communicative Grammar and study on style and substance.**
> ➢ **develop interest in appreciation of literature**
> ➢ **integrate the use of the four language skills: LSRW.**
> ➢ **communicate appropriately and use English effectively**
> ➢ **imbibe ethical, moral, national and cultural values**

Prescribed Texts:
K.T.V. *A Melodious Harmony.* Thanjavur: Rajendra Publishing House, 2017.
Natarajan, K. *FlyingColours.* Chennai: New Century Book House (P) Ltd., 2017.
Advanced Grammar and Composition. Chennai: New Century Publishing House, 2017.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
I	**20U1PHC1**	**Core – Properties of Matter and Sound**	**7**	**5**

Objectives:
- To gain the knowledge on gravitation.
- To understand the basic properties of materials.
- To acquire knowledge about acoustics.

Unit –I Gravitation

Kepler's laws of planetary motion – Newton's law of gravitation – deduction ofNewton's law of gravitation from Kepler's laws – Determination of G by Boy's method – mass and density of earth - gravitational field intensity –gravitational potential - Gravitational potential and field at a point outside and inside a spherical shell – Earthquakes – Seismic waves – Seismography.

Unit –II Elasticity

Stress – strain - Hook's law – stress vs strain curves – typesof moduli of elasticity – Poisson'sratio - Experimental determination of rigidity modulus bystatictorsion– Twisting couple on a cylinder –determination of rigidity modulus of a wire byTorsional pendulum – Bendingof beams – Expressionfor bending moment – Depressionof the free end of a cantilever –determination of Young's modulus by non-uniform bending – uniform bending – I Section of girders.

Unit – III Viscosity and Surface tension

Viscosity - Poisoulli'sformula – Theory and experiment for highly viscous liquid- Searle's viscometer- Meyer's formula for gases- determination of viscosity of gases by Rankine's method Surfacetension: surface energy – Determination of surface tension of water by capillary rise – surface tension by the method of drops- interfacial surface tension – Expression for excess of pressure – spherical drop and bubble- angle of contact – Quincke's method.

Unit – IVHydrostatics and Centre of Pressure

Pascal's law – Thrust on an immersed plane – Centre of pressure – particular cases of centre of pressure - vertical rectangular lamina – vertical triangular lamina-vertical circular lamina – Atmospheric pressure – Correction of barometric reading – Change of pressure with altitude – reasons for such variation

Unit –V Acoustics and Ultrasonics

Musical sound and noises - Laws of transverse vibrations in strings – Melde's string experiment -Characteristics of musical sound – Acoustics of buildings – reverberation- reverberation time -Sabine's formula –Echoes and Echo effect – factorsaffecting acoustics of buildings – determinationof absorption coefficient – Ultrasonics – Properties – Productionmethods:Magnetostrictionand Piezoelectricmethods– Uses.

Course Outcomes:
After studying this course, students will
- gain knowledge about earthquakes and seismography.
- acquire fundamental knowledge on various properties of matter.
- acquire fundamental knowledge on various properties of sound.
- aware on the principles to be observed in design of acoustically good auditorium.

Books for Study
1. Properties of matter – Brijlal and N. Subramanian.
2. Properties of matter and sound – R. Murugesan.
3. Hydrostatics – Narayanmurthi.

Books for Reference
1. Properties of matter – D.S.Mathur.
2. Fundamentals of physics - Haliday and Resnik.
3. Sound – Brijlal and Subramanian.
4. Advanced level physics - Melkan and Marker
5. Physics for scientists and engineers - Paul.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
I	20U1PHCP1	**Core – Major Practical – I**	3	4

Objectives:
- To gain the knowledge in experiments related to elasticity and viscosity.
- To acquire knowledge in experiments related to surface tension and sound.

List ofExperiments – Any TEN Experiments

1. Compound pendulum –Determination of acceleration due to gravity "g".

2. Uniform bending (Telescope and optic lever) - Determination of Young's Modulus.

3. Non uniform bending (pin and microscope) - Determination of Young's Modulus.

4. Cantilever depression (microscope) - Determination of Young's Modulus.

5. Koenig's method – Determination of Young's Modulus.

6. Torsional pendulum –Moment of inertia of a given disc and Rigidity modulus of a given wire.

7. Static torsion – rigidity modulus "n".

8. Drop weight method - Surface tension and Interfacial Surface tension.

9. Surface tension – Capillary rise method.

10. Stoke's method –Coefficient of viscosity of liquid.

11. Capillary flow method-viscosity of liquid.

12. Searle's viscometer – viscosity of liquid.

13. Mayer's disc – viscosity of liquid.

14. Melde's experiment.

15. Sonometer –verification of laws and frequency determination.

16. Resonance column experiment – velocity of sound.

Course Outcomes:
On completion of the course, students
- gain skills in doing experiments related to properties of matter and sound.
- will be aware on experiments related to gravitation, elasticity and heat.

Semester	Subject Code	Title of the Paper	Hours of Teaching/Week	No. of Credits
I	20U1PHMAA1	**Allied Mathematics-I**	5	3

Objectives:

➢ To introduce the concept of binomial, exponential and logarithmic series.
➢ To teach the relation between circular and hyperbolic function.
➢ To impart the knowledge of the methods to find radius of curvature and centre of curvature.

UNIT-I

Algebra: Binomial series - Application of Binomial theorem to the summation of series - Exponential series - summation of series using exponential series- Logarithmic series.

UNIT-II

Theory of Equations: Nature of roots – Relation between the coefficients and the roots of an algebraic equation – Transformation of equations – Reciprocal Equations.

UNIT-III

Matrices: Eigen values and eigen vectors – Diagonalisation – similar matrices – Cayley-Hamilton theorem – Eigen values for symmetric matrices.

UNIT-IV

Trigonometry: Expansion of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ – Powers of Sines and Cosines of θ in terms of multiples of θ – expansion of $\sin\theta$ and $\cos\theta$ in a series of ascending powers of θ – Hyperbolic Functions – Relation between hyperbolic functions.

UNIT-V

Differential Calculus: **Curvature – circle, radius and centre of curvature – Cartesian formula for radius of curvature – coordinates of centre of curvature - parametric form - Maxima and minima of a function of two variables.**

COURSE OUTCOMES:

After completion of the course, Students will be able to

➢ find the eigen values, eigen vector of a given matrix.
➢ calculate centre and radius of curvature.
➢ apply differential calculus to geometrical problems.
➢ understand the concept of matrices, in solving a system of linear equation.
➢ sum the series using binomial, exponential and logarithmic series

Textbook:

Ancillary Mathematics, Volume-I, S. Narayanan, R. Hanumantha Rao, T.K.Manicavachagom

Pillay, S. Viswanathan Printers Pvt. Ltd., 2013.

Unit I	:	Chapter 1 (Pages: 7 – 17, 28 – 37, 40 - 49)
Unit II	:	Chapter 2 (Pages: 59 – 83)
Unit III	:	Chapter 3 (Pages: 151 – 164)
Unit IV	:	Chapter 5 (Pages: 220 – 247)
Unit V	:	Chapter 6 (Pages: 296 – 309, 318 – 326)

References:
1. *Allied Mathematics, Paper-I, First Semester*, P. Kandasamy and K. Thilagavathy, S.Chand & Company Pvt. Ltd., New Delhi, 2014.
2. *Algebra Volume I*, T.K.M. Pillay, T. Natarajan and K.S.Ganapathy,
3. *Calculus Volume I*, S. Narayanan and T.K. Manicavachagom Pillay,
4. *Trigonometry*, Narayanan and T.K.Manicavachagom Pillay,

Semester	Subject Code	Title of the Paper	Hours of Teaching/Week	No. of Credits
I & II	**20U1PHMAA2**	**Allied Mathematics-II**	**3**	**-**

Objectives:
- ➢ To introduce the concepts of correlation and regression.
- ➢ To teach the concepts of interpolation, numerical solution of ordinary differential equation and multiple integrals.
- ➢ To enrich the knowledge of application of multiple integrals.

UNIT –I

  Correlation and Regression: Karl Pearson coefficient of correlation – Rank correlation – Regression: Regression coefficients – Properties of regression coefficients

UNIT – II

  Interpolation: **Gregory Newton forward interpolation formula - Backward interpolation formula- Gauss forward interpolation formula - Backward interpolation formula – Lagrange's interpolation formula** *(no proofs, simple problems only)***.**

UNIT – III

  Numerical solution of ordinary differential equation: Taylor series – Euler's method – Modified Euler's method – R. K method (4th order only).

UNIT – IV

  Beta and Gamma Functions: Definitions – Convergence of $\Gamma(n)$ – Recurrence formula of gamma function – Properties of beta function – relation between beta and gamma functions - Problems.

UNIT – V

  Multiple integral: Double integral – Evaluation of double integral - change of order of integration – Polar coordinates - Triple integrals - Application of multiple integrals.

Course Outcomes:
After completion of the course, students will be able to,
- ➢ give information on the strength and direction of the linear relationship between two variables using correlation.
- ➢ find numerical approximations to the solutions of ODE.
- ➢ calculate the area of a region, the volume under a surface and the average values of a function of two variables.
- ➢ know the relation between beta and gamma function.
- ➢ distinguish the overall mathematical knowledge gained to demonstrate and analyze the problems in real life situation.

Text Book:

1. ***Fundamentals of Mathematical Statistics,*** *S.C. Gupta, V. K. Kapoor, Sulthan, 2002.*
   Unit I: Chapter – 10(Sec.10.2–10.4, 10.7), Chapter – 11(Sec.11.1–11.2.2)

2. ***Numerical methods****, P. Kandasamy, Thilagavathi and Gunavathi*
   Unit II: Chapter: 6 (6.1-6.3), Pages: 209 – 225, Chapter: 7 (7.1-7.4), Pages:

   231 – 240, Chapter: 8 (8.7 only), Pages: 271 - 276.

   Unit III: Chapter – 11(Sec.11.5, 11.9, 11.11 – 11.3), Pages:352 – 358,369 -389

3. ***Calculus Vol II : T.K. M. Pillai, 2015***
   Unit IV: Chapter 7 (Sec: 2 – 5)
   Unit V : Chapter 5 (Sec: 2 – 5.3)

General References:

    1. Statistics   -   M. Sivathanupillai

    2. Ancillary Maths -   P.R.,Vittal, Margam Publications.

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
II	**20U2PHT2**	**இடைக்கால இலக்கியம் – பயன்முறைத் தமிழ் –இலக்கண இலக்கிய வரலாறு,**	**6**	**3**

நோக்கம்

1. தமிழிலக்கிய வரலாற்றில் பக்தி இலக்கியங்கள் பெறும் சிறப்பை உணர்வர்.
2. சமய வழிச் சமூக மாற்றத்திறன் பெறுவர்.
3. சமய நல்லிணக்க உணர்வை மாணவர்கள் பெறுவர்.

கூறு: 1   **நேரம்:18**

1. திருஞானசம்பந்தர் தேவாரம் : சீகாழி திருப்பதிகம்—
அடலேற அமருங்கொடி அன்ன (பா.எ.360—370)
2. திருநாவுக்கரசர் தேவாரம் : திருவையாற்றுப் பதிகம்
விடகிலேன், அடிநாயேன்; வேண்டியக் கால் யாதொன்றும் (பா.எ.124—133)
3. சுந்தரர் தேவாரம் : திருமழபாடி பதிகம்
பொன் ஆர் மேனியனே! புலித்தோலை அரைக்கு அசைத்து,(பா.எ.1-10 பாடல்கள்)
4. மாணிக்கவாசகர் : திருவாசகம் - பிடித்த பத்து

கூறு: 2   **நேரம்:18**

1. பெரியாழ்வார் : திருமொழி - தாய்ப்பால் உண்ண அழைத்தல் 129—138 வரை
10 பாசுரங்கள்
2. குலசேகர ஆழ்வார்: பெருமாள் திருமொழி- இராமர் தாலாட்டு - 719—729
11 பாசுரங்கள்
3. ஆண்டாள் நாச்சியார்: நாச்சியார் திருமொழி - திருமணக்கனவை உரைத்தல்
4. திருப்பாணாழ்வார் : அமலனாதிபிரான் - 10 பாசுரங்கள்

கூறு: 3   **நேரம்:18**

1. குமரகுருபரர் : வருகைப் பருவம் - 10 பாடல்கள்
2. திரிகூடராசப்பக்கவிராயர் :குற்றாலக் குறவஞ்சி - குறத்தி மலைவளம் கூறல்
3. வீரமாமுனிவர் : தேம்பாவணி - காட்சிப்படலம் முழுவதும்
4. உமறுப்புலவர் : சீறாப்புராணம்-விலாதத்துக் காண்டம்-கதீஜா கனவு கண்ட படலம்

கூறு: 4 பயன்முறைத்தமிழ்   **நேரம்:18**

எழுத்தியல்: உயிரெழுத்து, மெய்யெழுத்து, உயிர்மெய்யெழுத்து,முதலெழுத்து, சார்பெழுத்து, மொழிக்கு முதலாகவும் இறுதியாகவும் வரும்எழுத்துக்கள்,போலி.
சொல்லியல்: இலக்கண, இலக்கிய வகையிலான சொர்கள்.
பொதுவியல் : எழுத்துப் பிழைகளை நீக்குதல்,எழுத்துப் பிழைகளும்
திருத்தங்களும்,வலி மிகுதல்,வலிமிகாமை ,வாக்கிய அமைப்புக்கள், நிறுத்தற் குறியீடுகள்.

கூறு;5இலக்கணஇலக்கிய வரலாறு   **நேரம்:18**

1. இலக்கண வரலாறு (தமிழ்த்துறை வெளியீடு)
2. தமிழ் இலக்கிய வரலாறு: இடைக்கால இலக்கியம்

பயன்கள்

1. பல்வகை சமய இலக்கியப் போக்குகளை அறிந்து கொள்வர்.
2.சமயவழித் தமிழரின் வாழ்வியலை அறிவர்.
3. பல்வகை சமயக் கோட்பாட்டினை அறிந்துகொள்வர்.
4. பிழையின்றி எழுதப் பழகுவர்.
5. சமயங்களின் இன்றியமையாமையை உணர்வர்

Semester	Course Code	Title of The Course	Hours of Teaching/ Week	No. of Credits
II	**20U2PHE2**	**PART – II- Extensive Readers and Communicative Skills**	**6**	**3**

Objective
  ➢ **To impart language and communicative skills through short stories, one- act plays and communicative grammar.**

Unit – I
>   Shakespeare   – The Seven Stages of Man
>   Longfellow   – A Psalm of Life
>   Nissim Ezakiel   – Enterprise
>   William Wordsworth   – The world is too much with us

Unit – II
>   Anton Chekhov   -   The Bear
>   Cedric Mount   -   The Never-Never Nest
>   Farrell Mitchell   -   The Case of the Stolen Diamonds
>   M.V. Rama Sharma   -   The Mahatma

Unit - III
>   Fyodor Dostoyevsky -   The Christmas Tree and the Wedding
>   The Duchess   -   The Jewelry
>   O. Henry   -   The Romance of a Busy Broker

Unit – IV
>   Tense, Question Tag, Dialogue Writing, Paragraph Writing, Adjectives, Adverb

Unit – V
>   Voices, Degrees of Comparison, Direct and Indirect

 Course outcomes

 After the completion of this course students will be able to
  ➢ **promote the linguistic and communicative objectives through the study of poems, short stories and the communicative grammar.**
  ➢ **gain language and communicative skills through short stories**
  ➢ ** identify and differentiate different forms of literature.**
  ➢ **engage in reflective writing after learning the prescribed lessons.**
  ➢ **enhance the communicative skills through LSRW**

 Prescribed Texts:
  ➢ *Voices of Vision*, Board of Editors, NCBH, Chennai, 2016.
Communicative Grammar, The Department of English Course Material.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
II	**20U2PHC2**	**Core – Mechanics and Special Theory of Relativity**	**5**	**4**

Objectives:
- To introduce the concepts of Dynamics, Friction.
- To introduce the knowledge about Relativity.

Unit –I Dynamics

Projectile – angle of projection – Trajectory as a parabola – Time of flight – range on horizontal and inclined plane –Impulse and impact – Impulsive force – Laws of impact – Impact of a smooth sphere on a smooth horizontal plane – Direct and oblique impacts – Loss in kinetic energy – motion of two interacting bodies – reduced mass.

Unit – II Dynamics of rigid bodies

Theory of compound pendulum – equivalent simple pendulum – reversibility of centre of oscillation and suspension – Determination of g and radius of gyration of a bar pendulum – period of oscillation of a Bifilar pendulum with parallel and non-parallel threads – Centre of mass-velocity and acceleration of centre of mass – determination of motion of individual particle – system of variable mass – equation of motion for a rocket – conservation of linear and angular momentum.

Unit – III Friction

Static Friction – Laws of Friction, Sliding Friction, Angle of Friction – Cone of Friction – Acceleration down an inclined plane – Rolling Friction – Friction and Stability – Simple practical applications of Friction – The Prony Brake – Lubricants – Principle of the Virtual work – Case of a body in Equilibrium on a Smooth Inclined Plane under the action of a force – Case of Equilibrium of a body on a rough inclined plane.

Unit – IV Relativity I

Concept of space – Concept of time – Concept of mass – Frames of reference – Newtonian relativity –Galilean transformation – Ether hypothesis – Michelson Morley experiment – explanations for the negative result – Postulates of special theory of relativity – Lorentz transformation equations – Time dilation – Length contraction.

Unit – V Relativity II

Relativity of simultaneity – Addition of velocities –Mass variation- Mass-energy equivalence – Minkowski's four-dimensional space-time continuums – General theory of relativity – Particle wave duality – Photons and gravity – Gravitational red shift – Spacetime diagrams – Geometrical representation: simultaneity – space contraction – time dilation.

Course Outcomes:

After studying this course, the students will be able to
- acquire basic understanding on Mechanics and special Theory of Relativity.
- understand path of projectile.
- understand the dynamics of rigid bodies.
- gain the knowledge in friction and concepts of relativity.

Books for Study
1. Dynamics – M. Narayanamurthi.
2. Mechanics – D.S. Mathur.
3. Modern Physics – R.Murugeshan.

Books for Reference
1. Elements of Properties of matter –D.S. Mathur Unit III
2. Mechanics and Mathematical Methods – R. Murugeshan Unit I

Semester	CourseCode	Title of the Course	Hours of Teaching/week	No. of Credits
II	**20U2PHC3**	**Core – Electricity and Electromagnetism**	**4**	**4**

Objectives:

- To introduce the basic knowledge about Electrostatics.
- To introduce the knowledge about Magnetic, Chemical and Heating effects of current.

Unit – IElectrostatics

Coulomb's law-Electric field intensity-Electric line of force-Properties-Electric flux - Gauss theorem – statement and proof – applications: electric field intensity at a point due to a charged sphere – electric field intensity at a point near an infinite plane charged conductor – Equipotential surface – tubes of force – Maxwell tubes of force- Electric Potential – Potential at a point due to a electric dipole - relation between electric field and electric potential.

Unit – IIMagnetic Effect of Current

Ampere's law - Magnetic field at a point on the axis of a solenoid carrying current –Force experienced by an electron moving in a magnetic field – Fleming's left hand rule – theoryof moving coil galvanometer –ballisticgalvanometer – dampingcorrection – difference between dead beat and ballistic galvanometer - Hysteresis - B.H curve.

Unit – IIIElectromagnetic induction

Self-inductance of a coil – energy stored in an inductance –Determinationof L by Rayleigh method – mutualinduction – coefficientof coupling – determinationof mutual induction using BG – measurement of strong magnetic field (search coil method) – induction motor.

Unit – IVChemical effects of current and Thermoelectricity

Faradays laws of electrolysis – Ionic velocity and mobility – transportnumber – Determination of the conductivity of electrolytes (Kohlrausch Bridge) – applicationsof electrolysis– Thermocouple – Thermoelectricity – Seeback effect – Peltiereffect – Peltier coefficient –Thomson effect – Thomsoncoefficient – thermoelectricdiagram – uses.

Unit – VElectromagnetic oscillations

Growth and decay of current in a circuit containing L and R– timeconstant –Growth and decay of charge in a circuit with C, L and R–Impedance of AC circuit containing R, L and C in series - Resonance – QFactor– Maxwell's displacement current – Maxwell'sequations in material media - Plane electromagnetic waves in free space.

Course Outcomes:

On completion of this course, the students will
- gain knowledge on the basic concepts of electricity and magnetism.
- acquire knowledge on electric field related aspects.
- gain knowledge in magnetic, chemical and thermal effect of current.
- understand the basic concepts of electromagnetic induction.

Books for Study
1. Electricity and Magnetism – Brijlal and Subramanian.
2. Electricity and Magnetism – R. Murugesan.

Books for Reference
1. Electricity and magnetism – Sehgal, Chopra, Sehgal
2.Electricity and magnetism – A.S. Mahajan, A. A. Rangwaal

Semester	Subject Code	Title of the Paper	Hours of Teaching/Week	No. of Credits
I & II	20U1PHMAA2	**Allied Mathematics-II**	3	4

Objectives:
  ➢ To introduce the concepts of correlation and regression.

  ➢ To teach the concepts of interpolation, numerical solution of ordinary

    differential equation and multiple integrals.

  ➢ To enrich the knowledge of application of multiple integrals.

UNIT –I
    Correlation and Regression: Karl Pearson coefficient of correlation – Rank correlation – Regression: Regression coefficients – Properties of regression coefficients

UNIT – II

    Interpolation: **Gregory Newton forward interpolation formula - Backward interpolation formula- Gauss forward interpolation formula - Backward interpolation formula – Lagrange's interpolation formula** *(no proofs, simple problems only)*.

UNIT – III
    Numerical solution of ordinary differential equation: Taylor series – Euler's method – Modified Euler's method – R. K method (4th order only).

UNIT – IV
    Beta and Gamma Functions: Definitions – Convergence of $\Gamma(n)$ – Recurrence formula of gamma function – Properties of beta function – relation between beta and gamma functions - Problems.

UNIT – V
    Multiple integral: Double integral – Evaluation of double integral - change of order of integration – Polar coordinates - Triple integrals - Application of multiple integrals.

Course Outcomes:

After completion of the course, students will be able to,

  ➢ give information on the strength and direction of the linear relationship between two variables using correlation.

  ➢ find numerical approximations to the solutions of ODE.

  ➢ calculate the area of a region, the volume under a surface and the average values of a function of two variables.

  ➢ know the relation between beta and gamma function.

  ➢ distinguish the overall mathematical knowledge gained to demonstrate and analyze the problems in real life situation.

Text Book:

4. ***Fundamentals of Mathematical Statistics,*** *S.C. Gupta, V. K. Kapoor, Sulthan, 2002.*
   Unit I: Chapter – 10(Sec.10.2–10.4, 10.7), Chapter – 11(Sec.11.1–11.2.2)

5. ***Numerical methods****, P. Kandasamy, Thilagavathi and Gunavathi*
   Unit II: Chapter: 6 (6.1-6.3), Pages: 209 – 225, Chapter: 7 (7.1-7.4), Pages:

   231 – 240, Chapter: 8 (8.7 only), Pages: 271 - 276.

   Unit III: Chapter – 11(Sec.11.5, 11.9, 11.11 – 11.3), Pages:352 – 358,369 -389

6. ***Calculus Vol II :*** *T.K. M. Pillai, 2015*
   Unit IV: Chapter 7 (Sec: 2 – 5)
   Unit V : Chapter 5 (Sec: 2 – 5.3)

General References:

   1. Statistics   -   M. Sivathanupillai
   2. Ancillary Maths -   P.R.,Vittal, Margam Publications.

Semester	Subject Code	Title of the Paper	Hours of Teaching/Week	No. of Credits
II	**20U2PHMAA3**	**Allied Mathematics- III**	**5**	**3**

OBJECTIVES:

➢ To introduce various methods to solve the partial differential solution.
➢ To teach the concept of curl & divergence of vector field.
➢ To introduce the concept of laplace transforms and fourier series.

Unit–I PartialDifferential Equation:

Derivation of partial differential equation – Different integrals of PDE – standard types of first order equations of theform $f(p, q) = o$; $f(x, p, q) = 0$;
$f(y, p, q) = 0$;$f(z, p, q) = 0$; $f_1(x, p) = f_2(Y, q)$; $z = p x + qy + f(p, q)$ – Lagrange's method for solving $P_p + Q_q = R$.

Unit – II Vector differentiation:

Vector differential operator – Gradient – Direction and magnitude of gradient – Divergence and curl– Formulae involving operator ∇.

Unit –III Vector integration:

Gauss Divergence theorem – Stoke'stheorem (no proof of the theorem).

Unit – IV Laplace Transforms:

Definition – Results and proofs: Laplace Transform of functions$f(t) + g(t)$, $cf(t)$, $f'(t)$, $f''(t)$, e^{at}, coshat, sinhat, cosat, sinat, t^n- some general theorems – Inverse transforms relating to the above standard forms - solution of ordinary differential equation with constant coefficients.

Unit – V Fourier Series:

Definition – finding Fourier coefficients for the given periodic function with period 2π- Even and oddfunctions – Properties of odd and even functions - Half range Fourier series – Development in Cosine and sine series.

COURSE OUTCOME:

After completion of the course, the students will be able to

➢ Solve partial differential equation of both first and second order.
➢ use Stoke's theorem to give a physical interpretation of the curl of a vector field.
➢ use Green's theorem to evaluate line integral along simple closed contours on the plane.
➢ gain knowledge about basic concept of laplace transforms, vector differentiation and vector integration.
➢ understand the properties of fourier series.

Text Book:

Ancillary Mathematics, Volume-II, *S. Narayanan, R. Hanumantha Rao,*

T.K.Manicavachagom Pillay, S. Viswanathan Printers Pvt. Ltd., 2015.

Unit I   :   Chapter 5, Sec: 1 – 3, 5, 6 (Pages: 252 – 257, 262 – 273)
Unit II :   Chapter 8, Sec: 16 – 21 (Pages: 335 – 357)
Unit III: Chapter 8, Sec: 6, 9 (Pages: 381 – 389, 399 – 407)
Unit IV :   Chapter 7, Sec: 1 – 6 (Pages: 289 – 310)
Unit V :   Chapter 2, Sec: 1 – 5 (Pages: 123 – 148)

General References:

1. *Engineering Mathematics – A Singaravelu(Volume I & II)*
2. *Vector Calculus – K.Viswanbathan and S.Selvaraj.*
3. *Ancillary Mathematics – P.R.Vittal, Margam Publications.*

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Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
II	20U2PHS1	**Skill Based Elective – I Electrical Wiring Fundamentals**	1	1

Objective:

- To impart the knowledge in generation ofElectricity and Transformers.

Unit – I Generation of Electricity

Conventional methods of power generation – Thermal power plant – Hydropower plant- Atomic power station – Solar energy – Wind mill energy.

Fundamentals of Electricity

Electrons – Flow of electrons - current – Resistance - Electromotive Force - voltage – potential difference – voltage drop – alternating current – direct current – Ohm's law – Effects of electric current – Types of electrical circuits – work – power and energy.

Single phase and Polyphase AC circuits

Alternating current – amplitude – time period – frequency – RMS value – polyphase – 2 phase – 3 phase – advantage of polyphase over single phase – star connection – delta connection.

Unit – II Transformer

Construction – principle of operation – classification of transformers – types of core – Transformer losses – Efficiency – Alternator – Parts of an alternator – AC three phase motors – AC single phase motors - House wiring

Earthing – Necessity of earthing – Types of earthing – safety fuse – fuses – circuit breaker – thermal fuses – Toggle switch – keyboard switches – wires and cables – connectors.

Course Outcomes:

On completion of course, student will be able to

- acquire knowledge and skills on various aspects of generation ofelectricity.
- identify and rectify the defects in simple electronic circuits.

Books for study

1. Electrical power – Dr. S. L. Uppal.
2. Basic Electrical Engineering – M. L. Anwani.

Semester	Subject Code	Title Of The Paper	Hours Of Teaching / Week	No. of Credits
III	**20U3PHT3**	**காப்பியங்கள், கட்டுரைகள், இலக்கிய வரலாறு**	**6**	**3**

நோக்கம்

1. காப்பியங்களின் உள்ளடக்கம், உத்திகளைக் கற்றுக்கொடுத்தல்.

2. காலந்தோறும் காப்பியங்களில் காணலாகும் பாடுபொருள்களின் மாற்றங்களை எடுத்துரைத்தல்.

3. காப்பியச்சுவையை மாணவர்கள் அறிந்து கொள்ளச் செய்தல்.

கூறு: 1 காப்பியங்கள் நேரம்:18

1. சிலப்பதிகாரம்: மதுரைக்காண்டம்-வழக்குரைகாதை
2. மணிமேகலை; மலர்வனம் புக்ககாதை
3. சீவக சிந்தாமணி: சுரமஞ்சரியார் இலம்பகம்
4. கம்பராமாயணம்: கங்கைப் படலம்

கூறு: 2 காப்பியங்கள் நேரம்:18

1. பெரியபுராணம் : மெய்ப்பொருள் நாயனார் புராணம்-முழுவதும்
2. அரிச்சந்திரபுராணம்: மயான காண்டம்
3. தேம்பாவணி: திருமணப் படலம்-1-10 பாடல்கள்
4. சீறாப்புராணம் : நபி அவதாரப் படலம்-1-10 பாடல்கள்

கூறு: 3 கட்டுரைத் தொகுப்புகள் நேரம்:18

1. கேட்டிவி - இராகபாவம் (1-10)
2. கேட்டிவி - பயணங்கள் தொடரும்

கூறு:4 கட்டுரைக் கடிதங்கள் மொழிபெயர்ப்புப் பயிற்சிகள் நேரம்:18

பயிற்சிக்கட்டுரைகளும் கடிதங்களும் -பாவை வெளியீடு

கட்டுரைப் பயிற்சி - 10 மதிப்பெண்கள்

மொழிபெயர்ப்புப் பயிற்சி - 5 மதிப்பெண்கள்

கூறு:5 இலக்கிய வரலாறு நேரம்:18

காப்பிய இலக்கியங்கள் - சிற்றிலக்கியங்கள்

பயன்கள்

1. காப்பியங்கள் வாயிலாக அக்காலச் சமுதாயச் சூழலை அறிவர்.
2. பல்வேறு காப்பியங்களையும் ஒப்பிட்டு அவற்றின் தனித்தன்மைகளை அறிந்துகொள்வர்.
3. மீட்டுருவாக்கச் சிந்தனைகளை அறிவர்.
4. கட்டுரை எழுதும் திறன் பெறுவர்.
5. கடிதங்கள் எழுதும் பயிற்சி பெறுவர்.

Semester	Course Code	Title of The Course	Hours of Teaching /Week	No. of Credits
III	**20U3PHE3**	**PART - II** **Shakespeare, Extensive Readers And Communicative Skills**	**6**	**3**

Objective
  ➢ **To introduce the language and creativity of the world-renowned dramatists and novelists to enhance the communicative skills of the learners.**

Unit – I

Julius Caesar
The Merchant of Venice

Unit – II

Macbeth
Twelfth Night

Unit – III

Romeo and Juliet
Tempest

Unit – IV

Thomas Hardy – The Mayor of Casterbridge

Unit – V

Note making, Hints Developing, Expansion of Ideas and Proverbs, Clauses and
    Sentence, Structure: Simple, Compound and Complex.
Course outcomes

After the completion of this course students will be able to
  ➢ **promote their communicative skills through the study of Shakespeare and modern communicative methods.**
  ➢ **expand their perception interacting with the culture across the world**
  ➢ **imbibe moral and ethical prescriptions**
  ➢ **appreciate the creative genius and affluent expressions of Shakespeare**
  ➢ **develop the creative and analytical faculty**

Prescribed Texts:
      Natarajan, K.ed. *Selected Scenes from Shakespeare*. Chennai: NCBH, 2017.
      Hardy, Thomas.*The Mayor of CasterBridge*.(abridged)Chennai: Macmillan Publishers,2012.
Communicative Grammar.Department of English Edition. 2017

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
III	20U3PHC4	**Core –Thermal Physics**	5	5

Objectives:
- To introduce the concepts of transmission of heat.
- To understand the basic concepts of thermodynamics.
- To introduce basic concepts of statistical thermodynamics.

Unit – ITransmission of Heat

Modes of heat transfer-– coefficient of thermal conductivity(K)– Rectilinear flow of heat along a bar – Forbes's method for finding K – Lee's method for bad conductors – radial flow of heat between two coaxial cylinders – determination of K of glass –black body Radiation: Stefan's Law – Experimental Verification of Stefan's law – Determination of Stefan's constant – Total radiation pyrometers – Solar constant – Angstrom's pyrheliometer.

Unit – IIThermodynamics

Zeroth law and first law of thermodynamics – reversible and irreversible process – Isothermal - adiabatic process-work done- second law of thermodynamics – Carnot's reversible engine – derivation – Thermodynamic scale of temperature – Steam engine – Diesel Engine – Clausius-Clapeyron latent heat equation – Entropy– Change in entropy in a reversible and irreversible process -Third law of thermodynamics - Maxwell's thermodynamical relations.

Unit – IIIChange of state

Specific latent heat of Fusion – Lawsof fusion – Applications –Determinationof melting point of wax – Determinationof Latent heat of fusion of ice – vaporizationand condensation – Lawsof boiling – changeof boiling point with pressure – Applications- Latentheat of vapourization– coolingcaused by evaporation – examples– Triplepoint – Gibb's phase rule.

Unit – IVLow Temperature Physics

Joule Kelvin effect-inversion temperature-Porous plug experiment — Liquefaction of gases – Cascade process – Liquefaction of oxygen – Linde's process – liquefaction of air – Liquefaction of Helium – K. Onnes method – Helium I and II, Lambda point – Fountain effect – Adiabatic demagnetization – superconductivity.

Unit – V Statistical Thermodynamics

Specification of the state of the system – probability calculation – Formulation of statistical problem – Phase space – Maxwell-Boltzmann Statistics –Quantum statistics–Fermi-Dirac and Bose-Einstien statistics – Comparison of MB, FD, BE Statistics – photon gas – Planck's law of black body radiation.

Course Outcomes:

On completing the course, the students will be to
- acquire overall knowledge on transmission of heat.
- understand the concepts of Thermodynamics
- get awarenesson superconductivity, thermodynamic observables and entropy.
- gain basic knowledge in statistical thermodynamics

Books for study
1. Heat and thermodynamics –Brijlal and N. Subramaniyam.
2. Heat and thermodynamics – M.W. Zemansky.

Books for Reference
1. Fundamental of Statistical and thermal physics – F. Reif.
2. A textbook of Heat - Ananthakrishnan and Govindarajan.
3. Heat and Thermodynamics–Sears.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
III	20U3PHC5	**Core – Laser Physics**	5	4

Objectives:
- To give general ideas on Lasers.
- To know the application of Lasers.

Unit – I Properties of LASER

Characteristics of a Laser light – Coherence – Spatial coherence – Temporal coherence – Coherent length and coherent time-principles of laser – absorption – spontaneous emission – stimulated emission-Population inversion Pumping – pumping methods – Einstein's theory of stimulated emission– Threshold Condition –Types of lasers.

Unit – II Solid and Semiconductor LASERs

Active medium – Metastable states – Two level, three level and four level laser system (elementary ideas) — solid state lasers: Principle,Construction and working of Ruby lasers – Nd-YAG laser – Semiconductor lasers: GaAs laser –Energy level diagram -Characteristics, advantages and limitations.

Unit – III Gas and Pulsed LASERs

Gas lasers: He-Ne laser– ArgonIon laser – Molecular gas laser – CO_2 laser – principle – construction and working –Energylevel diagram- Pulsed lasers: Q switching – Mode locking – Frequencydoubling – Tunable laser.

Unit – IV Safety measures and applications of LASER

Laser radiation hazards including effects on the eye and skin – Laser safety precautions and protective measures. LaserInterferometry – Testingof optical system – Lasers in communication – computers –military – medical – industries.

Unit – V Holography

Holography – Theory and basic principles – Hologram – Recording and reconstruction of hologram – Experimental techniques – characteristics of hologram – classifications – Reflection holography and applications - Holographic interferometry – Non-destructive testing - optical memory.

Course outcomes:
Through this course, students will be
- acquire knowledge on the basic principles, properties, types and applications of LASER.
- ready to apply coherent light to solve various problems in areas such as scientific, industrial, healthcare etc.
- able to understand the concepts of holography.

Books for Study
1. Laser Fundamentals and applications, K. Thyagarajan, AjoyGhatak.
2. An introduction to laser theory and applications, M. N. Avadhanulu, S. Chand and Co.
3. Lasers and Non- linear optics – B.B. Laud.

Books for Reference
1. Lasers and their applications– Besley, Taylor &Fancis. London
2. Lasers and their applications–J.Wilson, J.F.B.Hawkes, Prentice Hall, 1987.

Semester	Subject Code	Title of the paper	Hours of Teaching/ week	No. of Credits
III	**20U3PHCHA1**	**Allied Chemistry –I** **(For Physics Students Only)**	**5**	**4**

Unit –I

Atomic Structure : Atomic number and mass number – isotopes (hydrogen, oxygen , chlorine and uranium) - Orbit and orbital – shapes of s, p, d orbitals - Aufbau principle Hund's rule – electronic configuration of hydrogen carbon, nitrogen, oxygen, - stability of half filled and completely filled orbitals with the examples Cr, Cu and Ag. **Types of chemical bonds** : Octet rule – formation of ionic, covalent , co-ordinate covalent bond with the examples of NaCl, H_2, Cl_2, HF molecules and BF_3 – NH_3 ₋ VSEPR theory -shapes of $BeCl_2$, BF_3, H_2O, PCl_5, XeF_6 – inter and intra molecular hydrogen bonds and their consequences.

Unit -II

Kinetics: Definition with suitable examples of rate, rate law, rate constants, order, molecularity, pseudo first order and half life period - factors that influence the rate of chemical reactions – effect of temperature on rate.

Catalysis: General characteristics of a catalyst –types (homogeneous & heterogeneous, positive & negative and enzyme) – catalytic promoter and catalytic poisoning - intermediates compound theory and adsorption theory.

Energetics: Heat units - concept of internal energy, enthalpy, entropy – exothermic and endothermic reactions

Unit –III

Acid – base concept: Arrhenius, Lowry – Bronsted and Lewis concepts – strong & weak acids -   pH, buffer solution – buffer action.

Colloids: Types- properties (Tyndall effect, Brownian movement, electrophoresis, electro osmosis) – purification by dialysis and ultrafilltration. Types of emulsions and gels

Water chemistry: Hard water – soft water, temporary and permanent Hardness – removal of hardness by reverse osmosis and ion exchange method.

Soaps and detergents – cleaning action of soap - -merits and demerits of soap and detergent

Unit - IV

Separation and purification techniques: Solvent extraction with Soxhlet apparatus – crystallization - fractional crystallization, distillation - fractional distillation, steam distillation with suitable examples.

Chromatography: adsorption and partition principles – column (preparation of column, development and elution), paper (sampling, ascending & descending developments, R_f values) and TLC (preparation of plate, sampling, ascending & descending developments) chromatography.

Unit -V

Organic compounds: Classification - functional groups – nomenclature of simple organic compounds.

Isomerism : Definition – types (structural & stereo) -   position, chain, functional isomerism and metamersm shown by butyl alcohol - Geometrical isomerism exhibited by maleic & fumaric acids - optical activity – condition for optical activity - optical isomerism exhibited by lactic acid & tartaric acid – racemisation – resolution .

Hybridisation of carbon: SP^3, SP^2, & SP hybridization with geometry citing examples.

References

1. Puri B.R. Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Milestone Publishers, Delhi (2008).

2. Puri B.R..,Sharma L.R., Pathania M.S., Principles of Physical Chemistry, Vishal PublishingCo., Jalandar, (2004).

3. Bahl B.S. Arun Bahl, Advanced Organic Chemistry, S. Chand & Company ltd., New Delhi, (2005).

4. Usharani S., Analytical Chemistry, Macmillian India Ltd., NewDelhi (2000).

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III & IV	**20U4PHCHAP**	**Allied chemistry practical (NS)**	**3+3**	**-**

A. Volumetric Analysis

1. Estimation of HCl (or H_2SO_4) by NaOH using a standard oxalic acid solution
2. Estimation of NaOH by H_2SO_4 (or HCl) using a standard Na_2CO_3 solution
3. Estimation of oxalic acid by $KmnO_4$ using a standard Mohr's salt solution
4. Estimation of Ferrous sulphate by $KmnO_4$ using a standard oxalic acid solution.
5. Estimation of Mohr's salt by $KmnO_4$ using a standard oxalic acid solution.
6. Estimation of KMnO4 by thio using a standard $K_2Cr_2O_7$ solution.
7. Estimation of $K_2Cr_2O_7$ by thio using a standard $CuSO_4$ solution
8. Estimation of $CuSO_4$ by thio using a standard $K_2Cr_2O_7$ solution

B. Organic qualitative analysis

Systematic analysis of an organic compound, Preliminary tests, detection of element present, Aromatic or aliphatic, Saturated or unsaturated, nature of the functional group and exhibiting confirmatory tests for given organic compounds.

The following substance are prescribed:

Benzoic Acid , Cinnamic acid, Phenol, Resercinol, Naphthol, Aniline, Toluene, Urea, Benzaldehyde, Glucose

Reference:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, Sultan Chand & sons, New Delhi, (1997)

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
IV	**20U4PHT4**	சங்க இலக்கியம் – அற இலக்கியம் – செம்மொழி தமிழ்– இலக்கிய வரலாறு	**6**	**3**

நோக்கம்:

1.பழந்தமிழ் இலக்கியங்களின் திணைத்துறைக் கோட்பாடுகளை அறிதல்.

2.திணைசார் சமுதாய வாழ்வின் பல்வேறுபட்டடப் பரிமாணங்களைப்

3.புலவர்கள் வாயிலாகவும் திணை இலக்கியத்தின் வாயிலாகவும் அறிதல்.

4.பழந்தமிழ் இலக்கியங்களின் உயர்தனித்தன்மை வாய்ந்த சிறப்பியல்புகளை அறிதல்.

கூறு: 1 எட்டுத்தொகை   நேரம்:18

குறுந்தொகை

1.குறிஞ்சி : தலைவன் கூற்று-யாயும் ஞாயும் யாராகியரோ - பா.எ.-40

2.முல்லை : தலைவி கூற்று-கருங்கால் வேம்பின் ஒண்பூ யாணர் - பா.எ.-24

3.மருதம் : தோழி கூற்று-யாய் ஆகியளே விழவு முதலாட்டி - பா.எ.-10

4.நெய்தல் : தலைவி கூற்று :நள்ளன் றன்றே யாமம் - பா.எ.-6

5.பாலை: செவிலி கூற்று-பறைபடப் பணிலம் - பா.எ.-15

நற்றிணை

1. குறிஞ்சி-நின்ற சொல்லர் பா.எ. 1

2. முல்லை:இறையும் அருந்தொழில் -பா.எ.161

3. மருதம்:அறியாமையின் அன்னை - பா.எ.50

4. நெய்தல்:இவளே கானல் நண்ணிய - பா.எ.45

5. பாலை:புணரில் புணராது பொருளே-பா.எ.16

கலித்தொகை

1. பாலை: எறித்தரு கதிர் தாங்கி- பா.எ.9

2. குறிஞ்சி : காமர் கடும்புனல்- பா.எ.39

அகநானூறு

1. குறிஞ்சி:நீர்நிறம் கரப்ப-பா.எ.18

2. முல்லை: வந்துவினை- பா.எ.44

கூறு: 2 எட்டுத்தொகை   நேரம்:18

1. ஐங்குறுநூறு : குறிஞ்சி -அன்னாய் வாழிப்பத்து -பா.எ.201-210

2. புறநானூறு : பாடல் எண்கள் - 9,16,20,51,109

3. பதிற்றுப்பத்து:ஆறாம் பத்து-

பா.எ.1 வடுவடு நுண்ணுயிர், பா.எ.2.கொடி நுடங்கு நிலைய

4. பரிபாடல் : ஏழாம்பாடல் - வையை

கூறு: 3 பத்துப்பாட்டு   நேரம்:18

1. குறிஞ்சிப்பாட்டு: முழுவதும்

கூறு: 4 அறநூல்கள்   நேரம்:18

1. திருக்குறள்: செய்ந்நன்றியறிதல் ,வினைத்திட்பம்,நெஞ்சொடு கிளத்தல்

2. மூதுரை: 1-10 பாடல்கள்

3.நல்வழி: 11-20 பாடல்கள்

4.நீதிநெறி விளக்கம்: 51-60 பாடல்கள்

கூறு: 5   நேரம்:18

அ. செம்மொழித் தமிழ்— இலக்கிய வரலாறு :

செம்மொழி வரலாறு : மொழி விளக்கம்-மொழிக்குடும்பங்கள்-உலகச் செம்மொழிகள் - இந்தியச் செம்மொழிகள் — செம்மொழித் தகுதிகள் - வரையறைகள் - தமிழின் தொன்மை -தமிழ்ச் செம்மொழி நூல்கள்.

ஆ. இலக்கிய வரலாறு: சங்க இலக்கியங்கள் ,பதினெண் கீழ்க்கணக்கு நூல்கள்

பயன்கள்

1.பழந்தமிழ் இலக்கியங்களை ஆய்வியல் நோக்கில் அணுகுவதற்கான
வழிமுறைகளை உணர்த்துதல்.

2.பண்டைத்தமிழரின் அக, புற வாழ்வியலை மாணவர்கள் அறியச் செய்தல்

3.அறத்தின் பெருமையை உணர்வர்

4.ஒழுக்க நெறிகளைப் பின்பற்றுவர்

5.தமிழ் செம்மொழியின் பண்புகளை உணருதல்

6.சங்க இலக்கியத்தின் தொன்மை உணர்தல்

Semester	Course Code	Title of The Course	Hours of Teaching/ Week	No. of Credits
IV	**20U4PHE4**	**PART - II** **English For Competitive Examinations**	**6**	**3**

Objective
  ➢ **To prepare the learners for competitive examinations and to teach the fundamentals of practical communication.**

Unit – I

  Grammar – Number, Subject, Verb, Agreement, Articles, Sequence of Tenses, Common Errors

Unit – II

  Word Power - Idioms & Phrases, one-word substitutes, Synonyms, Antonyms, Words we often confuse, foreign words & phrases, spelling.

Unit – III

  Reading & Reasoning – Comprehension, Jumbled Sentences.

Unit – IV

  Writing Skills – Paragraph, Précis Writing, Expansion of an idea, Report Writing, Essay, Letters, Reviews (Film & Book)

Unit – V

  Speaking- Public speaking, Group Discussion, Interview, Spoken English.

Course outcomes

 After the completion of this course students will be able to
  ➢ **develop English language skills by equipping themselves to face competitive exams**
  ➢ **improve English language abilities and gain the skills of writing and vocabulary building**
  ➢ **gain confidence to face competitive exams**
  ➢ **assimilate grammatical rule clearly and precisely**
  ➢ **hone their presentation and public speaking skills**

Prescribed Text:
English for Competitive Examinations, NCBH, Chennai, Dec. 2019.

B.Sc Physics

mester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
IV	20U4PHC6	Core – Optics	6	5

Objectives:

- To acquire the knowledge about optical instruments.
- To introduce the knowledge about properties of light.

UNIT – ILenses and Aberrations

Thin lens Equation – Lens makers Equation – Magnification – Power – Equivalent Focal Length of Two thin Lenses – Thick Lens – Thick Lens Formula – Power of Thick lens – Nodal points – Aberrations – Spherical aberration due to thin Lens – Methods of reducing spherical aberration – Coma – Distortion – Chromatic aberration – conditions for achromatism.

UNIT – IIOptical instruments

Eyepiece - Ramsden's Eyepiece – Huygen's eyepiece – comparison – Resolving power – Rayleigh's Criterion – Resolving power of a Telescope and Microscope – Dispersive power and resolving power of a plane transmission grating and Prism.

UNIT – IIIInterference

Colours of thin films – Air wedge – thickness of wire - Newton's Rings - Theory – Applications – radius of curvature of a lens - refractive index of a liquid – Haidinger's Fringes – Michelson interferometer – Applications – Determination of λ – standardization of metre – Fabry – Perot interferometer – Lummer and Gehrche plate.

UNIT – IV Diffraction

Types of diffraction – Fresnel's diffraction – Circular aperture - opaque circular disc – Diffraction pattern due a straight edge – Cornu's spiral – Fresnel integrals- Fraunhofer diffraction at a single slit – Transmission Grating - theory – oblique incidence – overlapping of spectral lines.

UNIT – VPolarization

Nicol Prism– Nicol Prism as a Polarizer & Analyzer- Huygen's explanation of double refraction – uniaxial crystals – Quarter wave plate and Half wave plate–Plane, Elliptically and Circularly polarized light – production and detection — Optical activity – Laurent's Half shade polarimeter.

Course Outcomes:
After studying this course, the student will be able to
- understand the types of lens and aberrations.
- acquire basic understanding on various aspects of geometrical and wave optics.
- gain knowledge on the function of optical instruments.

Books for Study

1. Optics – Brijlal, Subramaniyan and M. N. Avadhanulu.
2. Optics and Spectroscopy – R. Murugesan.

Books for Reference
1. Optics –Khannaand Gulati
2. Optics – Jenkins and White.
3. Optics– AjoyGhatak.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
IV	**20U4PHCP2**	**Core – Major Practical– II**	**3**	**4**

Objectives:
- To gain the knowledge in experiments related to electricity and magnetism.
- To acquire knowledge in experiments related to thermal physics and optics.

List ofExperiments – AnyTEN Experiments

1. Spectrometer -Determination of μ

2. Spectrometer - i-d curve

3. Spectrometer - i-i^1 curve

4. Spectrometer - Dispersive Power of Prism

5. Potentiometer - High range voltmeter calibration

6. Potentiometer - Ammeter calibration

7. Potentiometer - R and ρ determination

8. Potentiometer - Low range voltmeter calibration

9. Potentiometer - E.M.F. of Thermocouple

10. Field along the axis of a coil - 'Determination of earth magnetic field(H)

11. Field along the axis of coil - Determination of magnetic moment of given magnet(M)

12. Moment of a Magnet - Tan- C position

13. Carey Foster bridge - Determination of specific resistance 'ρ' of a given coil

14. Carey Foster Bridge - Temperature co- efficient of resistence of a given coil

15. Figure of merit - Galvanometer

16. B.G - current sensitivity

17. B.G. - Comparison of mutual inductances

18. Post Office Box - Determination of specific resistance of a given coil of wire.

19.Lee's disc method - Thermal conductivity of bad conductor

20. Forbe's method - Thermal conductivity of good conductor

Course Outcomes:
On completion this course, students
- acquire skills in doing experiments related to different fields of physics *viz.*electricity, magnetism and thermal physics.
- can do experiments related to light.

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No. of Credits
IV	**20U4PHCHA2**	**Allied Chemistry –II (For Physics Student Only)**	**5**	**4**

Unit – I

Concept of mole : Definition of mole - Avagadro number - calculation of molecular masses of Urea, Glucose, HCL, H_2SO_4, NaOH, Na_2CO_3 and sucrose - Molar volume, equivalent masses of acid and base (HCL, H_2SO_4, NaOH, Na_2CO_3).

Concentration terms: % by weight, molarity, molality, normality, mole fraction - simple problems to prepare different normal / molar solution for the substances NaOH and Glucose - simple problems to prepare different normal / molar solution from the given strength of solutions using $V_1V_2 = V_2N_2$ formula (for the HCL, H_2SO_4, NaOH, solutions).

Co-ordination compounds: Double salts (Mohr's salt, potash alum) and complex salt – terminology in co-ordination chemistry – Werner's theory – IUPAC names simple co-ordination compounds –structure and uses of haemoglobin and chlorophyll.

Unit – II

Industrial chemistry: *Fertilizers*: Essential nutrients for plants –functions N,P,K nutrients- micronutrients and their role in plant life - formulae of urea, calcium superphosphate, super phosphate of lime, potassium sulphate - mixed fertilizers - *Pesticides*: Isecticides (stomach & contact poison and fumigant), fungicides, herbicides, rodenticides and their adverse effect – alternative methods for pest control - *Fuel Gases*: Water gas, natural gas, bio gas and producer gas (no manufacture)

Electrochemistry: specific conductivity – equivalent conductivity – effect of dilution – conductometric titrations – PH – buffer – calculation of pH using Henderson equation. **Photochemistry:** Lambert Law, Lambert. Beer's Law, Grothus – Drapper law – Quantum yield – photo sensitization

Unit – III

Solid state : Elements of symmetry - crystal lattices & unit cell -seven crystal systems – cubic unit cells (sc, bcc & fcc cubes) – elementary structure of NaCl crystal – structure of metal crystals (hcp, ccp, bcc structure) – crystal defects (vacancy, interstitial and impurity)

Alloys: General methods of preparation of alloys – role of carbon in steel - heat treatment of steel – metallic bonding (electron sea model)
Phase rule: Definitions of phase , component and degrees of freedom – one component system (sulphur) two component system (Pb – Ag).

Unit – IV

Fundamental concepts in organic chemistry: Homolytic and heterolytic fissions – substitution, addition, elimination, and condensation reactions, electrophiles- nucleophiles and free radicals with suitable examples. Mechanism of chlorination of CH_4 - Electron displacement effect- inductive and mesomeric effects.

Carbohydrates : Definition -classification–D,L notations- mutarotation – invertsugar – reducing and non reducing sugars - structure of starch and cellulose(no structural elucidation)- Gun cotton, cellulose acetate and viscose rayon.

Unit -V

Chemotherapy : Drugs–sulpha drugs (structures of sulphapyridine, sulphadiazine, sulphaguanidine, sulphathiozole, sulphaacetamide)– mode of action – uses –Definition of antimalarials, antipyretics , analgesics tranquilizers and sedatives , anti septics and disinfectants – structure , uses and side effects of Aspirin,   Pharacetamol   Phenacetin   - local and general anesthetics - *Antibiotics* : Definition – structure ,mode of action and side effect of Pencillin , Chloramphenicol and tetracycline.

Polymers: Homo and co- polymers with the examples of polythene and polyester, thermoplastic and thermosetting polymers (PVC and backelite)

References:

1. Puri B.R. Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Milestone Publishers, Delhi (2008)
2. Puri B.R..,Sharma L.R., Pathania M.S., Principles of Physical Chemistry, Vishal PublishingCo., Jalandar, (2004)
3. Bahl B.S. Arun Bahl, Advanced Organic Chemistry, S. Chand & Company ltd., New Delhi, (2005).
4. Jaya shree Ghosh , A text book of pharmaceutical chemistry, 3rd ed., S.Chand &Company Ltd.,NewDelhi (2008)

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III & IV	**20U4PHCHAP**	**Allied chemistry practical (NS)**	**3+3**	**2**

B. Volumetric Analysis

1. Estimation of HCl (or H_2SO_4) by NaOH using a standard oxalic acid solution
2. Estimation of NaOH by H_2SO_4 (or HCl) using a standard Na_2CO_3 solution
3. Estimation of oxalic acid by $KmnO_4$ using a standard Mohr's salt solution
4. Estimation of Ferrous sulphate by $KmnO_4$ using a standard oxalic acid solution.
5. Estimation of Mohr's salt by $KmnO_4$ using a standard oxalic acid solution.
6. Estimation of KMnO4 by thio using a standard $K_2Cr_2O_7$ solution.
7. Estimation of $K_2Cr_2O_7$ by thio using a standard $CuSO_4$ solution
8. Estimation of $CuSO_4$ by thio using a standard $K_2Cr_2O_7$ solution

C. Organic qualitative analysis

Systematic analysis of an organic compound, Preliminary tests, detection of element present, Aromatic or aliphatic, Saturated or unsaturated, nature of the functional group and exhibiting confirmatory tests for given organic compounds.

The following substance are prescribed:

Benzoic Acid , Cinnamic acid, Phenol, Resercinol, Naphthol, Aniline, Toluene, Urea, Benzaldehyde, Glucose

Reference:

Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, Sultan Chand & sons, New Delhi, (1997)

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
IV	20U4PHS2	**Skill Based Elective – II** **Domestic Electrical Appliances and Measuring Instruments**	1	1

Objective:

- To gain the knowledge in resistors, capacitors and electrical appliances

Unit – I

Resistors

Resistance – unit – Law of resistance – effect of temperature on resistance (carbon, metal film, thin film, wire wound) – variable resistors – colour code.

Inductors

Inductance – General information – types of inductors (ferrite and choking inductors).

Capacitors

Capacitors principle – types of capacitors (air, paper, electrolyte and mica) – fixed and variable capacitors – specifications.

Illumination

Definition and units – luminous flux - luminous intensity – illumination – units of illumination – types of light sources – Sodium vapour lamp – Mercury vapour lamp – Fluorescent lamp.

Unit –II

Measuring Instruments

Galvanometer – Ammeter – Voltmeter – Ohmmeter – Multimeter – CRO.

Electrical Appliances

Heat producing appliances: Electric iron – Soldering iron – water heaters – Electric Oven – Geysers – Electric mixer – working.

Bell and Buzzer – Electric fan – Emergency lamp – Refrigerator – Water cooler – working.

Course Outcomes:

On successful completion, students will
- acquire knowledge and skills on operating various components likeresistors, capacitors etc.
- be able to identify and rectify the defects in Electrical Appliances.

Books for Study:-

1. Home appliances GT Publications, Jaipur.
2. Electrical power – Dr. S. L. Uppal.
3. Basic Electrical Engineering – M. L. Anwani, Dhanapat Rai and Co. New Delhi.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
V	20U5PHC7	**Core – Atomic Physics and Wave Mechanics**	5	6

Objectives:
- To introduce the study of structure of atom.
- To acquire the basic knowledge about nature of particles.
- To understand the basic concepts of wave mechanics.

Unit – I Atomic models

Vector atom model: spatial quantization and spinning of electrons – quantum numbers –L-S and j-j coupling schemes – Pauli's exclusion principle – Mosley's law and its importance - Electronic configuration of elements – Orbital and spin magnetic moments of electron – Stern - Gerlach experiment- Paschen-back effect.

Unit – II Atomic structure and X- ray Diffraction

Fine structure and hyperfine structure –Zeeman effect – Quantum mechanical explanation of normal and anomalous Zeeman effect- Stark effect. Absorption of X-rays – Bragg's Law – Bragg's X-ray spectrometer - powder crystal method-rotating crystal method-Laue method– determination of crystal structure by Bragg's law – structure of KCl and NaCl crystals – Compton scattering – theory and experiment.

Unit – III Photo electric effect

Photoelectriceffect – Experimentalstudy – Lenard's method for e/m of photo electrons – Richardsonand Compton experiment – lawsof photo electric emission – Failureof classical theory – quantumtheory – Einstein's photo electric equation – Millikan's experiment – photocells and their applications – photomultipliertubes.

Unit – IV Dual Nature of Matter

deBroglie idea of matter waves –deBroglie wavelength – wavevelocity and group velocity – Davissonand Germer experiment – G.P. Thomson experiment - Heisenberg's Uncertainty principle – Electronmicroscope – Gamma ray microscope.

Unit- V Wave Mechanics

Basic postulates of wave Mechanics – Derivation of Schrödinger wave equation – Time independent and dependent wave equations – Properties of wave function –Orthogonal and normalized wave function- Eigen function and Eigen values- Applications of Schrödinger equation – particle in a box –Harmonic oscillator.

Course Outcomes:
On completion of the course the student will
- acquire basic knowledge on the concepts of atomic physics like atom models.
- gain basic knowledge on the structure of atom and nature of particles.
- get an idea about atomic and molecular spectra, spin orbit interaction, fine and hyperfine structure of spectral lines, Zeeman and Stark effects.
- able to understand the basic concepts of wave mechanics.

Books for Study
1. Modern Physics – R. Murugesan.
2. S.N. Ghoshal - Atomics and Nuclear Physics Vol. I.S., Chand & Co.,
3. Athour Bezier- Modern Physics.

Books for Reference
1. B. D Duggal and C. L Copra- Modern Physics.
2. S.N. Ghoshal - Atomics and Nuclear Physics Vol. I.S., Chand & Co.
3. Modern Physics – J. B. Rajam

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
V	**20U5PHC8**	**Core – Basic Electronics**	**4**	**5**

Objectives:
- To gain the knowledge on the concepts of electronics.
- To introduce concepts of IC fabrication.

Unit– ISemiconductor Diodes, Rectifiersand Filters

Intrinsic and Extrinsic Semiconductors –PN junction diode –V-I characteristics – Rectifiers: Half wave rectifier –Full wave rectifier – Bridge rectifier with Centre tapped transformer – Efficiency - Ripple Factor – Comparison of rectifiers – Filter Circuits – Capacitor filter – Choke input filter – Π-section filter- Zener diode – biasing - V-I characteristics —Zener diode as voltage regulator.

Unit – II Transistors

Transistor action – Transistor connections – NPN –common base – common emitter – characteristics – Transistor load line analysis- operating point - biasing – Stabilization – Essentials of a transistor biasing circuit – Methods of transistor biasing – Base resistor method – Biasing with feedback resistor – Voltage-divider bias method.

Unit – III Amplifiers

Negative feedback amplifiers – Principle – Gain – advantages - Single stage (CE) transistor Amplifiers – frequency response – two stage – Multi stage transistor amplifiers in CE configuration – Transformer coupled Amplifier – Power amplifiers - classification – Class A, Class B and Push-pull Amplifiers - complementary symmetry power amplifier.

Unit – IV Oscillators

Essentials of positive feedback – Barkhausen criterion- Sinusoidal Oscillators – LC oscillatory circuit – frequency stability– Transistor oscillators – Tuned base oscillator – Hartley oscillator – Colpitt'soscillator– Phase shiftoscillator-Wien's Bridge oscillator.

Unit– V Semiconductor Devices and IC fabrication

Construction, working and characteristics of FET, MOSFET,UJT and SCR – Applications:SCR as a Switch –UJT Relaxation oscillator.

IC Fabrication– Advantages – Drawbacks – Scales of Integration – Classification - making of monolithic ICs – fabricationof IC components – Resistors – capacitors – diodes – transistors.

Course Outcomes:

Upon the successful completion of the course students will
- acquire basic knowledge on the principle, construction and working of semiconductor electronic devices.
- be able to explain the operation of basic semiconductor devices.
- be able to understand the concepts involved in IC fabrication

Books for Study
1. Principles of Electronics - V. K. Metha.
2. Basic Electronics – B. L. Theraja.
3. Integrated circuits & Semiconductor devices – DEBOO/BORROUS

Books for Reference
1. Basic electronics – A. P. Malvino.
2. Electronics – P. Arun.
3. Hand book of electronics – Gupta & Kumar.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
V	20U5PHC9	**Core – Materials Science**	4	4

Objectives:
- To gain the knowledge about crystallography.
- To introduce the basic ideas of magnetic and engineering materials.

Unit – I Elementary Crystallography

Basic concepts of crystal –Lattice – Basis – Crystal structure - Unit cell – primitive cell- lattice parameters – crystal systems – Bravais lattices – SC, BCC, FCC, HCP crystal structures –number of atoms in unit cell- atomic radius-coordination number - packing fraction- crystal planes – Miller indices-Bragg's law-crystal structure analysis-Laue's photographic method-Powder crystal diffraction method.

Unit– II Bonding and Defects in Solids

Interatomic forces – Bonding in solids – Primary bonds – Ionic, Covalent and metallic bonds – Secondary bonds – Dipole, dispersion and hydrogen bonds.

Defectsin solids – point defects: vacancy, interstitials, impurity – Line defects: Edge dislocation, screw dislocation –Surface defects: Grain boundary, stacking faults - Volume defects.

Unit– III Electron theory of metals and Semiconductors

Classical free electron theory of metals- – Electrical and Thermal conductivity-Wiedemann Franz law – Quantum free electron theory –Fermi energy- density of states – Band theory of solids – Brillouin zones.

Semiconductors – carrier concentration of intrinsic-electrical conductivity- carrier concentration of P-type and n-type – Hall Effect – experimental determination of carrier concentration and mobility – application.

Unit– IV Dielectric and magnetic materials

Dielectrics – polarization – dielectric constant - types of polarization – Lorentz field (derivation) – Clausius-Mossotti relation – Properties of dielectric materials – Dielectric loss and breakdown.

Magnetism– dia, para, ferro, antiferro and ferrimagnetisms – classical theory of diamagnetism – Langevin's theory of paramagnetism – Weiss's theory ferromagnetism – domain theory- Anti ferromagnetic materials – Ferrimagnetic materials.

Unit– V Modern Engineering materials and optoelectronic devices

Polymers – Types of polymerizations – Metallic glasses: Types, preparation, properties and applications - Composite materials – Fibre optic materials – Acoustic materials – ceramics – biomaterials – Liquid crystal displays – Light emitting diodes.

Course Outcomes:
On completion of this course, students will
- acquire knowledge on the electrical, dielectric and magnetic properties of solid materials
- understand why materials behave the way they do
- be able to understand the properties and applications of modern engineering materials.

Books for study
1. Solid State Physics –K. Ilangovan
2. Materials Science – V. Raghavan

Books for Reference
1. Materials Science – M. Arumugam
2. Solid State Physics – S.O. Pillai
3. Physics of Solids – W. Thompson.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
V	20U5PHCP3	**Core – Major Practical - III**	6	6

Objectives:
- To gain the knowledge in experiments related to optics.
- To acquire knowledge in experiments related toelectronics.

List of ExperimentsAny Twenty Experiments

1. Newton's rings- Radius of curvature of the given lens.

2. Newton's rings- Refractive index of lens

3. Air wedge- Thickness of wire

4. Air wedge- Thickness of insulation of wire

5. Spectrometer Grating- Normal Incidence

6. Spectrometer- minimum Deviation

7. Spectrometer- Dispersive power.

8. Spectrometer- Cauchy's constant

9. Junction Diode characteristics

10. Full Wave rectifier

11. Bridge Rectifier

12. Transistor Characteristics- CE configuration.

13. Transistor Characteristics- CB configuration.

14. Impedance and Power factor of a coil

15. RC coupled amplifier (Single stage)- Transistor

16. Emitter Follower amplifier

17. FET Amplifier

18. FET Characteristics

19. Hartley oscillator- Transistor

20. Low pass, High pass, Band pass filters- using R and C

21. Op-Amp – Adder and Subtractor.

22. Op-Amp – Differentiator and Integrator.

Course Outcome:
After the completion of the course, students will
- acquire skills in doing experiments related to Optics
- have the potential to handle the circuit components in electronics
- gain knowledge related to integrated circuits.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
V	**20U5PHEL1A**	**Major Elective – I Energy Physics**	**4**	**3**

Objective:
- To introduce the awareness of non-conventional energy
- To gain knowledge on different types of energy sources.

Unit – I Introduction to Energy Sources

Energy Sources – primary- secondary- supplementary sources – Various forms of Energy - Coal, oil, natural gas – Availability – applications – conventional and non-conventional energy systems – comparison — merits and demerits – energy conservation- prospects of renewable energy sources.

Unit – IISolar Energy

Introduction – Solar constant – nature of Solar radiation – Solar radiation measurements – Principle of conversion of solar radiation into heat – Solar energy collectors – Types – applications and advantages – Solar Ponds – Principle of operation – applications – Thermal electric conversion – photovoltaic generation – Solar cooking – merits and demerits.

Unit – IIIBiomass energy and Wind energy

Biomass energy – Classification – Photosynthesis – Biomass conversion process – Biogas plants – Types – Gobar gas plants – Biogas from plant wastes– advantages and disadvantages.

Wind energy – Principles of wind energy conversion – WECS – Wind machines – Types – Energy Storage – Applications.

Unit – IV Chemical energy sources

Fuel cells –design and principle of operation for H_2 and O_2 cell- types of fuel cells – molten carbonate cells – solid oxide electrolyte cell – Aluminum-oxygen cell – photochemically regenerative fuel cells – conversion efficiency of fuel cells – polarization in fuel cell - advantages and disadvantages.

Unit – VOther energy sources

Geothermal energy – Geothermal sources – Advantages and disadvantages of geothermal energy over other energy forms – Applications – Ocean thermal energy conversion (OTEC) – Power generation – Energy forms waves and tides – Hydrogen energy - methods – thermo chemical method – solar energy method – utilization of hydrogen gas.

Course Outcomes:
On successful completion of the course, students will
- be aware on the various renewable energy sources
- be able to assess the technical preconditions over the consequences of different energy conversion systems as well their environmental impact
- be aware on employment opportunities in utilizing the renewable energy sources
- have the potential to develop their own solar projects.
- have knowledge to install their own biomass unit at low cost.

Books for Study
1. Non-conventional Energy sources, G.D. Rai, 5th Edition, 2011.
2. Solar Energy, S.P. Sukhatme, Tata McGraw – Hill Publishing company, 2nd Edition 1997.

Books for Reference
1. Solar Energy, G.D. Rai, 5th Edition, 1995.
2. Energy Technology, S. Rao and Dr. B.B. Parulekar, 2nd Edition, 1997.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
V	20U5PHEL1B	**Major Elective – I Information Technology**	4	3

Objectives:
- To introduce the knowledge of different types of computers.
- To introduce the concepts of communication using computer.
- To introduce the knowledge about Multimedia technologies and their applications.

Unit - I Introduction

Types of Computers – characteristics- microcomputers, mini, main, super, mainframe and network computers – centralprocessing unit, memoryinsidea typical computer system, memory and processor –Theperipheral devices – CISC and RISC [qualitative only] – Auxiliarystorage devices – typesof input and output devices.

Unit – IIComputer system software and Data Base Management

Operating system – Utilities – compilers – interpreters –Functionsof operating system – Classificationof operating systems – Typesof High-level languages – Generalsoftware features and Trends – Dataprocessing. Introduction to database – Importanceand characteristics – Typesof database management systems [types of models] – database design.

Unit – IIITelecommunications, internet and intranet

Introduction to telecommunications – computernetworks – communicationsystems – distributedsystems. Internetand World Wide Web – Electronicmail – voicemail- teleconferencing – fax – intranets.

Unit – IVMultimedia and new technologies

Introduction to multimedia – multimediatools – introductionvirtual reality – electroniccommerce – hypermedia – datawarehouses and data marts – datamining – onlineanalytical processing (olap) – geographicinformation system (gis).

Unit - V Applications of information technology

Computers in business and industry – computersin home – computersin education and educational training – computersin entertainment, science, medicine, and engineering- careers in information technology.

Course Outcomes:
On completion of this course, students will
- acquire knowledge and skills on communicating through computers and multimedia technologies.
- be aware on various operating systems and could equip themselves for software development.
- be able to create IT-based multimedia products such as websites, DVDs and computer games that combine text with sounds, pictures, graphics, video-clips, virtual reality and digital animation.
- have the potential to equip themselves as logo designer and graphics designer.

Books for study

1. Fundamentals of information technology
    -   Alexis Leon & Mathews Leon
    -   Leon tech world publishers, Chennai and vikas pub pvt. Ltd., New Delhi

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
V	20U5PHEL2A	**Major Elective – II** **Digital Electronics**	4	4

Objective:
- To gain the knowledge in Digital electronics.
- To introduce the concepts of A/D and D/A converters

Unit – INumber system

Number system: Decimal, Binary, Octal and Hexadecimal–Conversionto one another –Addition, Subtraction and multiplication of binarynumbers– 1's and 2's complement subtraction –BinaryCoded Decimal– Excess3 code –Gray code– Alphanumericcode - ASCII code.

Unit – IILogic gates and Boolean algebra

Logicgates: NOT, AND,OR, EX-OR, NOR and NAND gates – Universality of NOR and NAND – Booleanalgebra – lawsof Boolean Algebra – De-Morgan's laws – verification – simplificationof Boolean equations – Karnaughmap.

Unit – IIICombinational Circuits and Logic Hardware

Half adder – Fulladder – HalfSubtractor – FullSubtractor – Parallelbinary adder– BCD adder – Encoder – Decoder – Multiplexer – De-multiplexer – Logic families: Diode Logic – DTL, RTL and TTL.

Unit – IVFlip Flops, Counters and Registers

Flip Flops – RS, Clocked RS, JK, JK M/S, D, T, Flip flops – Asynchronous Counters – Mod-2, Mod- 5 and Mod – 8 - ripple counter – Synchronous counters – Decade counter - Ring counter – Registers: Shift left –Shiftright – Serial and Parallel shift registers.

Unit –V A/D & D/A Converters

Accuracy – Resolution – D/A Converters: Binary Weighted resistor network – Binary ladder[R-2R] – A/D converter: Simultaneous conversion – counter type methods – DualSlope method – Voltage to Frequency converters – Frequencyto Voltage converters**.**

Course Outcomes:

On successful completion of the course, students
- acquire skills on various number systems and conversion from one another.
- gain knowledge in logic gates and Boolean algebra communicating through computers and multimedia technologies.
- will be able to analyse and design procedures for synchronous and asynchronous sequential circuits.

Books for Study
1. Malvino and Leach –Digital Principles and Application
2. W.H. Gothmann–Digital Electronics
3. Millman and Halkias–Integrated Electronics

Books for Reference
1. Electronic instrumentation – Kalsi.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
V	20U5PHEL2B	**Major Elective – II Biophysics**	4	4

Objective:
- To introduce the knowledge in Biophysics
- To introduce the concepts of the Bioinstrumentation.

Unit – I Thermodynamics of living system

Conservation of energy in living systems – Entropy and life – Gibbs free energy – Standard free energy – Equilibrium constant – Heat content of food, bombcalorimetry, chemical kinetics – rate, order, molecularity of reactions – energy of activation.

Unit – IIDynamics of biomolecules

Diffusion – Laws of diffusion – Active transport – Facilitated diffusion – Osmosis Osmotic pressure – Osmoregulation – Viscosity and biological importance – Surface tension – Factors influencing surface tension – Biological importance.

Unit – IIIBioenergetics

Energy requirements in cell metabolism – role – Structure of mitochondria – high energy phosphate bond – transport of proteins – force for proteins stability – protein structures – protein function – Structure of myoglobin and hemoglobin – oxygen binding mechanism – Bohr effect – Electron transfer phenomenon – Biological transfer.

Unit – IVMolecular alphabets of life

Amino acids – nucleic acid bases – lipids – Classification – properties of amino acids – peptides – polypeptides – Nucleosides – nucleotides – polynucleotides – pentose hexose poly saceharides.

Unit – VBioinstrumentation

Electrophoresis – principle – types – Chromatographic techniques – Flow Cytometry – Centrifugation of Biomolecules – types – Basics of light microscopy – different types of compound microscopes – Adsorption spectroscopy – Spectrophotometry – Flurometry – specialized instruments – life time measurements.

Course Outcomes:

After completion, students
- get awareness on thermodynamics of living systems, Bioenergetics and Bioinstrumentation systems.
- will be able to deal with the synthesis of hormones and minerals and determines the effects of nutrients on the physical bodies and their functions.

Books for Study
1. Introduction to Biophysics by Cortell.
2. Tex book of Biophysics – R.N. Roy, New Central Agency (P) Ltd, Culcutta.
3. Bioinstrumentation: Tools for understanding life – Wandersce, James H. Ed and others.

Books for Reference
1. Physical Chemistry for life Science, Peter Atkins and Julio de Paula, 2006, Oxford Press
2. Molecular and Cellular Biophysics, Meyer B Jackson (2006), Cambridge.
3. Physical Chemistry for the Biosciences, Raymond Chang, (2004), University book Science biological Thermodynamics, Donald, T Hayine, (2007), Cambridge.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No.ofCredits
V	20U5PHNME	**Non - Major Elective** **Non-Conventional Energy Sources**	2	1

Objective:

- To gain knowledge on different types of energy sources.

Unit – I

Basics of Energy

Definition of energy – energy resources (conventional and non-conventional) – types of conventional and non-conventional energy sources – merits and demerits.

Solar Energy

Solar energy – nature and solar radiation – solar spectrum – components – crop dryers – solar cookers – photovoltaic generation – merits and demerits.

Biomass Energy

Biomass energy – classification – photosynthesis – biomass conversion process – Gobar gas plants – wood gasification – advantages and disadvantages.

Unit – II

Geothermal and Wind energy

Geothermal energy – its resources – power plants – types. Wind energy – nature and origin – wind energy conversion systems – merits & demerits – limitations – wind energy stations in India.

Ocean Energy

Ocean energy resources – advantages and disadvantages – limitations – conversion technologies – principle of OTEC (ocean technology energy conversion) – merits and demerits – Tidal energy conversion – Tidal power.

Course outcomes:

On Successful completion of the course, students will
- have employment opportunities on renewable energy sources to meet out India's burgeoning energy demand challenges.
- develop their own solar projects.
- be able to install their own biomass unit at low cost and with freely available raw materials to produce biogas which is a promising bio fuel.

Books for study

1. Non - conventional energy sources –G.D. Rai.
2. Renewable energy sources and emerging technologies by D. P. Kothari.

K.C. Singal & Rakesh Rajan, Prentice Hall of India PVT Ltd., New Delhi (2008).

Books for Reference

1. Renewable energy sources and their environmental impact, S. A. Abbasi and Nasema Abbasi PHI learning pvt ltd., New Delhi (2008).

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
V	20U5MALSD	**Life skill development**	1	-

Course objectives

➢ To enhance one's ability to be fully self aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.

➢ To increase one's knowledge and awareness of emotional competency and emotional intelligence at place of study/work.

➢ To provide opportunity for releasing one's potential through practical experience.

➢ To develop interpersonal skills and adopt good leadership behaviour for empowerment of self and others.

➢ To set appropriate goals, manage stress and time efficiently.

➢ To manage competency- mix at all levels for achieving excellence with ethics.

Unit – I   (30 hrs)

Communication and Professional skills

1. Writing and different modes of writing. (4 hrs)

2. Digital Literacy.   (4 hrs)

3. Effective use of social media.   (3 hrs)

4. Non verbal communication.   (2 hrs)

5. Resume skills.   (3 hrs)

6. Presentation skills.   (4 hrs)

7. Listening as a Team skill.   (2 hrs)

8. Brainstorming.   (2 hrs)

9. Social and cultural Etiquettes.   (4 hrs)

10. Internal communication.   (2 hrs)

Unit – II (30 hrs)

Leadership, management and Universal Human Value

1. Leadership skills.   (4 hrs)

2. Managerial skills.   (4 hrs)

3. Entrepreneurial skills.   (4 hrs)

4. Innovative Leadership and Design thinking.   (4 hrs)

5. SWOT (Strengths, Weaknesses, Opportunities and Threats Analysis)   (4 hrs)

6. EQ (Emotional Quotient)   (2 hrs)

7. Love and Compassion.   (4 hrs)

8. Truth.   (1 hr)

9. Non Violence.   (1 hr)

10. Righteousness.   (1 hr)

11. Ethic and Integrity.   (1 hr)

Course outcomes

At the end of the programme learners will be able to:

➢ Gain Self Competency and Confidence.
➢ Practice Emotional Competency.
➢ Gain Intellectual Competency.
➢ Gain an edge through Professional Competency.
➢ Aim for high sense of Social Competency.
➢ Be an integral Human Being.

References:

1. Bailey, Stephen, Academic Writing : A handbook for International Students, 2010 Rourlege.

2. Shlpa Sablok Bhardwaj (2018). Computer Applications for Class 9 MS Office Blueprint Education (Contributor).

3. http:// WWW.lyfemarketing.com / blog / how-digital – marketing – works/

4. http:// WWW.thoughtco.com/what-is-nnverbasl - communication - 1691351

5. http:// WWW.wikihow.com/Write-a-Neat-Resume

6. http:// WWW.gildabonanno.com/presentation-skill-coaching-videos

7. http:// blog.vantagecircle.com/active-listening/

8. Osborn, A.F. (1963) Applied imagination: Principles and procedures of creative problem solving (Third Revised Edition). New Yok, NY: Charles Scribner's Sons.

9. http:// WWW.thespruce.com/what - is - etiquette – and – why – is- it- important – 1216650

10. http:// WWW.talkfreely.com/blog/internal-and-eternal-communication

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
VI	20U6PHC10	**Core – Nuclear Physics**	5	5

Objectives:

- To gain the knowledge about Properties of Nuclei.
- To introduce knowledge Cosmic rays and elementary particles.

Unit – IGeneral Properties of Nuclei & Nuclear forces

Classification of nuclei – General properties of nucleus–determination of nuclear size - electron scattering experiment –Dempster's mass spectrograph – bindingenergy, mass defect and packing fraction – stabilityand binding energycurve – Semi-empirical mass formula – Nuclearspin and magnetic moment – Electricquadruple moment – Nuclearforces – basicproperties- Meson theory of nuclear forces.

Unit –IIRadioactivity

Laws of Natural radioactivity – Law of radioactive disintegration – Half-life period – Mean life period – Law of successive disintegration – Radioactive Equilibrium – Types of radioactive radiations – Properties – Alpha emission –Geiger and Nuttal law – Alpha particle spectra – Theory of alpha decay – Gamow's theory – Beta ray spectra – line and continuous spectrum – Neutrino theory – Gamma ray spectra – origin of Gamma rays – Nuclear isomerism – Internal conversion.

Unit – IIINuclear Reactions

General ideas of nuclear reactions –types of nuclear reactions – energy balance in nuclear reaction – threshold energy – nuclear transmutations – types of transmutations with examples – discovery of neutron – properties -Nuclear models: liquid drop model – shell model - fission – fusion.

Unit – IV Detectors and Accelerators

Solid state detectors – Geiger-Muller counter – Wilson-cloud chamber – Bubble chamber – Scintillation counters – Cerenkov counter – Linear accelerator – Cyclotron – Synchrocyclotron – Betatron – Electron synchrotron – Proton synchrotron.

Unit – VCosmic Rays and elementary Particles

Discovery of Cosmic rays – Latitude effect – Azimuth effect – Altitude effect – Primary and Secondary cosmic rays – cosmic ray showers – Van Allen belts – Origin of cosmic rays – Elementary particles – classification – Particles and antiparticles – fundamental interactions – elementary particle quantum numbers – conservation laws and symmetry.

Course Outcomes:

After passing the course, students
- acquire knowledge on concepts of nuclear forces, radioactivity.
- will be able to understand nuclear detectors and accelerators.
- can have the ability to calculate the kinematics of various reactions and decay processes by relativistic calculations.
- will be able to get knowledge in cosmic rays and elementary particles.

Books for Study
1. Modern Physics – R. Murugesan
2. Nuclear Physics-D.C.Tayal

Books for Reference
1. Nuclear Physics - R.C. Sharma.
2. Introductory Nuclear Physics - R.K. Puir and V.K. Babbar
3. Modern Physics – J.B. Rajam

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
VI	20U6PHC11	**Core – Fundamentals of Nanotechnology**	5	5

Objective:
- To introduce basics of Nanoscience and nanotechnology
- To introduce the synthesizing steps to prepare nanomaterials

Unit – IIntroduction to Nanotechnology

Nanoscience – Nanotechnology –Definitions - History of nanotechnology – Nanomaterials: classification – zero, one and two dimensional nanomaterials – Classification based on the composition of materials(metal, semiconductor, ceramic, polymeric and carbon-based nanomaterials) - Properties of nanomaterials– Surface area to volume ratio(S.A/V) – Effect of S.A/V on the properties of materials – Quantum dots – Production of quantum dots – Applications of quantum dots – Quantum wires – properties and applications of quantum wires - Challenges in nanotechnology.

Unit – II Preparation Methods

Top-down and Bottom-up approaches – Top-down methods: Ball milling, Chemical etching photolithography and Electron beam lithography – Advantages – Limitations.

Bottom-up methods: Vacuum evaporation, Sputter deposition process, Laser ablation, Hydro thermal method – Advantages – Limitations.

Unit – III Fullerenes

Fullerenes – Types of fullerenes – Bucky ball/Buckminster fullerene - Carbon nano tubes(CNTs) - Single walled CNTs – Multi walled CNTs – Differences – Properties of CNTs: mechanical, electrical and superconducting properties – Preparation of CNTs – Plasma discharge method – Chemical vapour deposition method – Applications.

Unit – IV Characterization Techniques

Construction, working principle, merits and demerits of X-ray diffractometer - Scanning Electron Microscope (SEM) – Atomic Force Microscope (AFM) -– UV-Vis–NIR double beam spectro photometer – Energy dispersive X-ray analysis (EDAX) - SQUID - Raman spectroscopy.

Unit – IV Applications

Nanoelectronics – Molecular electronics – Nanophotonics – Nanorobotics – Nanomechanics – Band gap engineered quantum devices - Quantum computers – Carbon nanotube FETs – Nano MOSFETs – Molecular diodes, transistors – Biomedical applications: Targeted drug delivery – targeted chemotherapy.

Course Outcomes:
On completion of the course, students will
- acquire knowledge on fundamentals of nanotechnology.
- understand the preparation techniques and applications of nanomaterials.
- able to explain general concepts and physical phenomena of relevance within the field of nanoscience.

Books for Study

1. K. Ravichandran, K. Swaminathan, P.K. Praseetha, P. Kavitha, Introduction to Nanotechnology, JAZYM publications.
2. M.Ratner.et al., Nanotechnology; A Gentle intro Practices – hall ISBN 0-13-101400-5, 2003.
3. Nanotechnology; Basic Science and Emergining Technologies, CRC Press

Books for Reference
1. Charles P.Poole Jr and Frank J.Owens. "Introduction to Nanotechnology" Wiley, 2003.
2. A. S. Edelstien and R.C. Cornmarata, Nanomaterials; synthesis, Properties and Applications, 2ed, Iop (U.K), 1996.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
VI	**20U6PHC12**	**Core – Linear Integrated Circuits**	**4**	**4**

Objectives:
- To gain the knowledge in operational amplifiers.
- To understand the working principle of various op-amp circuits.

Unit – I Operational Amplifier characteristics

Introduction to Operational Amplifier – Op-Amp Characteristics – Differential amplifier –Ideal - Practical Op-Amp – Op-Amp parameters– Output offset voltage – Input offset current–CMRR – slew rate – open loop gain –Frequencyresponse of op-amp –gain of inverting and non-inverting Amplifier.

Unit – IIOperational amplifier with negative feedback

Feedback configuration – Blockdiagram – Voltage – Series feedback – Negative feedback – Closed Loop Voltage gain – Input Resistance with feedback – Output resistance with feedback – Bandwidth with feedback – Effect of feedback on total of output offset voltage.

Unit – III Applications of Operational Amplifier

Basic Op-Amp circuits – inverting summing and difference amplifier – Integrator – Differentiator – Linear op-amp circuits – DC sources – Current-to-Voltage and Voltage-to-Current converters – Logarithmic and Anti-logarithmic amplifiers using diode.

Unit – IVSignal Generators

Op-amp as comparator – Regenerative Comparator (Schmitt Trigger) –Triangular wave generator – Sawtooth Waveform generator – 555 Timer - pin diagram- internal circuit- Multivibrator – Astable – Bistable.

Unit –VAnalog and Digital computation

Solving simultaneous equation- Solving linear differential equations – D/A converter – resistive divider – accuracy – resolution – A/D converter – Counter type method.

Course Outcomes:

On successful completion, students will
- acquire knowledge and skills on various aspects of operational amplifiers.
- experience both theory and practical knowledge on op-amp circuits.

Books for study
1. Introduction to Integrated Electronics-V.Vijayendran.
2. Linear integrated circuits-Roy Chouthry.
3. Integrated Electronics(Analog and digital circuits and systems),JacobMillman and Christos C. HalKias,Tata McGraw Hill edition, New Dehli.
4. Electronic Devices and Circuits,Millman and HalKias.
5. Micro Electronics, Digital and Analog circuit and System – Jacob Mill man.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
VI	**20U6PHCP4**	**Core – Major Practical - IV**	**6**	**6**

Objectives:
- To gain the knowledge in experiments related to analog and digital electronics.
- To acquire skills in computer programming techniques.

List of Experiments - Any Twenty Experiments

1. Zener Diode Characteristics

2. Temperature Coefficient of resistance of a Thermistor using Potentiometer.

3. Single stage RC coupled transistor Amplifier Zener Regulated Power Supply

4. Zener Regulated Power Supply

5. Voltage Doubler

6. Construction of IC Regulated Power supply

7. Transistor as a switch

8. AstableMultivibrator- Transistor

9. Logic gates- Discrete components

10. DTL- NAND gate

11. RTL- NOR gate

12. Logic Gates- IC

13. Study of Universal gates- NAND and NOR

14. Half adder and subtractor

15. Full adder and subtractor

16. Verification of Demorgan's theorems

17. Parallel Binary adder

18. Encoder (0 to 8)

19. Microprocessor- Addition and subtraction

20. Microprocessor- 8 bit multiplication

21. C programming – find the biggest number of an array.

22. C programming – Arranging a set of numbers in ascending/ descending order

23. C programming – matrix addition and subtraction

24. C programming – solving quadratic equation

Course Outcomes:
After completing the course, students
- will acquire skills on designing electronic circuits and making observations.
- will be familiar about the function of semiconductor diodes, transistors, amplifiers, oscillators and digital instruments.
- will get knowledge in programming techniques.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
VI	20U6PHEL3A	**Major Elective – II Programming in C**	4	3

Objective:
- To introduce knowledge in C programming
- To gain knowledge in writing assembly language programs

Unit I Fundamentals of Clanguage

Introduction - Importance of C - Basic structureof C programs - character set - C Tokens - Keywords and Identifiers - Constants - Variables - Data types - Declaration of variables - Assigning values to variables - Defining symbolic constants.

Operators: Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional and Bitwise operators - Arithmetic expressions - Precedence of arithmetic operators - Evaluation of expressions.

Unit II Input/Output Statementsand Control Structures

Input output statements: getchar - putchar - formatted input (scanf) - formatted output (printf).

Control structures: Decision making with simple if - if-else - nesting of if-else - else-if ladder - switch - goto statement - Looping with while - do-while - for statements - break and continue statements - flowchart symbols.

Unit III Arrays, Stringsand Functions

Arrays: One dimensional arrays– Declaration and initialization of one dimensional arrays - two dimensional arrays - Declaration and initialization of two dimensional arrays

Strings: Declaration and initialization of string variables - Reading strings from terminal - Writing strings to screen - String handling functions.

Functions: Library functions - User-defined functions - Definition of functions - function declaration - function calls - nesting of functions - recursion.

Unit IV Pointers, Structures, Unionsand Files

Pointers: Advantages of using pointers - Declaring pointer variables - Accessing a variable through its pointer - Pointer expressions - Pointer increments and scale factor.

Structures and unions: Defining a structure - Accessing structure members - Arrays of structures - Defining unions.

Files: Declaring and opening a file - Closing a file - Input / Output operations on file: getc - putc - getw - putw - fprintf and fscanf functions - Error handling functions: feof and ferror.

Unit -V Programming
Algorithm, flowchart and program to
1. Calculate the total and Average of a set of numbers.
2. Calculate the circumference and area of a circle.
3. Convert Fahrenheit to Celsius and vice versa.
4. Calculate the Young's modulus of a material of a bar (Non- uniform bending)
5. Solve quadratic equation
6. Findthe factorial using recursion
7. Add/ subtract / multiply two matrices
8. To find the smallest and largest elements in an array
9. Sorting a set of numbers in ascending/ descending order
10. To arrange the names in alphabetical order

Course Outcomes:
After the completion of the course, students will
- gain knowledge in C language and skills in high level programming
- be able to develop readable C programs with files for reading input and storing output.

Books for Study
1. Programming in ANSI C- E. Balagurusamy - Tata McGraw- Hill
2. Schaum's Outline Series Theory and problems of programming with C- Byron S. Gottfriend, McGraw Hill internationals.

Books for Reference
1. Programming with C- Venugopal, K.R and Sudep R.P- Tata McGraw- Hill 1998
2. Let us C- Yashwant Kanetkar.

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
VI	20U6PHEL3B	**Major Elective –III History of Physics**	4	3

Objective:

- To know the history of Physics.
- To gain knowledge fundamentals on quantum mechanics.
- To know the advancement of Physics in India.

Unit - I Ancient Greeks of Newton

Pythagoras – Democritus's theory – Aristotle and "why things happen?" – Aryabhata – Copernicus – Kepler and the elliptical orbit – Galileo's laws of motion and telescope – Newton laws of motion and gravity.

Unit – II Light, Gases, Atomic Structure and Thermodynamics

Light – Newton's Corpuscular theory – Young and double slit experiment – Fresnel and light waves – Development of Science of gases – Pascal and Boyle – Atomic theories of Daton and Bohr – The birth of Thermodynamics – Joule's measurement – The first and second laws – Maxwell's Demon.

Unit –III Electricity and Magnetism

Experiment of Galvani, Oersted, Ampere, Faraday, Coulomb, Rutherford and Benjamin Franklin – Volta and the birth of battery – Thomas Alva Edison – Maxwell and his Field – Lasers – Superconductors.

Unit – IV Quantum Mechanic and Relatively

Planck's idea – Einstein's photoelectric effect – Schrodinger and his wave equation – Heisenberg's uncertainly principle – Stern – Gerlach experiment – Einstein's special theory of relatively – Twin paradox – General theory of relatively.

Unit – V Physics in India

Why is the sea blue? – Raman effect – Bose and his statistics – Bosons and Bose condensation – Chandrasekhar, his limit and white dwarfs – Saha and his ionization formula – Homi Bhabha: Research finding – The institution builder – Birth if DAE and AEET.

Course Outcomes:

After successfully completing the course, students will be to

- acquire knowledge on history of physics
- describe and comment the
  beginning of science in western civilization with special attention to Miletus, Pythagoras, Atomic, Elestic and Peripatetic schools of philosophy.

Books for Study and Reference

1. R. Spangerrburg and D.K. Moser, The History of Science: Form the Ancient Greeks to the scientific revolution (University Press, Hyderabad, 1999).
2. R. Spangerrburg and D.K. Moser, The History of Science: in the Eighteenth century (University Press, Hyderabad, 1999).
3. R. Spangerrburg and D.K. Moser, The History of Science: in the Nineteeth century (University Press, Hyderabad, 1999).
4. R. Spangerrburg and D.K. Moser, The Story of Science: From 1900 to 1945 (University Press, Hyderabad, 1999).

Semester	Course Code	Title of the Course	Hours of Teaching/week	No. of Credits
VI	**20U6PHEL4A**	**Major Elective – IV 8085 Microprocessor and its Applications**	**4**	**4**

Objective:
- To introduce the knowledge in 8085 microprocessor fundamentals and assembly language programming
- To know the applications of 8085 microprocessor

Unit– IFundamentalsof Microprocessors

Microcomputer - block diagram - Microprocessor - general block diagram of a microprocessor - ALU - Timing and control unit - Registers - Buses.

Memory - Semiconductor memory - RAM - static and dynamic RAM - ROM - PROM - EPROM - EEPROM - CCD Memory - Cache memory - Hard disks - Block diagram for interfacing memory and I/O devices through buses.

Unit – II Intel 8085 μp Architecture

Block diagram of Intel 8085 - ALU - Timing and control unit - Accumulator - general purpose registers - Program counters - Stack pointer - Flags - Data and address bus - pin configuration - Instruction cycle:- fetch operation - execute operation - machine cycle and state - instruction and data flow.

Unit –III Instruction Set of Intel 8085

Data transfer group - Arithmetic group - logical group - Branch and control group -I/O and machine control group - Addressing modes: Direct addressing - Register addressing - register indirect addressing - immediate addressing - implicit addressing – simple programs for arithmetic operations using each addressing mode - opcode and operands- Classification based on instruction word size.

Unit –IVAssembly Language Programming

Machine language - assembly language - high level language - software development - modular programming - structural programming - debugging - programs for addition - subtraction - 8bit multiplication.

Unit –VPheripheralDevices, Interfacing and Applications

Address space partitioning - Memory mapped I/O scheme - I/O mapped I/O scheme - Memory and I/O interfacing - Intercepts in Intel 8085 - Programmable Peripheral Interface (PPI) Intel 8255 - Delay subroutineusing one register - 7 segment LED display - stepper motor.

Course Outcomes:

At end of the course, students will be able to
- understandthe basic concepts, architecture and instruction set of Intel 8085 microprocessor.
- acquire skills in assembly language programming using 8085 instruction set.
- interface 8085 microprocessor with Programmable Interface Devices.

Books for Study and Reference

1. Fundamentals of microprocessors and microcontrollers – B. Ram,Dhanpat Rai publications., Reprint 2010.
2. Microprocessor Architecture, Programming and Application 8085 – III – By Ramesh S. Gaonkar.
3. Microprocessor & Applications Adhidya P. Mathur.

Semester	Course Code	Title of the Paper	Hours of Teaching/week	No. of Credits
VI	20U6PHEL4B	**Major Elective – Communication Electronics**	4	4

Objectives:
- To impart the concepts of radio communications
- To gain the knowledge about Radio and Fiber optic communications.

Unit – IModulation

Essential of modulation – Amplitudemodulation – Frequencymodulation – singleside band modulation – Principles– determination of modulation factors – wave analysis -mathematical expressions – Thebalanced modulator – signalto noise ratio – comparison between AM and FM modulation – Demodulation – AM diode detectors – FM detectors.

Unit – IIRadio Communications

Principles – Radio broadcasting systems – Amplitude modulated transmitters – Frequency modulated transmitters – SSB transmitters – mathematical analysis – Radio receivers – types – Simple crystal receiver – tuned radio frequency receiver – AM superhetrodyne receiver – SSB receivers.

Unit – IIIMicrowaves and Radars

Generation– Klystron – Two cavity – Multi cavity Klystron – Reflex Klystron – Travelling wave tube – Construction – Operation – Magnetron – Cavity magnetron – Applications

Radar – Block diagram of a simple radar – Classification – Radar range equation – Pulsed radar system – Radar displays – A scope display – Plane position indicator – Scanning and Tracking with radar – Applications.

Unit – IV Antenna and Satellite Communication

Antenna –Resonant antenna – Antennagain –Impedence matching – Grounded antennas – High frequency antennas – Dipole arrays – YAGI-UDA antenna – Rhombic antenna.

Satellite Communications: Satellite orbits – Satellite frequencies – Station keeping – Transmission path – Link calculations – Factors affecting satellite communication.

Unit – VFiber Optic Communication

Principle – classificationof optical system – single mode – multi mode step index – multi mode graded index – structure – propagation of light – Snell's law – total internal reflection – light propagation through fibre – cone of maximum acceptance – numerical aperture – fibre losses – splicer's and connectors – types – fibre optic communication system – advantages.

Course Outcomes:

On completion of course student will be able to
- gain knowledge and skills on various aspects of radio communications
- know the types and function of antennas
- understand the concepts of satellite communication
- identify the required system for a better communication technique.

Books for Study
1. Electronic communications –RoddyandCoolen.
2. Monochrome and Colour television – R.R. Gulati.
3. Microwave and radar engineering – M. Kulkarani- Umesh Publications, Delhi.

Books for Reference
1. Electronic communication – Kennedy Davis.
2. Communications Electronics - N.D. Deshpande, D.A. Deshpande and P.K. Rangole.