CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

NATIONALLY ACCREDITED (III CYCLE) WITH "A" GRADE BY NAAC

ISO 9001:2015 Certified

TIRUCHIRAPPALLI – 620 018

PG AND RESEARCH DEPARTMENT OF PHYSICS

B.Sc., PHYSICS SYLLABUS

(2023-2024 and Onwards)

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
TIRUCHIRAPPALLI-620 018

PG AND RESEARCH DEPARTMENT OF PHYSICS

<u>VISION</u>

To establish a substratum for excellence and creation of knowledge by igniting the essence of learning physics and exploring its area of research with novel ideas.

<u>MISSION</u>

Our mission is two – fold.

- To provide an outstanding and distinctive education to our undergraduate and postgraduate students.
- To expand our research enterprises via centers and institutes to achieve national and international prominence in strategic research areas.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES FOR B.Sc PHYSICS PROGRAMME

PO NO.	On completion of B.Sc Physics Programme, The students will be able to
PO 1	**Domain Knowledge**: Analyse, design and develop solutions by applying firm fundamental concepts of basic sciences and expertise in discipline.
PO 2	**Problem solving:** Ability to think rationally, analyse and solve problems adequately with practical knowledge to assess the environmental issues.
PO 3	**Creative thinking and Team Work:** Develop prudent decision-making skills and mobility to work in teams to solve multifaceted problems.
PO 4	**Employability:** Self-study acclimatize them to observe effective interactive practices for practical learning enabling them to be a successful science graduate.
PO 5	**Life Long Learning**: Assure consistent improvement in the performance and arouse interest to pursue higher studies in premium institutions.

PROGRAMME SPECIFIC OUTCOMES FOR B.Sc PHYSICS PROGRAMME
B.Sc PHYSICS CURRICULUM [2023-2024 and Onwards]

PSO NO.	Programme Specific Outcomes Students of B.Sc Physics will be able to	POs Addressed
PSO1	Intensify the student academic capability, unique qualities and transferable skills which will give them opportunity to evolve as responsible citizens.	PO1, PO2, PO4
PSO2	Explain the fundamentals laws involved in physics.	PO1, PO5
PSO3	Understand the theory and consequence of the various physical occurrence.	PO1, PO2, PO3, PO5
PSO4	Carryout experiments to interpret the laws and concepts of Physics.	PO1, PO2, PO5
PSO5	Relate the theories learnt and the skills procured to solve enduring problems.	PO1, PO2, PO3, PO5

Cauvery College for Women (Autonomous)
PG & Research Department of Physics
B.Sc., Physics
LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS-LOCF)
(For the Candidates admitted from the Academic year 2023-2024 and onwards)

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam Hrs.	Exam Marks Int	Exam Marks Ext	Total
I	I	Language Course-I (LC)	பொதுத்தமிழ் – I	23ULT1	6	3	3	25	75	100
			Hindi ka Samanya Gyan aur Nibandh	23ULH1						
			Poetry, Grammar and History of Sanskrit Literature	23ULS1						
			Foundation Course: Paper I- French I	23ULF1						
	II	English Language Course- I(ELC)	General English -I	23UE1	6	3	3	25	75	100
	III	Core Course – I(CC)	Properties of Matter and Acoustics	23UPH1CC1	5	5	3	25	75	100
		Core Practical - I (CP)	Properties of Matter and Acoustics (P)	23UPH1CC1P	3	3	3	40	60	100
		First Allied Course- I (AC)	Calculus and Fourier Series	22UPH1AC1	4	3	3	25	75	100
		First Allied Course- II (AC)	Algebra, Analytical Geometry of 3D & Trigonometry	22UPH1AC2	4	3	3	25	75	100
	IV	Ability Enhancement Compulsory Course-I (AECC)	Value Education	23UGVE	2	2	-	100	-	100
		Total			**30**	**22**				**700**
II	I	Language Course-II (LC)	பொதுத்தமிழ் – II	23ULT2	6	3	3	25	75	100
			Hindi Literature & Grammar –II	22ULH2						
			Prose, Grammar and History of Sanskrit Literature	23ULS2						
			Basic French – II	22ULF2						
	II	English Language Course- II(ELC)	General English - II	23UE2	6	3	3	25	75	100
	III	Core Course – II (CC)	Mechanics and Relativity	22UPH2CC2	5	5	3	25	75	100
		Core Practical - II (CP)	Mechanics and Digital Electronics (P)	23UPH2CC2P	3	3	3	40	60	100
		Core Course -III (CC)	Introduction to Digital Electronics	23UPH2CC3	2	2	3	25	75	100
		First Allied Course –III (AC)	ODE, PDE, Laplace Transforms and Vector Analysis	22UPH2AC3	4	3	3	25	75	100
	IV	Ability Enhancement Compulsory Course-II (AECC)	Environmental Studies	22UGEVS	2	2	-	100	-	100
		Ability Enhancement Compulsory Course-III (AECC)	Innovation and Entrepreneurship	22UGIE	2	1	-	100	-	100
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
		Total			**30**	**22**				**800**

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam Hrs.	Marks Int	Marks Ext	Total
III	I	Language Course-III (LC)	பொதுத்தமிழ் – III	23ULT3	6	3	3	25	75	100
			Hindi Literature & Grammar –III	22ULH3						
			Drama, Grammar and History of Sanskrit Literature	23ULS3						
			Intermediate French-I	22ULF3						
	II	English Language Course-III(ELC)	Learning Grammar Through Literature – I	23UE3	6	3	3	25	75	100
	III	Core Course– IV (CC)	Thermal Physics and Statistical Mechanics	23UPH3CC4	5	5	3	25	75	100
		Core Practical – III (CP)	Thermal Physics (P)	23UPH3CC3P	3	3	3	40	60	100
		Second Allied Course-I (AC)	Chemistry – I	22UPH3AC4	4	3	3	25	75	100
		Second Allied Course- II (AP)	Chemistry-I (P)	22UPH3AC5P	4	3	3	40	60	100
	IV	Generic Elective Course-I (GEC)	Physics in Everyday Life	22UPH3GEC1	2	2	3	25	75	100
			Basic Tamil – I	22ULC3BT1						
			Special Tamil – I	22ULC3ST1						
		Extra Credit Course	SWAYAM	As per UGC Recommendation						
		Total			**30**	**22**				**700**

15 Days INTERNSHIP during Semester Holidays

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam Hrs.	Marks Int	Marks Ext	Total
IV	I	Language Course - IV (LC)	பொதுத்தமிழ்– IV	23ULT4	6	3	3	25	75	100
			Hindi Literature & Functional Hindi	22ULH4						
			Alankara, Didactic and Modern Literatures and Translation	23ULS4						
			Intermediate French -II	22ULF4						
	II	English Language Course – IV(ELC)	Learning Grammar Through Literature– II	23UE4	6	3	3	25	75	100
	III	Core Course – V (CC)	Electricity, Magnetism and Electromagnetism	23UPH4CC5	6	5	3	25	75	100
		Core Practical – IV (CP)	Electricity and Magnetism (P)	23UPH4CC4P	4	4	3	40	60	100
		Second Allied Course- III (AC)	Chemistry – II	22UPH4AC6	4	3	3	25	75	100
		Internship	Internship	22UPH4INT	-	2	-	25	75	100
	IV	Generic Elective Course- II(GEC)	Photography and Videography	22UPH4GEC2	2	2	3	25	75	100
			Basic Tamil – II	22ULC4BT2						
			Special Tamil - II	22ULC4ST2						
		Skill Enhancement Course – I(SEC)	Web Designing (P)	22UPH4SEC1P	2	2	3	40	60	100
		Extra Credit Course	SWAYAM	As per UGC Recommendation						
		Total			**30**	**24**				**800**

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Hrs.	Int	Ext	Total
								Exam Marks		
V	III	Core Course – VI (CC)	Optics	23UPH5CC6	6	5	3	25	75	100
		Core Practical – V (CP)	General and Electronics (P)	22UPH5CC5P	3	3	3	40	60	100
		Core Course – VII (CC)	Atomic and Nuclear Physics	23UPH5CC7	6	5	3	25	75	100
		Core Course – VIII (CC)	Analog Electronics	23UPH5CC8	6	5	3	25	75	100
		Discipline Specific Elective – I (DSE)	A. Materials Science	23UPH5DSE1A	5	3	3	25	75	100
			B. Laser Physics	23UPH5DSE1B						
			C. Astrophysics and Cosmology	23UPH5DSE1C						
	IV	Ability Enhancement Compulsory Course-IV(AECC)	UGC Jeevan Kaushal - Professional Skills	22UGPS	2	2	-	100	-	100
		Skill Enhancement Course – II (SEC)	Physics concepts through Animation (P)	22UPH5SEC2P	2	2	3	40	60	100
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
				Total	**30**	**25**				**700**
VI	III	Core Course – IX (CC)	Fundamentals of Microprocessor	23UPH6CC9	6	5	3	25	75	100
		Core Course – X (CC)	Classical and Quantum Physics	23UPH6CC10	5	4	3	25	75	100
		Core Practical –VI (CP)	Electronics and Microprocessor (P)	22UPH6CC6P	3	3	3	40	60	100
		Core Course – XI (CC)	Cyber Security	22UGCS	5	4	3	25	75	100
		Discipline Specific Elective – II (DSE)	A. Communication Physics	23UPH6DSE2A	5	3	3	25	75	100
			B. Computational Physics	23UPH6DSE2B						
			C. Medical Physics	23UPH6DSE2C						
		Project	Project Work	22UPH6PW	5	4	-	-	100	100
	IV	Ability Enhancement Compulsory Course-V(AECC)	Gender Studies	22UGGS	1	1	-	100	-	100
	V	Extension activity		22UGEA	0	1	0	-	-	-
				Total	**30**	**25**				**700**
				Grand Total	**180**	**140**				**4400**

THEORY	
Attendance	3
Library	3
Seminar/Quiz/ Assignment	4
CIA – I	7.5
CIA – II	7.5
Total	**25**

PRACTICAL	
Observation	5
Record	10
Continuous Performance in Practical	10
Model Practical	15
Total	**40**

Semester I	Internal Marks: 25			External Marks: 75
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
23UPH1CC1	**PROPERTIES OF MATTER AND ACOUSTICS**	**CC-I**	**5**	**5**

Course Objectives

- To build the elastic behavior in terms of three moduli of elasticity and working of torsion pendulum.
- To apply the concept of bending of beams and analyze the expression, quantify, and understand nature of materials.
- To study the concept of surface tension and viscosity of fluids and learn about an analogous solution to many engineering problems
- To analyze simple harmonic motions mathematically and understand the concept of resonance and set up experiment to evaluate frequency of vibration.
- To understand the concepts of acoustics and the significance of building construction. Able to apply ultrasonic knowledge in real life.

Pre-requisites

- Knowledge about the concepts of elasticity and bending moment
- Fundamental knowledge of capillarity, viscosity of various liquids
- Develop the idea of formula, frequency of vibration and factors affecting the architectural acoustics

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to	Cognitive Level
CO 1	Understand the basic ideas of Physical properties of different states of matter and sound	K1, K2
CO 2	Analyze the characteristics of elasticity, viscosity, surface tension and the requisites of good acoustics	K3
CO 3	Evaluate the ideas of elasticity and excess pressure of surface tension in fluids and analyze the capillarity nature in liquids	K4
CO 4	Apply the concepts of moduli of elasticity, surface tension, viscosity, waves and acoustics	K3, K5
CO 5	Develop the idea of bending of beams, empirical relations between surface tension and temperature, stokes formula, frequency of vibration of strings and factors affecting the architectural acoustics	K4

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	2	1	3	2	3	2	1
CO 2	3	3	2	3	1	3	2	3	2	2
CO 3	3	3	2	1	1	3	3	2	2	1
CO 4	3	3	3	2	2	3	3	2	3	1
CO 5	3	3	3	2	1	3	3	2	2	1

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation   "-" – indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**ELASTICITY** Hooke's law-stress-strain diagram- Elastic constants-Poisson 's ratio -relation between elastic constants and Poisson 's ratio -Work done in stretching and twisting a wire-twisting couple on a cylinder-rigidity modulus by static torsion-torsional pendulum (with and without masses)	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**BENDING OF BEAMS** Cantilever -Expression for bending moment-expression for depression at the loaded end of the cantilever -oscillations of a cantilever-expression for time period-experiment to find Young 's modulus-non-uniform bending-experiment to determine young's modulus by Koenig 's method-uniform bending-expression for elevation-experiment to determine Young's modulus using microscope	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**FLUID DYNAMICS:** Surface Tension: definition-molecular forces-Excess pressure over curved surface-application to spherical and cylindrical drops and bubbles-determination of surface tension - Jaeger's method-variation of surface tension with temperature Viscosity: Definition- Streamline and turbulent flow– Rate of flow of liquid in a capillary tube -Poiseuille's formula–corrections-terminal velocity and stoke's formula-variation of viscosity with temperature	22	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**WAVES AND OSCILLATIONS** Simple Harmonic Motion (SHM)–differential equation of SHM-graphical representation of SHM-Composition of two S.H.M in a straight line and at right angles-Lissajous's figures-Free, Damped, Forced vibrations - Resonance and sharpness of resonance Laws of transverse vibration in strings - Determination of AC frequency using sonometer - Determination of frequency using Melde's string apparatus	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**ACOUSTICS OF BUILDINGS AND ULTRASONICS:** Intensity of sound-Decibel-Loudness of sound-Reverberation- Sabine's reverberation formula-acoustic intensity-factors affecting the acoustics of buildings Ultrasonic waves: -Production of ultrasonic waves–Piezoelectric crystal method–Magnetostriction effect–application of ultrasonic waves	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	**SELF STUDY FOR ENRICHMENT:** (Not to be included for External Examination) Rigidity modulus of different materials - I- shaped griders and its uses - surface tension of soap bubble - sonic waves and its types – application of acoustics.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Murugeshan, R., (2012). *Properties of Matter and Acoustics*. (3rd edition) S.Chand& Co, New Delhi.
2. Mathur, D.S., (2010). *Elements of Properties of Matter*. (1st edition) S. Chand & Company, New Delhi.
3. Khanna, D.R., & Bedi, R.S., (1969). *Textbook of Sound*. (7th edition) Atmaram and sons, New Delhi.
4. Subrahmanyam, N., & BrijLal., (2015). *Textbook of Sound*. (2nd edition) Vikas Publishing House, Chennai.

Reference Books

1. Smith, C.J., (1960). *General Properties of Matter and Acoustics*. Orient Longman Publishers, Hyderabad.
2. Gulati, H.R., (1977). *Fundamentals of General Properties of Matter*. (5th edition) R. Chand& Co, New Delhi.
3. French, AP., (1973). *Vibration and waves*. (2nd edition), MIT Introductory Physics, Arnold-Heinmann, India.

Web References

1. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html
3. https://www.youtube.com/watch?v=gT8Nth9NWPM
4. https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s
5. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
6. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/
7. http://www.sound-physics.com/
8. http://nptel.ac.in/courses/112104026/

Pedagogy

Chalk and Talk, Assignment, Group discussion and quiz

Course Designer

Dr.S.Gowri

Semester I	Internal Marks: 25			External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**	
23UPH1CC1P	**PROPERTIES OF MATTER AND ACOUSTICS (P)**	**CP-I**	**3**	**3**	

Course Objectives

- To help students to enhance their experimental skills.
- To gain hands-on experience with a variety of techniques.
- To learn the basic principles and procedures of laboratory work.

Pre-requisites

- Basic knowledge on usage of scientific apparatus.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to	Cognitive Level
CO 1	Select the equipment and get the necessary accessories.	K1
CO 2	Demonstrate the use of equipment for various measures.	K2
CO 3	Construct the experiment by arranging and assembling the equipment.	K3
CO 4	Solve the physical quantity using the relevant formula after gathering accurate data through observations. Keep a detailed record of all laboratory activities.	K3
CO 5	Apply experimental approaches to correlate with physics theory to develop practical understanding.	K3

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	1	1	1	2	1	3	2	1	2	1
CO 2	2	3	2	2	2	3	3	1	2	1
CO 3	1	1	2	3	1	3	2	1	3	1
CO 4	2	3	3	3	2	1	3	1	3	2
CO 5	3	2	3	3	3	1	3	2	3	2

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation

Syllabus

LIST OF EXPERIMENTS (Any 8)

1. Determination of rigidity modulus without mass using Torsional pendulum.
2. Determination of rigidity modulus with masses using Torsional pendulum.
3. Determination of Young's modulus by uniform bending – load depression graph.
4. Determination of Young's modulus by non-uniform bending – scale & telescope
5. Determination of Young's modulus by cantilever – load depression graph.
6. Determination of rigidity modulus by static torsion.
7. Determination of surface tension & interfacial surface tension by drop weight method.
8. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
9. Determination of viscosity by Poiseullie's flow method.
10. Determination of g using compound pendulum.
11. Sonometer – determination of frequency of tuning fork.

Text Book

1. Ouseph, C.C., Rao, U.J., Vijayendran, V., (2016). *Practical Physics and Electronics*. S.Viswanathan, Printers & Publishers Pvt Ltd., Chennai.

Reference Book

1. Prof.Namboodirippad, M.N., Prof..Daniel, P.A., (1982). *B.Sc., Practical Physics*. G.B.C. Publications, Cochin.

Web References

1. https://vlab.amrita.edu/?sub=1&brch=280&sim=550&cnt=1
2. https://vlab.amrita.edu/index.php?sub=1&brch=280&sim=1518&cnt=4
3. https://vlab.amrita.edu/?sub=1&brch=280&sim=602&cnt=2
4. https://vlab.amrita.edu/?sub=1&brch=280&sim=210&cnt=2

Pedagogy

Demonstration, practical sessions, and viva voce

Course Designer

Dr.N.Manopradha

FIRST ALLIED COURSE-I (AC)
CALCULUS AND FOURIER SERIES

(For B.Sc Physics & Chemistry)

(2022-2023 and Onwards)

Semester I	Internal Marks: 25		External Marks:75		
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS	
22UPH1AC1/ 22UCH1AC1	CALCULUS AND FOURIER SERIES	ALLIED	4	3	

Course Objective

- Explore the students with mathematical methods formatted for their major concepts and train them in basic Integrations.
- Analyze mathematical statements and expressions.
- Evaluate the fundamental concepts of Differentiation and Integration.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Explain the concepts of Calculus and Fourier series	K1,K2
CO2	Classify the problem models in the respective area.	K3
CO3	Solve various types of problems in the corresponding stream.	K3
CO4	Identify the properties of solutions in the core area.	K3
CO5	Discover the applications of Calculus and Fourier series.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	2	2	2	2
CO2	3	2	2	2	2	3	2	2	2	2
CO3	3	2	2	2	2	3	2	2	2	2
CO4	3	2	2	2	2	3	2	2	2	2
CO5	3	2	2	2	2	3	2	2	2	2

"1" – Slight (Low) Correlation ¬ "2" – Moderate (Medium) Correlation ¬

"3" – Substantial (High) Correlation ¬ "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Successive Differentiation:** The nth derivative – Standard results – Method of splitting the fractional expressions into partial fractions - Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the nth derivative of a product(proof not needed) – A complete formal proof by induction (proof not needed) - Curvature- Circle, radius and center of curvature - Cartesian formula for the radius of curvature–Simple problems in all these.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**Evaluation of integrals:** Integration of Rational algebraic functions– Rule (a) – Rule (b) Integration of the form $\int \dfrac{lx + m}{ax^2 + bx + c} dx$ – Rule (c)- Integration of Irrational functions : Integration of the form $\int \dfrac{px + q}{\sqrt{ax^2 + bx + c}} dx$ – Integration of the form $\int \dfrac{dx}{(x + p)\sqrt{ax^2 + bx + c}}$ - Integration of the form $\int \dfrac{dx}{a + b\cos x}$.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**Reduction Formula:** Properties of definite integrals –Reduction formula (when n is a positive integer) for 1] $\int e^{ax} x^n\, dx$ 2] $\int x^n \cos ax\, dx$ 3] $\int \sin^n x\, dx$ 4] $\int_{0}^{\frac{\pi}{2}} \sin^n x \cos^m dx$ (without proof) and illustrations.	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**Double and Triple Integrals:** Definition of the double integral-Evaluation of Double integral(Problems Only)- Change of order and evaluation of the double integral (Problems only).	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	**Fourier Series:** Definition of Fourier Series – Finding the Fourier Coefficients for a given periodic function with period 2π - Even and Odd functions –Half range Fourier series.	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

VI	**Self-Study for Enrichment : (Not to be included for External examination)** Radius of curvature when the curve is in Polar co-ordinates - (i) $\int \dfrac{dx}{ax^2 + bx + c}$ (ii) $\int \dfrac{dx}{\sqrt{ax^2 + bx + c}}$ - (1) $\int \cos^n x\,dx$ (2) $\int_0^{\frac{\pi}{2}} \cos^n dx$ -Triple Integrals in simple cases(Problems Only)- Development in cosine series - Development in sine series.		-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

1. Narayanan, S & Manichavasagam Pillai, T.K. (2015). *Calculus Volume I.* S. Viswanathan Pvt Limited.
2. Narayanan, S & Manichavasagam Pillai, T.K. (2015). *Calculus Volume II.* S. Viswanathan Pvt Limited.
3. Narayanan, S & Manichavasagam Pillai, T.K. (2015). *Calculus Volume III.* S. Viswanathan Pvt Limited.

UNIT–I	Chapter 3:Sections 1.1 to 1.6,2.1,2.2[1]
	Chapter 10:Sections 2.1 to 2.3 [1]
UNIT-II	Chapter 1:Sections 7.1,7.3,7.4,8(CASE II, CASE V), 9 [2]
UNIT-III	Chapter 1:Sections 11,13.1 to 13.5 [2]
UNIT-IV	Chapter 5:Sections 2.1,2.2,4 [2]
UNIT-V	Chapter 6:Sections 1to 4[3]

Reference Books

1. Sankarappan, S. Arulmozhi,G. (2006). Vector Calculus, Fourier series and Fourier Transforms. Vijay Nicole Imprints Private Limited.
2. Vittal, P.R.(2014). Allied Mathematics. Margham Publications.
3. Singaravelu, A.(2003). Differential Calculus and Trigonometry. R Publication.

Web Links

1. **https://www.youtube.com/watch?v=tBtF3Lr-VLk&t=64s**
2. **https://www.youtube.com/watch?v=Z4oSGuAZrZM**
3. **https://www.youtube.com/watch?v=w6llnAOX_f8**
4. **https://www.youtube.com/watch?v=LMcj8o0ERNE**
5. **https://www.youtube.com/watch?v=_GAwOGCvWy0**
6. **https://www.youtube.com/watch?v=9X3gqehcFIJ**

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designers

1. Dr. P. Saranya
2. Ms.L.Mahalakshmi
3. Ms.P.Geethanjali

FIRST ALLIED COURSE-II (AC)
ALGEBRA, ANALYTICAL GEOMETRY OF 3D & TRIGONOMETRY
(For B.Sc Physics & Chemistry)

(2022-2023 and Onwards)

Semester I	Internal Marks: 25		External Marks:75		
COURSE CODE	**COURSE TITLE**		**CATEGORY**	**Hrs / Week**	**CREDITS**
22UPH1AC2/ 22UCH1AC2	**ALGEBRA, ANALYTICAL GEOMETRY OF 3D & TRIGONOMETRY**		**ALLIED**	**4**	**3**

Course Objective

- Analyze the mathematical methods formatted for their major concepts.

- Evaluate the problems in Algebra and Trigonometry.

- Explain the basics of Three-Dimensional geometry.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Explain various notions in Algebra, Analytical Geometry of 3D & Trigonometry.	K1,K2
CO2	Identify the problem models.	K3
CO3	Apply the concepts of Algebra, Analytical Geometry of 3D & Trigonometry.	K3
CO4	Solve the given problems in the respective stream.	K3
CO5	Analyze the applications of the core area.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	2	3	2	2	2	2
CO2	2	2	2	3	2	3	2	2	2	2
CO3	2	2	2	3	2	3	2	2	2	2
CO4	2	2	2	3	2	3	2	2	2	2
CO5	2	2	2	3	2	3	2	2	2	2

"1" – Slight (Low) Correlation ¬ "2" – Moderate (Medium) Correlation ¬

"3" – Substantial (High) Correlation ¬ "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Series Expansion:** Application of Binomial Theorem to summation of series – Approximate values – Summation of series by Exponential series - Summation of series by Logarithmic series (Formulae only).	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
II	**Matrices:** Matrix-Special types of Matrices –Scalar multiplication of a matrix-Equality of matrices-Addition of matrices-Subtraction of matrices- Symmetric matrix-Skew symmetric matrix-Hermitian and Skew Hermitian matrix –Multiplication of matrix – Inverse matrix-Inner product-Solution of simultaneous equations-Rank of a matrix-Elementary transformation of a matrix-A system of m homogeneous linear equations in n unknowns-Linear dependence and independence of vectors-System of non-homogeneous linear equations - Eigen values and Eigenvectors.(Applications only)	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
III	**Three Dimensional Geometry:** The Sphere – Definition- The equation of a sphere when the center and radius are given-The equation of a sphere to find its center and radius- The length of the Tangent Plane from a point to the sphere – The Plane Section of a sphere – Equation of a circle on a sphere – Intersection of two spheres in a circle.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
IV	**Expansion of Trigonometric functions:** Expansions of $cos\, n\theta$ and $sin\, n\theta$ - Expansion of $tan(A + B + C + ...)$ (omitting examples on formation of equations) –Powers of sines and cosines of θ in terms of functions of multiples of θ – Expansions of $cos^n\theta$ when n is a positive integer – Expansions of $sin^n\theta$ when n is a positive integer – Expansions of $sin\,\theta$ and $cos\,\theta$ in a	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.

	series of ascending powers of θ- The expansions of $sin\ \theta$ and $cos\ \theta$ to find the limits of certain expressions.			
V	**Hyperbolic functions:** Hyperbolic functions – Relation between hyperbolic functions – Relations between hyperbolic functions and circular functions - Inverse hyperbolic functions.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
VI	**Self-Study for Enrichment :** (**Not to be included for External examination**) Series which can be summed up by the Logarithmic series - Simple applications of Matrices- The equation of the tangent plane to the sphere at a point. (Only problems) - Expansion of $tan\theta$ in terms of powers of θ- Separation of real and imaginary parts of tanh(x+iy).	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.

Text Books

1. Manichavasagam Pillai, T.K. Natarajan,T.& Ganapathy, K.S.(2015). *Algebra, Volume I.* S. Viswanathan Pvt Limited.

2. Manichavasagam Pillai, T.K. (2015). *Algebra, Volume II.* S.Viswanathan Pvt Limited.

3. Manichavasagam Pillai, T.K. & Natarajan,T. (2016). *A Text book of Analytical Geometry Part-II 3D.* New Gamma Publishers.

4. Manichavasagam Pillai, T.K. & Narayanan,S.(2013). *Trigonometry.* S. Viswanathan Pvt Limited.

UNIT–I   Chapter 3:Sections 10,14[1]

       Chapter 4:Sections 3,7,9 [1]

UNIT-II   Chapter 2:Sections 1 to 16 [2]

UNIT-III Chapter 4:Sections 1-5,6,6.1,7,8 [3]

UNIT-IV Chapter 3:Sections 1 to 4, 4.1,5,5.1[4]

UNIT-V   Chapter 4:Sections 1,2,2.1 to 2.3[4]

Reference Books

1. Arumugam,s.Issac,A. (2017). Analytical Geometry 3D and Vector calculus. New Gamma Publishing house.
2. Pandey, H.D. Khan, M.Q. & Gupta, B.N.(2011). A Text Book of Analytical Geometry and Vector Analysis. Wisdom Press.
3. Singaravelu, A. (2003). Differential Calculus and Trigonometry. R Publication.

Web Links

1. **https://www.youtube.com/watch?v=JayFh5EJHcU**

2. **https://www.youtube.com/watch?v=h5urBuE4Xhg**

3. **https://www.youtube.com/watch?v=59z6eBynJuw**

4. **https://www.youtube.com/watch?v=9DyPyJb2N9g**

5. **https://www.youtube.com/watch?v=HOk2XLeFPDk**

6. **https://www.youtube.com/watch?v=G1C1Z5aTZSQ**

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designers

1. Dr. P. Saranya
2. Dr.L.Mahalakshmi
3. Ms.P.Geethanjali

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hrs	Marks		
									CIA	External	Total
23UGVE	VALUE EDUCATION	Ability Enhancement Compulsory Course-I (AECC	30	-	-	-	2	2	100	-	100
Year		I									
Semester		I									
Prerequisites		Basic Understanding of Values									
Learning Objectives											
1	To enrich the knowledge about ethics and values.										
2	To instil Moral and Social Values and Loyalty and to appreciate the rights of others.										
3	To explain the role of ethics in the operation of human conduct										
4	To promote an understanding and framework for students to achieve value based positive and purposeful lives for themselves and their communities.										
5	To build excellent citizens and leaders for the country										

Course Outcomes and Cognitive Level Mapping

On the successful completion of the course, the students will be able to

CO NUMBER	CO STATEMENT	COGNITIVE LEVEL
CO1	To understand the importance of values and ethical issues at micro, mezzo and macro level of the society and the workplace.	**K1, K2**
CO2	To apply values and ethics in the daily life.	**K3**
CO3	To exhibit Ethical Leadership in the workplace and in the society.	**K4**
CO4	To think logically and reasonably and to handle moral issues with greater clarity	**K5**
CO5	To Engage in ethical debate and formulate ethical justification.	**K6**

Syllabus

UNIT	CONTENT	HOURS
I	**Value education:** Meaning, Definition, purpose and significance in the present world. **Human Values For Life:** Truth, commitment, honesty and integrity, humility, forgiveness, love, empathy, ability to sacrifice, care, unity, inclusiveness, Self esteem, self-confidence, punctuality – Time, task and resource management.	6
II	**Ethics:** The Essence of Ethics, Determinants and Consequences of Ethics in Human Interaction. Dimensions of Ethics. Ethics in private and public relationships. Role of family, society and educational institutions in inculcating moral and ethical values	6
III	**Theory & Approaches in Ethics:** Kohlberg's theory, Gilligan's theory, Damon's View of Moral Identity, & Deontology. The Utilitarian Approach, The Rights Approach, The Fairness or Justice Approach, The Common-Good Approach, The Virtue Approach & Ethical Problem Solving Approach.	6
IV	**Moral Thinkers & Philosophical Schools of Thought and their contribution:** Socrates, Plato, Aristotle, Epicurus, Stoicism. Thomas Aquinas , Contractarianism, Thomas Hobbes, John Locke, Jean-Jacques Rousseau, John Rawls, John Stuart Mill, Emanuel Kant and Hegel, Mother Teresa, Chanakya, Kautilya, Sarojini Naidu, Thiruvalluvar, Rabindranath Tagore, Mahatma Gandhi, Dr. Ambedkar, Bharathiyar and Bharathidasan.	6
V	**Values and Ethics in Public administration:** ethical concerns and dilemmas in government and private institutions; laws, rules, regulations and conscience as sources of ethical guidance; accountability and ethical governance; ethical issues in international relations and funding; corporate governance. Information sharing and transparency in government, Codes of Ethics, Codes of Conduct, Citizen's Charters, Quality of service delivery, Utilization of public funds, challenges of corruption.	6
VI	**Self Study for Enrichment** Learners need to list ways of practicing human Values. Group Discussion needs to be conducted on strategies to promote human values at various levels – family, community, society, nation and global.	-

Text Books:

1. ETHICS, INTEGRITY & APTITUDE (Prabhat Prakashan). (2021). (n.p.): Prabhat Prakashan.

2. Political Parties and Administrative Reforms in India: At the Centre, in the States and in the Local Bodies. (2019). (n.p.): Notion Press.

3. Sharma, P. D. (2015). Ethics, Integrity and Aptitude: Foundational Values for Civil Service in India. India: Rawat Publications.

4. Vozzola, E. C. (2014). Moral Development: Theory and Applications. United Kingdom: Taylor & Francis.

5. Thinkers and Theories in Ethics. (2011). Ukraine: Britannica Educational Pub..

Reference Books:

1. Bandiste, D.D.: Humanist Values: A Source Book, B.R. Publishing Corporation, Delhi, 1999

2. Ethics in Governance. (2021). (n.p.): K.K. Publications.

3. Maheshwari, S. (2002). Administrative Reforms in India. Germany: Macmillan India.

4. Bandiste, D.D.: Humanist Values: A Source Book, B.R. Publishing Corporation, Delhi, 1999.

5. Saxena, N. C. (2019). What Ails the IAS and Why It Fails to Deliver: An Insider's View. India: SAGE Publications.

6. Xavier Alphonse S.J (2008) We Shall Overcome – A Textbook on life coping skills ICRDCE Publication, Chennai

Web References

1. https://publicintegrity.org

2. https://www.ethicssage.com

3. https://darpg.gov.in

4. https://www.ethics.org

5. https://ethicsunwrapped.utexas.edu/glossary/integrity

Pedagogy

Chalk& Talk, Seminar, PPT Presentation, Group Discussion, Blended Method, and Case Study.

ABILITY ENHANCEMENT COMPULSORY COURSE (AECC) I : VALUE EDUCATION (23UGVE)

Assessment Rubrics for 100 Marks

1. Designing Posters / video making / preparation of Album – **20 marks**

2. Case study presentation / Narration of stories / Writing stories – **20 Marks**

3. Writing essay based on the individual life experience following human values –personal, family and society level (minimum 10 pages) – **20 Marks**

4. VIVA VOCE - **40 Marks**

S. No	RUBRICS FOR VIVA VOCE	MARKS
1.	Theoretical Knowledge	20
2.	Values Practiced	10
3.	Attitude & Commitment	10
Total		**40**

Course Designer Dr.G.Mettilda Buvaneswari

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22UPH2CC2	**MECHANICS AND RELATIVITY**	**CC-II**	**5**	**5**

Course Objectives

- To find the time of flight and impact velocity of a projectile that lands at a different height from that of launch.
- To explain motion along curved path.
- To illustrate the motion of rigid bodies and outline laws of gravitation.
- To make use of the ideas of frames of reference.

Pre-requisites

- A solid understanding of scalars and vectors.
- Fundamental concepts of physics.
- Basic understanding of Newtonian mechanics.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to	Cognitive Level
CO 1	Define the effects of a change in the position of any physical object or event.	K1
CO 2	Demonstrate laws and principles in physics.	K2
CO 3	Apply the mathematical tools in understanding physics.	K3
CO 4	Make use of simple concepts of mechanics in daily life.	K3
CO 5	Analyse the principles behind the mechanics of objects travelling at relativistic speeds.	K4

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	3	3	3	3	3	3	2	2	3
CO 2	2	3	3	3	3	3	3	2	2	3
CO 3	2	3	3	3	3	3	3	2	3	3
CO 4	2	3	3	2	3	3	2	2	2	3
CO 5	2	3	3	2	3	3	2	2	2	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**PROJECTILE, IMPACT AND FRICTION:** Projectile – Path of a projectile is a parabola – Range of horizontal and inclined plane – Impulse of a force – Impulsive force – Impact between two smooth bodies – Laws of impact – Direct and oblique impacts – Impact of a smooth sphere on a smooth horizontal plane – Loss in kinetic energy due to direct and oblique impacts – Friction – Laws of friction – Angle of friction.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**MOTION ON A PLANE CURVE:** Centripetal and centrifugal forces – Hodograph – Expression for normal acceleration by the hodograph method – Motion of cyclist along a curved path – Motion of a railway carriage round a curved track – Upsetting of a carriage on a curved level track – Motion of a carriage on a banked-up curve – Effect of the Earth's rotation on the value of the acceleration due to gravity – Variation of g with altitude.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**DYNAMICS OF RIGID BODIES AND GRAVITATION:** Moment of Inertia - Kinetic energy and angular momentum of rotating body - Theorems of perpendicular and parallel axes – Acceleration of a body rolling down an inclined plane without slipping – Oscillations of a small sphere on a large concave smooth surface – Compound pendulum – Centre of suspension and centre of oscillation – Centre of percussion – Minimum period of a compound pendulum – Kater's pendulum. Newton's laws of gravitation – Kepler's laws of planetary motion – Deduction of Newton's law of gravitation – Determination of G – Boy's method.	25	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**FRAMES OF REFERENCE:** Frames of reference: Inertial and Non-Inertial – Galilean Transformation: Transformation of position, length, velocity and acceleration – Galilean invariance: Newton's law of motion, law of conservation of momentum and energy – Transformation equation for one frame of reference rotating with its axis with respect to an inertial frame – Coriolis force – Foucault's pendulum.	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

V	**SPECIAL THEORY OF RELATIVITY:** Michelson-Morley experiment - concept of ether - Einstein's special theory of relativity - Lorentz transformation - time dilation - length contraction – proper length and proper time - simultaneity - relativistic mass, momentum, force and acceleration - equivalence of mass and energy ($E = mc^2$).	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	**SELF STUDY FOR ENRICHMENT:** (**Not to be included for External Examination**) Angular acceleration – Relation between the torque and angular acceleration of a rigid body – Conservation of energy – Conical pendulum – Moment of Inertia of a flywheel – Torsion pendulum.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

1. Narayanamurthi, M., and Nagarathinam, N., (2008). *Dynamics.* (8th edition) The National Publishing Company, Chennai.

2. Mathur, D.S., and Hemne, P.S., (2015). *Mechanics.* (Revised edition) S. Chand & Company Ltd., New Delhi.

Reference Books

1. Narayanamurthi, M., and Nagarathinam, N., (2002). *Statics, Hydrostatics and Hydrodynamics.* (3rd edition) The National Publishing Company, Chennai.

2. Murugesan, R., (2016). *Mechanics and Mathematical Physics.* (3rd edition) S. Chand & Company Ltd., New Delhi.

3. Brijilal Subramaniam, (1990). *Mechanics and Relativity.* (1st edition), Margham Publications.

4. Murugesan, R., and Kiruthiga Sivaprasath, (2016). *Modern Physics.* (18th edition) S. Chand & Company Ltd., New Delhi.

Web References

1. https://courses.lumenlearning.com/suny-osuniversityphysics/chapter/4-3-projectile-motion/

2. http://www.jbsw.shikshamandal.org/wp-content/uploads/2016/07/2-Gravitation.pdf

3. https://vlab.amrita.edu/?sub=1&brch=280&sim=518&cnt=1

4. https://www.youtube.com/watch?v=wD7C4V9smG4

5. https://www.youtube.com/watch?v=TgH9KXEQ0YU

Pedagogy

Chalk and Talk, Assignment, Group discussion and Quiz

Course Designer

Dr.N.Manopradha

Semester II	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
23UPH2CC2P	MECHANICS AND DIGITAL ELECTRONICS (P)	CP-II	3	3

Course Objectives

- To give students a foundational understanding of how to measure various physical quantities.
- To use scientific equipment to estimate various physical properties.
- To investigate the basic idea behind digital technology.
- To construct basic logic gates using distinct components.

Pre-requisites

- Basic knowledge on usage of scientific apparatus.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be able to	Cognitive Level
CO1	Select the equipment and get the necessary accessories.	K1
CO2	Explain the experiment's fundamental concepts.	K2
CO3	Make use of fundamental principles and experiment circumstances.	K3
CO4	Experiment with the laboratory norms.	K3
CO5	Examine the applications.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	1	1	1	2	1	3	2	1	2	1
CO2	2	3	2	2	2	3	3	1	2	1
CO3	1	1	2	3	1	3	2	1	3	1
CO4	2	3	3	3	2	1	3	1	3	2
CO5	3	2	3	3	3	1	3	2	3	2

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation

Syllabus

LIST OF EXPERIMENTS (Any 8)
1. Young's modulus – Non-Uniform bending (Pin and Microscope).
2. Young's modulus – Non - Uniform bending (Optic lever).
3. Sonometer – Determination of unknown frequency.
4. Verification of Logic gates.
5. Construction of Half and Full adder.
6. NAND as UBB.
7. NOR as UBB.
8. Spectrometer – μ of solid prism.
9. Concave lens – Focal length determination.
10. Determination of Poisson's ratio of ductile specimen using strain gauges.
11. Verification of Euler- Bernoulli Hypothesis.
12. Verification of Flexural Stress Formula.

Text Book

1. Ouseph, C.C., Rao, U.J., Vijayendran, V., (2016). *Practical Physics and Electronics*. S.Viswanathan, Printers & Publishers Pvt Ltd., Chennai.

Reference Book

1. Prof.Namboodirippad, M.N., Prof.Daniel, P.A., (1982). *B.Sc., Practical Physics*. G.B.C. Publications, Cochin.

Web References
1. https://vlab.amrita.edu/?sub=1&brch=280&sim=210&cnt=2
2. https://vlab.amrita.edu/?sub=1&brch=280&sim=1509&cnt=1
3. https://de-iitr.vlabs.ac.in/exp/truth-table-gates/simulation.html
4. https://amrita.olabs.edu.in/?sub=1&brch=6&sim=244&cnt=4

Pedagogy

Demonstration, practical sessions and viva voce.

Course Designer

Dr.N.Manopradha

Semester II	Internal Marks: 25			External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**	
23UPH2CC3	**INTRODUCTION TO DIGITAL ELECTRONICS**	**CC-III**	**2**	**2**	

Course Objectives

- To learn about different numbers systems and their conversion from one to another.
- To understand the workings of logic gates and equations.
- To acquire Knowledge about Boolean laws to draw Karnaugh maps.
- To know the uses of encoders, decoders, multiplexers and demultiplexers.
- To understand the workings of flip-flops and to analyze sequential circuits.

Pre-requisites

- Basic knowledge of the binary number system.
- Fundamental ideas on logic gates.
- Basic knowledge of the conversion of a number system.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be ableto	Cognitive Level
CO 1	Understand the basic knowledge of Number system, Logic gates,Combinational circuit, Boolean expression and Flip flops	K1
CO 2	Interpret the concept of number conversion, logic circuits and thereby developequivalent circuits.	K2
CO 3	Develop the concept of number conversion and combinational logic circuits.	K3
CO 4	Examine different number system, arithmetic and logic functions with appropriate selection of inputs and check the possible outputs for arithmetic and logic circuits.	K4
CO 5	Simplify the arithmetic operation of the number system. Apply the Booleanexpressions in the K Map and design the flip flop.	K5

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	2	2	3	3	2	2	2
CO 2	2	2	2	2	2	3	3	2	3	3
CO 3	2	3	3	2	2	3	3	3	3	3
CO 4	2	2	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" – indicates there is no Correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**NUMBER SYSTEM AND CODE:** Binary number system – Binary to decimal conversion – Decimal to binary conversion – Octal numbers –Conversion of octal numbers – Hexadecimal numbers –Conversion of hexadecimal numbers.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**ARITHMETIC CIRCUITS:** Binary addition – Binary subtraction –Binary multiplication – Binary Division – Half and Full adder – Half and Full subtractor.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4 K5
III	**DIGITAL LOGIC AND LOGIC CIRCUITS:** Basic gates – NOT, OR, AND – EX-OR gates – Universal logic gates – NOR, NAND – Boolean laws – Simplification of Boolean Expression and Demorgan's theorems.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**APPLICATION OF BOOLEAN THEOREM – K-MAP:** Sum-of-Products- Product of sum – Truth table to Karnaugh map – Pairs, Quads, and Octets – Karnaugh map simplifications – Don't care condition.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**FLIP – FLOPS:** R-S flip-flops – Clocked R-S flip-flop – Edge-triggered RS flip flop –J-K flip – D flip-flop – T flip flop – Applications of flip-flops.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**SELF STUDY FOR ENRICHMENT:** (**Not to be included for External Examination**) Application of number system Physical Quantity – Counting – Electrical projectcircuit**.**	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Donald P Leach, Albert Paul Malvino, Goutam Saha, (2011). *Digital Principles and Applications*.(7th edition) Tata McGraw – Hill Publishing Company Limited, New Delhi.
2. Jain,R.P, (2009). *Modern Digital Electronics*. (4th edition) Tata McGraw Hill Education PrivateLimited, Noida.
3. Vijayendran, V, (2003). *Digital fundamentals*. (1st edition) S. Viswanathan Printers andPublishers Pvt. Ltd, Chennai.
4. Virendra Kumar, (2007). *Digital electronics Theory and Experiments*. (2nd edition) New AgeInternational Publishers, Chennai.

Reference Books

1. James W. Bignel, (2007). *Digital Electronics*. (5th edition) Cengage learnings, Uttar Pradesh.
2. MandalS.K, (2017). *Digital Electronics Principles & Applications*. (1st edition) McGraw HillEducation, Karnataka.
3. Thomas L. Floyd, (2015). *Digital Fundamentals*. (11th edition) Pearson Education, Bengaluru.
4. Kothari,D.P., J.S. Dhillon, (2016). *Digital Circuits and Design*. (1st edition) Pearson Education,Bengaluru.

Web References

1. https://circuitglobe.com/rs-flip-flop.html
2. http://hyperPhysics.phy-astr.gsu.edu/hbase/Electronic/jkflipflop.html
3. https://circuitglobe.com/half-adder-and-full-adder-circuit.html
4. https://programmerbay.com/construct-4-to-1-multiplexer-using-logic-gates/
5. https://www.electronicshub.org/demultiplexerdemux/
6. https://www.elprocus.com/designing-of-2-to-4-line-decoder/
7. https://www.electricaltechnology.org/2018/05/bcd-to-7-segment-display-decoder.html

Pedagogy

Chalk and Talk, Assignment, Group discussion and quiz

Course Designer

Dr.S.Priya

ODE, PDE, LAPLACE TRANSFORMS AND VECTOR ANALYSIS

(2022-2023 Onwards)

Semester II	Internal Marks: 25		ExternalMarks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UPH2AC3	ODE, PDE, LAPLACE TRANSFORMS AND VECTOR ANALYSIS	ALLIED	4	3

Course Objective

- Explain the basics of Ordinary Differential Equations.
- Emphasize in the field of Partial Differential Equations.
- Explore the mathematical methods formatted for major concepts.

CourseOutcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Knowledge Level
CO1	Explain various notions in ODE, PDE, Laplace transforms & Vector Analysis.	K1, K2
CO2	Classify the problem models in the respective area.	K3
CO3	Identify the properties of solutions in the core area.	K3
CO4	Solve various types of problems in the corresponding stream.	K3
CO5	Analyze the applications of the core area.	K4

Mapping of COwithPO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	2	3	2	3	3
CO2	3	2	2	2	2	2	3	2	3	3
CO3	3	2	2	2	2	2	3	2	3	3
CO4	3	2	2	2	2	2	3	2	3	3
CO5	3	2	2	2	2	2	3	2	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Ordinary Differential Equations:** Eqautions of the first order but of higher degree – Type A: Equations solvable for $\dfrac{dy}{dx}$- Type B: Equations solvable for y - Equations solvable for x -Clairaut's Form (simple cases only). **Linear equations with constant coefficients:** Definitions – The operator D- Complementary function of a linear equation with constant co-efficients - Particular integral: General method of finding P.I- Special methods for finding P.I.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**Partial differential equations:** Classification of integrals–Derivation of Partial differential equations: By elimination of constants - By elimination of arbitrary function-Lagrange's method of solving the linear equation-Special methods –Standard forms-I,II,III,IV(Geometrical Meaning is not needed)-(only problems in all the above) – (No proof needed for any formula).	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**Laplace Transforms:** Laplace Transforms – Definition -Sufficient conditions for the existence of Laplace transform-Basic results-Laplace transform of periodic functions-Some general theorems-Evaluation of integrals using Laplace transform.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**Inverse Laplace Transform:** The Inverse Transform –Modification of results obtained in finding Laplace transforms to get the inverse transforms of functions- Laplace Transforms to solve ordinary differential equations with constant co-efficients.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	**Vector Differentiation:** Limit of a vector function-continuity of vector functions-Derivative of a vector function-Some Standard Results-Geometrical significance of vector differentiation-Physical application of derivatives of vectors - partial derivative of a vector function. **Gradient, Curl and Divergence:** Scalar and Vector point functions – Gradient of a scalar point function-Directional derivative of a scalar point function-Equations of tangent plane and normal line to a level surface. **Divergence and curl of a vector point function:** Definition- Curl of a vector point function- irrotational vector.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	**Self -Study for Enrichment:** **(Not included for End Semester Examination)** Equations that do not contain x and y for explicitly-Equations reducible to the standard form - Piecewise continuity - Laplace Transforms to solve ordinary differential equations with variable co-efficients - Physical interpretation of divergence of a vector - Physical interpretation of curl of a vector-Vector identity.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Narayanan. S**,** Manicavachagam Pillai. T. K. (2016). *Differential Equations and its applications.* S. Viswanathan Pvt Limited.
2. Vittal. P. R, Malini. V. (2016). *Vector Analysis*. Margham Publications.

Chapters and Sections

UNIT-I Chapter 4: Sections 1-3 [1]

Chapter 5: Sections 1-4 [1]

UNIT-II Chapter 12: Sections 1-5.4 [1]

UNIT-III Chapter 9: Sections 1-5 [1]

UNIT- IV Chapter 9: Sections 6-8 [1]

UNIT- V Chapter 1: Pages (1-24,26-35) [2]

Reference Books

1. Narayanan. S, Manicavachagam Pillai. T. K. (2003). *Calculus, Vol. III.* S.Viswanathan Pvt Limited.
2. Arumugam Isaac. (2014). *Differential Equations and Applications*. New Gamma Publishing House.
3. Sankarappan. S, Arulmozhi. G. (2006). *Vector Calculus, Fourier Series and Fourier Transforms*. Vijay Nicole Imprints Private Limited.

Web References

1. https://www.youtube.com/watch?v=OM01KTc0_9w
2. https://youtu.be/zlfsh1SyH58
3. https://www.youtube.com/watch?v=dCVBZbebl8Y
4. https://www.youtube.com/watch?v=Y8GXpS31CGI
5. https://www.youtube.com/watch?v=IVJjm5FE4x8
6. https://www.youtube.com/watch?v=FXTt6Sa79mI
7. https://www.academia.edu/35399426/CHAPTER_1_VECTOR_DIFFERENTIATION

Pedagogy

Power point presentation, Group Discussion, Seminar, Assignment.

Course Designer

1. Dr.L.Mahalakshmi

Semester II	InternalMarks:100			
COURSECODE	COURSETITLE	CATEGORY	HRS/ WEEK	CREDITS
22UGEVS	ENVIRONMENTAL STUDIES	ABILITY ENHANCEMENTCOMP ULSORYCOURSE	2	2

Course Objective

To train the students to get awareness about total environment and its related problems and to make them to participate in the improvement and protection of the environment.

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Outline the nature and scope of environmental studies	K2
CO2	Illustrate the various types of natural resources and its importance.	K2
CO3	Classification of various types of ecosystem with its structure and function.	K2
CO4	Develop an understanding of various types of pollution and biodiversity.	K3
CO5	List out the various types of social issues related with environment.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	3	2	2	3	2	3
CO2	3	3	2	3	3	3	2	3	3	3
CO3	2	3	3	2	3	3	3	3	3	2
CO4	2	3	3	3	2	3	2	3	3	3
CO5	3	3	2	3	3	3	3	2	3	3

"1"–Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3"–Substantial (High)Correlation   "-"indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	Introduction to environmental studies Definition, scope and importance. Need for public awareness	06	CO1, CO2, CO3, CO4	K1, K2, K3, K4
II	**Natural Resources: Renewable and non-renewable resources:** a. Forest resources: use andover-exploitation,deforestation,casestudies.Timber extraction,mining,dams andtheir effects on forests and tribal people. b. Water resources: Use and over-utilization of surface and ground water,floods,drought,conflictsoverwater,damsbenefits and problems. c. Mineral resources:Use and exploitation,environmental effects of extracting and using mineral resources. d. Food resources:World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. e. Energy resources:Growing energy needs,renewable and non-renewable energy sources,use of alternate energy sources.Case studies. f. Land resources:Landas resources,land degradation,maninduced Landslides,soil erosion and desertification. Role of an individual in conservation of natural resources.	06	CO1, CO2, CO3, CO4	K1, K2, K3, K4
III	**Ecosystems** Concept,Structure and function of an ecosystem.Producers,consumers and decomposers Energy flow in the ecosystem and Ecological succession. Food chains, food webs and ecological pyramids Introduction,types,characteristic features,structure and function of the following ecosystem:-Forest ecosystem,Grassland ecosystem and Desert ecosystem, Aquatic ecosystems,(ponds,streams,lakes,rivers,oceans, nestuaries)	06	CO1, CO2, CO3, CO4	K1, K2, K3, K4

IV	**Bio diversity and Environmental Pollution** Introduction,types and value of biodiversity.India as a mega diversity nation. Hot-spots of biodiversity.Threatsto biodiversity:habitatloss,poaching of wildlife,man-wildlife conflicts.Endangered and endemic species of India.Conservation of biodiversity:In-situand Ex-situ conservation of biodiversity.Definition,Causes,effects and control measures of :Air Pollution, Water Pollution, Soil Pollution, Noise pollution,Nuclear hazards,Solid waste Management:Causes,effects and control measures of urban and industrial wastes. E-Waste Management:Sources and Types of E-waste.Effect of E-waste on environment and humanbody.Disposal of E-waste,Advantages of Recycling E-waste.Role of an individual inprevention of pollution.Disastermanagement:floods,earthquake, cyclone and landslides.	06	CO1, CO2, CO3, CO4	K1, K2, K3, K4
V	**Social Issues and the Environment** Water conservation,rain water harvesting,water shedmanagement. Climate change,global warming, acid rain,ozone layer depletion, Waste land reclamation. **Environment Protection Act** Wildlife Protection Act. Forest Conservation Act. Population explosion–Family Welfare Programmes Human Rights-Value Education.HIV/ AIDS- Women and Child Welfare. Role of Information Technology in Environment and human health.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

References

1. Agarwal,K.C.2001 EnvironmentalBiology,Nidi PublicLtdBikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt Ltd, Ahamedabad – 380013,India, E-mail: mapin@icenet.net(R)
3. BrunnerR.C.1989,HazardousWaste Incineration,McGraw HillInc480p
4. ClarkR.S.MarinePollution,ClandersonPressOxford(TB)
5. Cunningham,W.P.Cooper,T.H.GorhaniE&Hepworth,M.T.2001.
6. DeA.K.EnvironmentalChemistry, WileyEasternLtd
7. DowntoEarth, Centre for Science and Environment(R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security.StockholmEnv. InstituteOxford University, Press 473p.
9. Hawkins,R.E.EncyclopediaofIndia NaturalHistory,BombayNaturalHistorySociety,Bombay.
10. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge UniversityPress1140 p.
11. Jadhav,H&Bhosale,V.M. 1995.EnvironmentalProtectionand LawsHimalayaPub.

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar

CourseDesigner

Dr.B.Thamilmaraiselvi

Semester III	Internal Marks: 25			External Marks: 75
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
23UPH3CC4	**THERMAL PHYSICS AND STATISTICAL MECHANICS**	**CC - IV**	**5**	**5**

Course Objectives

- To gain knowledge in heat transfer, entropy, production of low temperature and liquefaction of gases, thermal radiation and statistical thermodynamics.
- To Solve the function of Internal combustion engine and Carnot's engine
- To analyze the behavior of gases under very high pressure.
- To apply probability in statistical thermodynamics.

Pre-requisites

- Strong Foundation of Thermodynamics and its Applications
- Learn the basic principles of elasticity and the elastic nature of materials.
- Understand realistic cycles for internal combustion engines, steam engines, and low-temperature refrigeration systems.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO 1	Learn the basic concepts of thermodynamics, radiation, and statistical mechanics, as well as their significance.	K1
CO 2	Understand the experimental procedures for producing low temperatures, measuring high temperatures, and determining the specific heats of solids, liquids, and gases.	K2
CO 3	Apply the theories related to low temperature, radiation and specific heat of solid, liquid and gas.	K3
CO 4	Examine the energy distribution in the black body spectrum, the system of bosons and fermions, and the temperature change of solids and gases' specific heats.	K4
CO 5	Solve the specific heat capacity of solid, liquid and gas theoretically.	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	2	2	2	3	2	2	3	2
CO 2	2	3	3	2	3	3	2	3	3	2
CO 3	2	3	3	2	3	3	2	3	3	2
CO 4	3	3	3	3	3	3	3	3	3	2
CO 5	2	2	3	3	3	2	3	3	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation;

"3" – Substantial (High) Correlation   "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**THERMODYNAMICS** Thermodynamic system - Zeroth law of thermodynamics - internal energy- First law of thermodynamics - reversible and irreversible process - Carnot's cycle - Otto and diesel engine - second law of thermodynamics - Entropy - Change in entropy during reversible and irreversible process - T- dS equation-Third law of thermodynamics–Clausius's Claypeyron's latent heat equations.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**LOW TEMPERATURE PHYSICS** Joule Thompson effect - Production of low temperature - Theory of Porous plug experiment - Liquefaction of gases - Linde's air liquefier - Liquefaction of Helium and Hydrogen - Adiabatic demagnetization - Practical application of low temperature - Refrigeration machine - Air conditioning machines.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**RADIATION** Coefficient of thermal conductivity - Lee's method for bad conductors - Convection and its applications - Stefan's Boltzmann law - Experimental determination of Stefan's constant - Blackbody radiation - Rayleigh Jean's law - Wien's Displacement Law - Planck's law - Solar constant - temperature of the Sun -Angstrom's Pyrheliometer	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**SPECIFIC HEAT** Specific heat of solids - Dulong and Petit's law - Einstein's theory of specific heat - Debye's theory - Specific heat of gases - Mayer's Relation-Determination of C_P by Ragnault's method - Newton's law of cooling	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**STATISTICAL THERMODYNAMICS** Phase space – Statistical equilibrium - Microstates and Macrostates – Maxwell-Boltzmann distribution - Ideal gas - Fermi-Dirac distribution - Electron gas - Bose-Einstein distribution	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**SELF-STUDY FOR ENRICHMENT** (Not included for End Semester Examinations) Internal combustion engine (ICE) - Electrolux refrigerator- Bolometer- Variation of specific heat of diatomic gases with temperature- Probability theorems in statistical thermodynamics.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Brijlal Subrahmanyam N, Hemne P S, (2021), *Heat and Thermodynamics and Statistical Physics*, (Revised edition), S.Chand & Co., Pvt. Ltd., New Delhi.
2. Sathya Prakash and Agarwal J P, (2019), *Statistical Mechanics*, (7th edition), Kedarnath Ramnath & Co., Meerut.

Reference Books

1. Mathur D S, (2008), *Heat and Thermodynamics*, (5th edition) S. Chand and Co., New Delhi.
2. Halliday D, Resnick R and Walker J, (2018), *Fundamentals of Physics*, (11th Edition), John Wiley & Sons, U.S.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_ce27/preview
2. https://onlinecourses.swayam2.ac.in/nou21_me01/preview
3. https://web.stanford.edu/~peastman/statmech/thermodynamics.html

Pedagogy

Chalk and Talk, Seminar, Assignment, Power point Presentation, Group discussion and Quiz

Course Designer

Dr.R.Gayathri

Semester III	Internal Marks: 40			External Marks: 60
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
23UPH3CC3P	**THERMAL PHYSICS (P)**	**CP-III**	**3**	**3**

Course Objectives

- To make the students to develop their experimental skills.
- To acquire hands-on experience.
- To enhance the laboratory skills.

Pre-requisites

- Basic knowledge on usage of scientific apparatus.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to	Cognitive Level
CO 1	Apply the physics principle involved in the various instruments; also relate the principles to new application.	K1
CO 2	Understand the theoretical concepts of transmission of heat with the experimental knowledge	K2
CO 3	Use the theoretical ideas through thermodynamic relations	K3
CO 4	Expand the creative skills that are essential for practical thermodynamics systems	K3
CO 5	Analyze experimental approaches to correlate with physics theory to develop practical understanding.	K4

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	1	1	1	2	1	3	2	1	2	1
CO 2	2	3	2	2	2	3	3	1	2	1
CO 3	1	1	2	3	1	3	2	1	3	1
CO 4	2	3	3	3	2	1	3	1	3	2
CO 5	3	2	3	3	3	1	3	2	3	2

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation   "-" indicates there is no Correlation

Syllabus

LIST OF EXPERIMENTS (Any 8)

1. Specific heat capacity of a liquid – Newton's law of cooling
2. Emissive power of a surface – Spherical calorimeter
3. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee's disc method
4. Joule's Calorimeter - Specific heat capacity
5. Thermal conductivity of rubber
6. Black Body Radiation: Determination of Stefan's Constant
7. Specific heat by method of mixtures
8. Verification of Stefan-Boltzmann law
9. Latent heat of steam/ice
10. Verification of Boyle's law
11. Mechanical equivalent of heat
12. Thermal conductivity of a good conductor - Searle's method
13. Heat Transfer by Radiation
14. Heat transfer by Conduction
15. Determination of Planck's constant

Text Book

1. Ouseph, C.C., Rao, U.J., Vijayendran, V., (2016). *Practical Physics andElectronics*. S.Viswanathan,Printers & Publishers Pvt Ltd., Chennai.

Reference Book

1. Prof.Namboodirippad, M.N., Prof..Daniel, P.A., (1982). *B.Sc., Practical Physics*. G.B.C.
   Publications, Cochin.

Web References

1. https://vlab.amrita.edu/index.php?sub=1&brch=194
2. https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=802&cnt=1
3. https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=354&cnt=1
4. https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=353&cnt=1

Pedagogy

Demonstration, practical sessions, and viva voce

Course Designer

Dr.S.Gowri

Semester III	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs. / Week	CREDITS
22UPH3AC4	CHEMISTRY - I	ALLIED	4	3

Course Objectives
- ➢ To understand the bonding nature in chemical compounds, nuclear reactions and reaction mechanisms in chemistry.
- ➢ To know the materials used in industrial chemistry and the separation of chemical compounds.
- ➢ To acquire the knowledge of basic principles of thermodynamics, phase equilibria and analytical techniques.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Define the terms involved in nuclear, analytical and industrial chemistry, organic reaction, thermodynamics and phase equilibria.	K1
CO2	Understand the magnetic properties, compounds used in industries, organic, thermal reactions and principle of analytical techniques.	K2
CO3	Illustrates the bonding nature, mechanisms, phase diagram, instrumentation of analytical techniques.	K3
CO4	Describe the molecular orbital diagrams, fuel gases, fertilizers, hybridization and applications of analytical techniques.	K4
CO5	Predict bond order, mechanism, phase rule, separation of compounds and its uses in industries.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	3	3	2	3	2	3
CO2	3	3	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2	3	2
CO5	3	3	2	3	3	3	2	3	2	2

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" Indicates there is No Correlation.

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Chemical Bonding and Nuclear Chemistry:** Chemical Bonding: Molecular orbital theory - bonding, antibonding and non-bonding orbitals. Molecular orbital diagrams (H_2, O_2, N_2, CO and CN) - bond order and magnetic properties. Nuclear Chemistry: Fundamental particles - isotopes - isobars - isotones and isomers - differences between chemical reactions and nuclear reactions. Nuclear binding energy - mass defect - calculations - nuclear stability - applications of nuclear fission and nuclear fusion. Group displacement law - radioactive series - applications of radioisotopes.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

II	**Industrial Chemistry:** Fuels: Natural gas - water gas - semi water gas - carbureted water gas - producer gas - CNG - LPG and oil gas. Silicones: Synthesis - properties - uses of silicones. Fertilizers: Urea - ammonium sulphate - potassium nitrate - NPK fertilizer - superphosphate.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Fundamental Concept in Organic Chemistry:** Hybridization: Orbital overlap - hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6. Electronic effects: Inductive effect - relative strength of aliphatic monocarboxylic acid and aliphatic amines. Hyperconjugation - heat of hydrogenation - bond length - dipole moment and steric effect. Reaction mechanisms: Types of reactions - aromaticity (Huckel's rule) - aromatic electrophilic substitution; nitration - halogenation - Friedel Craft's alkylation- Heterocyclic compounds: Preparation - properties of furan - thiophene - pyrrole and pyridine.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Thermodynamics and Phase Equilibria:** Thermodynamics: Types of systems processes - state and path functions - statements of first law and second law of thermodynamics - Carnot's cycle - efficiency of heat engine. Entropy - significance - relationship between Gibbs free energy and entropy. Phase Equilibria: Phase rule - terms - reduced phase rule and its application to a simple eutectic system water system - Two-component system - (Pb - Ag).	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

V	**Analytical Chemistry:** Introduction to qualitative and quantitative analysis - principles of volumetric analysis. separation - purification techniques - extraction, distillation - crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self-Study for Enrichment:** (Not to be included for External Examination) Triple superphosphate - Electromeric and mesomeric effects - Friedel craft's acylation - Free energy change and its importance - entropy and Gibbs free energy.	-	CO1, CO2, CO3, CO4	K1, K2, K3. K4

Text Books

1. Puri, B. R., Sharma, L. R., & Kalia, K. K. (2018). Principles of Inorganic Chemistry. 33rd edition. Shoban Lal Nagin Chand & Co., New Delhi.

2. Bahl, B. S., & Bahl, A. (2010). Advanced Organic Chemistry. (12th edition), New Delhi, Sultan Chand & Co.

3. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2022). Principles of Physical Chemistry. 48th edition. Shoban Lal Nagin Chand & Co, New Delhi.

4. Sharma, B. K. (2013). Industrial Chemistry. Goel Publishing House.

5. Gopalan, R., Subramanian, P. S., & Rengarajan, K. (2003). Elements of Analytical Chemistry. 2nd edition, Sultan Chand & Sons.

Reference Books

1. Madan, R. D. (2000). Modern Inorganic Chemistry. S. Chand and Company. New Delhi.

2. Chatwal, G. R., & Anand, S. K. (2005). Instrumental methods of chemical analysis. Himalaya publishing house.

3. Morrison, R. T., Boyd, R. N., & Bhattacharjee, S. K. (2011). Organic Chemistry. (7th edition), Pearson India, (2011).

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1. https://www.youtube.com/watch?v=QMb-pmf7PKA.
2. https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Physical_Properties_of_Matter/States_of_Matter/Phase_Transitions/Phase_Diagrams.
3. https://byjus.com/biology/fertilizers/.
4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206469/.
5. https://www.vedantu.com/chemistry/hybridization.

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar.

Course Designer

➢ Dr. S. Devi

Semester III	Internal Marks: 40			External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs. / Week	CREDITS	
22UPH3AC5P	CHEMISTRY- I (P)	ALLIED	4	3	

Course Objectives

➢ To gain knowledge about the basics of preparation of solutions.

➢ To impart skills on the quantitative estimation of compounds through volumetric analyses.

➢ To develop skills for qualitative analysis of organic compounds.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statements On the successful completion of the course, students will be able to	Cognitive Level
CO1	Remember the basic principles involved in quantitative and qualitative analyses.	K1
CO2	Outline the preparation of solutions and basic organic reactions involved in organic functional group analyses.	K2
CO3	Apply tests for the identification of functional groups and titration for quantitative analysis.	K3
CO4	Analyze compounds by qualitative and quantitative methods.	K4
CO5	Predict a suitable way to analysis compounds through qualitative and quantitative methods.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	3	2	3	2
CO2	3	3	2	2	2	3	3	2	3	1
CO3	3	3	2	2	2	3	3	2	2	1
CO4	3	3	3	2	2	3	3	2	2	2
CO5	3	3	2	2	2	3	3	2	2	2

"1"– Slight (Low) Correlation   "2"– Moderate (Medium) Correlation

"3"– Substantial (High) Correlation   "-" Indicates there is No Correlation.

SYLLABUS

I. Volumetric Analysis:
1. Estimation of HCl using NaOH as a link and standard oxalic acid solution.
2. Estimation of NaOH using HCl as a link and standard sodium carbonate.
3. Estimation of oxalic acid using NaOH as a link and standard oxalic acid solution.
4. Estimation of ferrous sulphate using $KMnO_4$ as a link and standard Mohr's salt.
5. Estimation of $KMnO_4$ using sodium thiosulphate as a link and standard $K_2Cr_2O_7$ solution.
6. Estimation of Mg (II) using EDTA solution as a link and standard $MgSO_4$ solution.
7. Estimation of ferrous ion using $K_2Cr_2O_7$ as a link and standard ferrous ammonium sulphate.

II. Organic Analysis:
1. Detection of elements.
2. To distinguish - aliphatic and aromatic; saturated and unsaturated compounds.
3. Detection of functional group - monosaccharides, aldehyde, ketone, acid, diamide, aromatic amine.

Text Books
1. Venkateswaran, V., Veeraswamy, R., & Kuandaivelu. (1997). Basic Principles of Practical Chemistry. 2nd edition. New Delhi, Sultan Chand & Sons.
2. Bassett, J. (1985). Text Book of Quantitative Inorganic Analysis. 4th edition. ELBS Longman.

Reference Book
Vogel, A. I. (2000) Textbook of quantitative inorganic analysis. The English language book society.

Web References
1. https://www.youtube.com/watch?v=uOzniLNNxAE.
2. https://www.brainkart.com/article/Estimation-of-sodium-hydroxide_38685/.
3. https://www2.chem21labs.com/labfiles/UofC_GOB01A_Lab.pdf.
4. https://byjus.com/chemistry/volumetric-analysis/.

Pedagogy
Demonstration and Practical Sessions.

Course Designer
Dr. S. Devi

Semester- III	Internal Marks: 25			External Marks: 75
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22UPH3GEC1	**PHYSICS IN EVERYDAY LIFE**	**GEC-I**	**2**	**2**

Course Objectives

- To experience the objects from our daily environment.
- To impart basic knowledge about everyday electrical devices in home with their working principle.
- To focus on their principles of operation and relations to one another.

Pre-Requisites

- Get depth knowledge of physics in day-to-day life.
- Understand the fundamentals of home and office devices.
- Knowledge about the concepts of digital access devices.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to,	Cognitive Level
CO 1	Recall the basics of electricity	K1
CO 2	Outline the risk factors and precautionary steps to avoid electric shock.	K2
CO 3	Understand the basics of electrical appliances.	K4
CO 4	Knowledge on handling home appliances.	K3
CO 5	Explain the functioning of several home appliances.	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	2	3	2	3	3	3	2	3	3
CO 2	3	2	2	2	3	3	2	2	3	3
CO 3	2	3	3	2	3	3	3	2	3	3
CO 4	2	2	3	3	3	2	2	2	3	3
CO 5	2	2	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**BASICS OF ELECTRICITY** Electricity – Basic principles - Practical unit of electricity - International system (S.I) of units – Electric shock.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**SAFETY PRECAUTION** Precautions to avoid electric shock – Rescue steps in electric Shock – methods of resuscitation - Electric Line Circuit Breaker (ELCB).	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**ELECTRICAL APPLIANCES-I** **Heating appliances:** Design for heating element – Electric iron-Water heater-Room heater.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**ELECTRICAL APPLIANCES -II** **Cooling appliances:** Refrigerator – Air cooler - Air Conditioner **Other electrical appliances:** Washing Machine.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**LIQUID CRYSTAL SCREEN TELEVISION** LCD technology - LCD matrix types and operation - LCD screens for television - LED TV - Edge LEDs, Differences between LED and LCD displays.	6	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**SELF STUDY FOR ENRICHMENT** **(Not to be included for External Examination)** Smartphones, Smartwatch, Global Positioning System, CCTV.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Gulati R R, *Colour Television: Principles & Practice*, (2007) New Age International Publisher.
2. Anwani M L, *Basic Electrical Engineering*, (2014), Dhanpat Rai Co. Ltd., Delhi.
3. William D. Cooper, *Electrical Instruments and Measurement Techniques*, (1997), Prentice Hall India, New Delhi.

Reference Books

1. Bali S P, *Consumer Electronics*, (2008), Pearson Education, New Delhi.
2. Theraja B L and Theraja A K, *A Textbook of Electrical Technology*, (2014), S. Chand & Co.
3. R.R. Gulati, Modern Television Practice, New Age International Publishers, 2007.

Web References

1. https://www.esabna.com/euweb/mig_handbook/592mig6_2.htm
2. https://www.constellation.com/energy-101/electrical-safety-tips.html
3. https://nptel.ac.in/courses/112/105/112105129/

Pedagogy

Chalk and Talk, Seminars, Power Point Presentation, Quiz, Assignment and Group discussion.

Course Designer

Dr. R. Mekala

Semester IV	Internal Marks: 25			External Marks: 75
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
23UPH4CC5	ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM	CC-V	6	5

Course Objectives

- To develop knowledge in electrostatics and magnetostatics and apply theories of static andmoving charges.
- To give idea on the fundamentals of electromagnetic conduction and electromagnetic waves.
- To extend the understanding of its applications to instruments involving electric and magneticfields.
- To explore the applications of Electricity and Magnetism.
- To analyze various concepts in electromagnetism with real time applications.

Pre-requisites

- Knowledge about the concepts of electrostatic potential.
- Fundamental knowledge of currents in a network circuits.
- Concept of magnetic materials and its applications.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be able to	Cognitive Level
CO 1	Understand the basic laws of electrostatics, magnetostatics and Electromagnetism.	K1, K2
CO 2	Apply the Principles behind the electric and magnetic instruments.	K3
CO 3	Analyze the behavior of circuits containing Inductance, Capacitance and Resistance connected in different combinations.	K4
CO 4	Organize experiments to determine the absolute values of Q factor and power factor of LCR circuits.	K5
CO 5	Interpret the circuit into a mathematical problem using circuit laws and theorems.	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3	3	2	2	2	2
CO 2	3	3	3	3	3	3	2	2	2	2
CO 3	3	3	3	3	3	3	2	2	2	2
CO 4	3	3	3	3	3	3	3	3	2	2
CO 5	3	3	3	3	3	3	3	3	2	2

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" –Substantial (High) Correlation   "-" – indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	Cos	COGNITIVE LEVEL
I	**Electrostatics** Coulomb's inverse square law – Gauss theorem and its applications – intensity at a point due to a charged sphere and cylinder – Principle of a capacitor – Capacity of spherical and cylindrical capacitors – Parallel plate capacitor – Effect of a dielectric – Energy stored in a capacitor – Loss of energy due to sharing of charges.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Current Electricity** Current density – Equation of continuity- Grouping of cells – Theory of Ballistic Galvanometer – Figure of merit – Damping Correction – Kirchhoff's laws – Wheatstone Bridge – Carey Foster's Bridge-Potentiometer Calibration of ammeter and voltmeter- Comparison of resistance	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Magnetostatics** Biot-Savart's law and its applications- straight conductor, Circular coil, Solenoid carrying current – Divergence and curl of magnetic field- Magnetic vector potential – Ampere's circuital law- Types ofmagnetic materials – Properties of dia,para and ferromagnetic materials – Magnetometer method – Cycle of magnetization and Hysteresis- Loss of energy per cycle	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Electromagnetic Induction** Laws of electromagnetic induction – Self and mutual induction – Self-inductance of a solenoid – Mutual inductance of a pair of solenoids – Coefficient of coupling – Experimental determination of self and mutual inductance (Rayleigh's method) Growth decay of current in circuit containing Land R – Growth and decay of charge in circuit containing C and R – High resistance by leakage – Charging and discharging of capacitor through Land R.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**AC Circuits** Alternating EMF – Alternating EMF applied to circuits containing L and R – C and R – Alternating EMF applied to circuits containing L, C and R – Series and Parallel resonance circuits – Sharpness of resonance– Q factor – Power in AC circuits – Power factor – Watt less current	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment:** **(Not to be included for External Examination)** Applications of Capacitor – Superposition Theorem- Magnetic Circuit – Earth inductor – Transformer.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Murugeshan R(2017), *Electricity and Magnetism*(10th edition), S. Chand and Co., New Delhi.
2. Brij Lal and N Subrahmanyam(2000), *Electricity and Magnetism*(8th edition), Ratan Prakashan Mandir,Agra.

Reference Books

1. Vasudeva D N(2013), *Fundamentals of Magnetism and Electricity*(2nd edition), S. Chand & Co,New Delhi.
2. Sehgal N K , Chopra K L and Sehgal D L(2014), *Electricity and Magnetism*(3rd edition), Sultan Chand andSons, New Delhi.
3. Tiwari K K(2018) , *Electricity and Magnetism*(2nd edition), S. Chand and Company, New Delhi.
4. David J. Griffith(2015), *Introduction to Electrodynamics*(2nd edition), Prentice Hall of India.
5. Paul A. Tipler and G. Mosca(2003), *Physics for Scientist and Engineers*, W.H.Freeman, NewYork.

Web References

1. https://nptel.ac.in/courses/115106122
2. https://www.edx.org/learn/physics/rice-university-electricity-and-magnetism-part-1
3. https://www.coursera.org/courses?query=electricity%20and%20magnetism

Pedagogy

Chalk and Talk, Assignment, Group discussion and Quiz

Course Designer

Dr.R.Meenakshi

Semester IV	Internal Marks: 40			External Marks: 60
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
23UPH4CC4P	**ELECTRICITY AND MAGNETISM (P)**	**CP – IV**	**4**	**4**

Course Objectives

- To develop practical knowledge of Electricity and Magnetism
- To enhance the experimental skills.
- To gain hands-on experience with a variety of techniques.
- To learn the basic principles and procedures of laboratory work.

Pre-requisites
- Basic knowledge on usage of scientific apparatus.
- Basic Physics principle in Electricity and Magnetism
- Understanding on circuit connection.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be able to	Cognitive Level
CO 1	Apply the physics principle involved in the various instruments and also relate the principles to new application.	K1, K2
CO 2	Apply experimental approaches to correlate with physics theory to develop practical understanding.	K2, K3
CO 3	Relate the concept of electricity to a real time applications	K4
CO 4	Demonstrate knowledge and understanding of experiments in Electricity and Magnetism	K5
CO 5	Design and develop circuits which enhance the existing scientific knowledge.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	1	2	1	2	1	3	2	1	2	1
CO2	2	3	2	2	2	2	3	2	2	2
CO3	2	1	2	3	1	3	2	1	3	1
CO4	2	2	3	3	2	2	3	1	2	2
CO5	3	2	3	3	3	1	3	2	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation   "-" – indicates there is no correlation

Syllabus

LIST OF EXPERIMENTS (Any 8)

1. Post Office Box – Temperature coefficient.
2. Carey Foster's Bridge – Specific Resistance.
3. Potentiometer – Temperature coefficient of a coil.
4. Potentiometer – High range voltmeter calibration.
5. Series resonance circuit.
6. Parallel resonance circuit.
7. Ballistic Galvanometer – Figure of merit.
8. B.G. – Absolute capacity of condenser.
9. Deflection and Vibration magnetometer- Determination of M and H
10. Field along the axis of a coil – Determination of M.
11. Potentiometer – Ammeter calibration.
12. Meter Bridge – Specific Resistance.

Text Book

1. Ouseph,C.C., Rao,U.J., Vijayendran,V., (2016). *Practical Physics and Electronics*. S.Viswanathan, Printers & Publishers Pvt Ltd., Chennai.

Reference Book

1. Prof.Namboodirippad M.N., Prof.Daniel,P.A.,(1982).*B.Sc.,PracticalPhysics*. G.B.C.Publications, Cochin.

Web References

1. https://vlab.amrita.edu/index.php?sub=1&brch=192
2. https://vlab.amrita.edu/index.php?sub=1&brch=192&sim=972&cnt=1
3. https://vlab.amrita.edu/index.php?sub=1&brch=192&sim=346&cnt=1

Pedagogy

Demonstration, Practical sessions and Viva-voce.

Course Designer

Dr. B.Anitha

Semester IV	Internal Marks: 25			External Marks: 75
COURSE CODE	COURSE TITLE	CATEGORY	Hrs. / Week	CREDITS
22UPH4AC6	CHEMISTRY - II	ALLIED	4	3

Course Objectives

➢ To stimulate the concepts in basic chemistry and apply them in real world problems.

➢ To understand the preparation and properties of carbohydrates, amino acids and proteins.

➢ To study the basic concept of polymers, photochemistry, electrochemistry and magnetic properties.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recall the fundamental ideas in material science and biomolecules.	K1
CO2	Understand the characteristics of polymers, biomolecules, alloys, photochemical and electrochemical reactions	K2
CO3	Identify the types of polymerization, biomolecules, photolytic process, magnetic and nanomaterials	K3
CO4	Calculate the molecular weight, quantum yield and emf of a cell.	K3
CO5	Analyze the applications of industrial and bio materials	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	3	3	2	3	2	3
CO2	3	3	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2	3	2
CO5	3	3	2	3	3	3	2	3	2	2

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" Indicates there is No Correlation.

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Carbohydrates, Aminoacids and Proteins:** Carbohydrates - classification - glucose and fructose - preparation and properties - structure of glucose only - Fischer and Haworth cyclic structures - amino acids and proteins - classification based on structure - essential and non - essentials amino acids - preparation – properties – uses - proteins - classification based on physical properties and biological functions - structure of proteins - primary and secondary structure.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**Photochemistry:** Introduction - Photosynthesis - comparison between thermal and photochemical reactions - laws of photochemistry - Beer-Lambert law - Grotthus-Dropper law - Einstein's law of photochemical equivalence - quantum yield - actinometer - kinetics of hydrogen-chlorine reaction - Jablonski diagram - photoprocesses - phosphorescence - fluorescence - photosensitization - quenching - types of luminescence - thermoluminescence - bio-luminescence - chemiluminescence.	12	CO1, CO2, CO3, CO5	K1, K2, K3, K4
III	**Electrochemistry and Magnetic Properties of Materials:** Galvanic cells - emf - standard electrode potential - reference electrodes - electrochemical series and its applications - corrosion - types - methods of prevention – galvanization - electroplating - cathodic protection - magnetic properties of molecules - types of magnetic behavior- dia - para - ferro -	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

		antiferro magnetism - magnetic susceptibility - determination of magnetic moment using Guoy balance - applications of magnetic measurements.			
IV	**Material Science:** Ferrous and non-ferrous alloys - aluminium - copper - titanium - nickel alloys - types and composition of glass - cement - ceramics - nanomaterials - nanoparticles and bulk materials - classification - synthesis - properties - applications of carbon nanotube - graphene - quantum dots - energy storage devices - supercapacitors - batteries - solar cell	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	**Polymer Chemistry:** Introduction - functionality - nomenclature - classification of polymers - differences between thermoplastic and thermosetting polymers - types - mechanism of polymerization - addition, condensation and copolymerization - properties of polymers - transition temperature - tacticity - molecular weight - weight average and number average - polydispersity index - preparation - properties - uses of Nylon 6, 6 - epoxy resin.	12	CO1, CO2, CO3, CO5	K1, K2, K3, K4
VI	**Self-Study for Enrichment:** (Not to be included for External Examination) Techniques of polymerization - bulk - emulsion - solution - suspension - tertiary structure of proteins - kinetics of hydrogen - bromine reactions - fuel cells - properties of glass.	-	CO1, CO2, CO3, CO4	K1, K2, K3. K4

Text Books

1. Puri, B. R., Sharma, L. R., & Kalia, K. K. (2018). Principles of Inorganic Chemistry. 33rd edition. Shoban Lal Nagin Chand & Co., New Delhi.

2. Bahl, B. S., & Bahl, A. (2010). Advanced Organic Chemistry. (12th edition), New Delhi, Sultan Chand & Co.

3. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2022). Principles of Physical Chemistry. 48th edition. Shoban Lal Nagin Chand & Co, New Delhi.

4. Arumugam, (2007). Materials Science, Anuradha Publications.

5. Gopalan, R., & Sundaram, S. (2015). Engineering Chemistry - I. 2nd edition, Sultan Chand & Sons.

Reference Books

1. Madan, R. D. (2000). Modern Inorganic Chemistry. S. Chand and Company. New Delhi.

2. Mohan, S. and Arjunan, V.(2016). Principles of Materials Science. MJP Publishers.

3. Morrison, R. T., Boyd, R. N., & Bhattacharjee, S. K. (2011). Organic Chemistry. (7th edition), Pearson India, (2011).

Web References

1. https://web.mit.edu/5.33/www/lec/poly.pdf.

2. https://byjus.com/biology/biomolecules/.

3. http://stpius.ac.in/crm/assets/download/Photochemistry.pdf.

4. https://archive.nptel.ac.in/content/storage2/courses/113108051/module1/lecture1.pdf.

5. https://www.ccri.edu/chemistry/courses/chem_1100/terezakis/notes/Chapter_19_Lecture_Notes.pdf.

6. https://www.sathyabama.ac.in/sites/default/files/course-material/2020-10/UNIT- 1_4.pdf.

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar.

Course Designer

➢ Dr. S. Devi

SEMESTER IV	Internal Marks: 25			External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS / WEEK**		**CREDITS**
22UPH4GEC2	**PHOTOGRAPHY AND VIDEOGRAPHY**	**GEC-II**	**2**		**2**

Objectives

- To acquire knowledge with modern cameras.
- To understand the concepts of Digital Photography &Sensitivity.
- To familiarize the concepts of various Lenses.
- To know the fundamentals of the shoot.
- To import the knowledge of getting creative with photography.

Pre-Requisities

- Understand the basic ideas about photography
- Knowledge about basic camera operations
- Skills to use various tools

Course Outcomes and Cognitive Level Mapping

CO No.	CO Statements On the successful completion of the course, the students will be able to	Knowledge Level
CO 1	Knowledge and skills in the use of basic tools, techniques, technologies and able to acquaint with basic camera operations.	K1
CO 2	Understanding of special features and utility purposes of various types of lenses and able to choose an appropriate lens for the job concerned	K2
CO 3	Demonstrate uses of cameras and lighting/digital technologies.	K2
CO 4	Utilize the concept of correct exposure and identify correct andincorrect exposure in photographs.	K3
CO 5	Apply understanding of aesthetics related to shooting and editing.	K3

Mapping with Programme Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	2	2	3	3	3	2	2
CO2	2	3	2	2	2	2	3	2	2	2
CO3	2	2	3	2	3	2	2	3	2	3
CO4	2	2	2	3	3	2	2	2	3	3
CO5	2	2	3	3	3	2	2	3	3	3

"1" – Slight (Low) Correlation "   2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation   "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction** Digital Photography - Advantages and Disadvantages – SLR – Aperture – Shutter Speed – ISO Sensitivity	3	CO1 „CO2 CO3 CO4 CO5	K1 K4 K2 K3 K3
II	**Lenses** Specialized Lenses – Telephoto Lens – Wide-Angle Lens – Lens Multiplication Factor - Zoom Lens – Prime Lens – Macro (or Close-Up) Lens – Fish-Eye Lens – Tilt and Shift Lenses	6	CO1 CO2 CO3 CO4 CO5	K1 K2 K4 K3 K3
III	**Composition** Line - Rule of Odds - Rule of Thirds - The Phi Grid - Negative Space- Repetition - Color - Texture	6	CO1 CO2 CO3 CO4 CO5	K1 K2 K2 K3 K4
IV	**Shooting video with DSLR** Fundamentals of the shoot – Exposure – Keeping the camera steady – Shooting to edit – Shooting Just Enough Variations – Watching and Learning from the Movies – Varying Focal Length – Mastering Shot Structure – Maintaining continuity between shots	9	CO1 CO2 CO3 CO4 CO5	K1 K4 K2 K3 K3
V	**Getting Creative with Shoot** Controlling Aperture for Effect – Finding the Best Angle – Using Camera Filters – Tooling withCamera Effects – Using Time-Lapse Photography	6	CO1 CO2 CO3 CO4 CO5	K1 K2 K2 K4 K3
VI	**SELF STUDY FOR ENRICHMENT** (**Not to be included for External Examination**) Applications of full frame camera, 50mm lenses, 100mm macro lenses, Tripods, Backlighting, Overhead angle.	-	CO1 CO2 CO3 CO4 CO5	K1 K2 K2 K3 K4

Text Book

1. Black, (2013), DSLR *Photography for Beginners*, Independently Published, 1st Edition.
2. John Carucci, (2013), *Digital SLR video & Filmmaking for Dummies*, John Wiley & Sons, Inc.

Reference Book

1. Tom Clark, (2011), *Digital PhotographyComposition for Dummies*, John Wiley & Sons, Inc.

Web References

1. www.digital-photography-school.com

2. https://www.linkedin.com/in/singhofen/

3. https://dev.to/singhofen

4. https://codepen.io/csinghofen

Pedagogy:

Chalk and talk, Assignment, power point presentation.

Course Designer

Dr. K. Kannagi

Semester IV	Internal Marks: 40			External Marks: 60
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22UPH4SEC1P	WEB DESIGNING (P)	SEC - I	2	2

Course Objectives

- To understand the concepts in web design.
- To design a webpage with font and colour variation.
- To develop a webpage using HTML tags.
- To animate the webpage.
- To apply the HTML tag to create the webpage.

Pre-requisites

- Basics of webpage designing.
- Fundamental ideas on HTML.
- Basics of Flash and Photoshop.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Identify the basic tags used in an HTML document.	K1
CO2	Demonstrate the animating webpages.	K2
CO3	Develop HTML code for the webpage.	K3
CO4	Create formatting and link webpages.	K4
CO5	Make their own web page.	K5

Mapping with Programme Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	1	2	2	2	2	3	3	2	2	2
CO2	2	2	2	3	3	3	3	2	2	3
CO3	2	2	2	2	3	3	3	2	3	3
CO4	2	2	2	2	3	3	3	2	3	3
CO5	2	2	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" – indicates there is no correlation

Syllabus

LIST OF EXPERIMENTS (Any 8)

1. Web page to demonstrate font variations.
2. Web page illustrating text formatting tags.
3. Sample code to illustrate three lists in HTML.
4. HTML page with seven separate lines in different colors. State color of each line in its text.
5. HTML code to form a table.
6. Web page for form filling.
7. HTML program for personal website.
8. HTML code to design your own curriculum vitae.
9. Web page to explain concepts using hyperlinks.
10. Web page to explain concepts using animated picture, movie and sound.

Text Books

1. Weixel et al, (2004). *Multimedia Basics.*(First Edition) Thomson Course Technology, India.
2. Xavier C, (2007). *Web Technology and Design.(*First Edition). New Age International, New Delhi.

Reference Books

1. Srivastava R N, (2011). *Web Technology.* (First Edition). Global Academic Publishers & Distributors.
2. Daniel Gray, (2000). *Web Design Fundamentals Hand Book.* (First Edition). Sun Rise Printers Shahdara, Delhi.

Web References

1. https://www.w3schools.com/html
2. https://nptel.ac.in/courses/106/105/106105084/
3. HTML Color Names (w3schools.com)
4. HTML page with 7 separate lines in different colors. State   color of each line in its text - RakeshMgs
5. How to create a CV using HTML and host in github ? - GeeksforGeeks

Pedagogy

Demonstration, Practical sessions and viva-voce.

Course Designer

Dr. B. Anitha

Semester V	Internal Marks: 25			External Marks: 75
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
23UPH5CC6	**OPTICS**	**CC-VI**	**6**	**5**

Course Objectives

- To study the nature of light waves.
- To understand the basic ideas of geometric optics.
- To differentiate between optical properties like diffraction and interference.
- To gain knowledge on the working principles of optical instruments.
- To design simple optical instruments with fundamental ideas.

Pre-requisites

- Knowledge about the behavior of light waves.
- Fundamental knowledge of the different characteristics.
- Basic ideas of the different optical instruments.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be able to	Cognitive Level
CO 1	Understand the basic principles of light waves.	K1, K2
CO 2	Analyze the characteristics of optical waves.	K3
CO 3	Classify different properties of light waves like interference, polarization and diffraction.	K4
CO 4	Develop practical knowledge of different optical instruments and their applications	K5
CO 5	Design simple optical instruments by applying the concepts of light waves.	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	2	3	3	3	2	3	3
CO 2	3	3	3	3	3	3	2	2	3	3
CO 3	3	3	3	3	3	3	3	2	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation   "-" – indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Geometrical Optics** Lenses – Introduction- Conjugate Points-Planes and Distances-Location of the image-Lens Maker's Equation-Newton's Lens Equation-Magnification. Lens aberrations - Spherical aberrations -Coma-Astigmatism - Curvature of field- Distortion - Chromatic aberrations.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Interference** Fresnel's Biprism - Lloyd's single mirror experiments - Achromatic fringes-Haidinger Fringes -Fringes in wedge shaped films - Newton's Rings - Michelson's interferometer - Determination of wavelength and refractive index- Reflective and antireflective coatings –Interference filters	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Diffraction** Rectilinear propagation of light - Zone plate - Fresnel diffraction - Diffraction at circular aperture, circular disc and a straight edge - Fraunhofer diffraction - Diffraction at a single and double slit - Missing orders in double slit - Theory of diffraction grating - Determination of wavelength - Dispersive power - Rayleigh's criterion and resolving power of a prism and telescope.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Polarization** Plane of polarization - Brewster's law - Malu's law - Double refraction - Nicol prism - Huygen's explanation of double refraction - Elliptically and circularly polarized light -Quarter and half wave plates - Production and determination of plane, elliptically and circularly polarized light - Optical activity - Fresnel's theory-Specific rotation-Laurent's half shade polarimeter.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Optical Instruments** Microscopes - Simple Microscope (Magnifying glass) - Compound Microscope - Ultra-Microscope - Eyepieces - Huygen's Eyepiece - Ramsden's Eyepiece - Comparison of Eyepieces - Telescope - Refracting astronomical telescope - Abbe Refractometer - Pulfrich refractometer - Photographic Camera - Prism binoculars.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	**SELF STUDY FOR ENRICHMENT:** (Not to be included for External Examination) Types of Lenses -Applications of thin film interference - Difference between interference and diffraction- Photo elasticity – Modern optical devices	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Dr. Subramaniyam N, Brijlal and Dr.Avathanulu M N, (2016). *A Textbook of Optics.* (25th Revised Edition),S. Chand & Co. Pvt.Ltd., New Delhi.
2. Ajoy Ghatak**,** (2010)**.** *Optics. (*6th Edition*),* Tata McGraw Hill Co.**,** Mumbai.

Reference Books

1. Kakani S L, Bhandari K C, (2002). *A Text Book of Optics* (2nd Edition), S.Chand and Sons, New Delhi.
2. Murugeshan R , Kiruthiga Sivaprasath*,(2003).Optics and Spectroscopy*(Reprint)*,*S.Chand and Sons, New Delhi.

Web References

1. https://www.youtube.com/watch?v=ML7HcZo6IaE
2. https://www.physicsclassroom.com/class/waves/Lesson-3/Interference-of-Waveshttps://www.digimat.in/nptel/courses/video/108105102/L28.html
3. https://www.toppr.com/guides/physics/wave-optics/diffraction/
4. https://www.physicsclassroom.com/class/light/Lesson-1/Polarization
5. https://archive.nptel.ac.in/courses/115/105/115105104/

Pedagogy

Chalk and Talk, Assignment, Power Point Presentation, E-content, Group discussion and quiz.

Course Designer

Dr.D.Devi

Semester V	Internal Marks: 40			External Marks: 60
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22UPH5CC5P	**GENERAL AND ELECTRONICS (P)**	**CP-V**	**3**	**3**

Course Objectives

- To acquire knowledge of spectrometry and to find optical constants.
- To impart the knowledge about the vibrator circuits.
- To analyze the various parameters related to operational amplifiers.
- To understand the working of amplifiers.
- To enable the students to gain knowledge of basic gate through discrete components.

Pre-requisites

- Fundamental knowledge and hands on experience of general and electronics experiments of Physics.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be able to	Cognitive Level
CO 1	Explain the basic concepts of experimental physics.	K2
CO 2	Understand knowledge the principles of amplifiers and vibrators through the experiments	K2
CO 3	Explore the concepts of spectrometry involved in the optical instrument.	K3
CO 4	Verify experimentally the concepts about Logic circuits	K4
CO 5	Develop the skill in handling instruments in the construction of circuits	K5

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	1	2	1	2	2	2	2	1	2	1
CO 2	1	2	2	2	2	2	2	2	2	1
CO 3	1	2	2	2	2	2	2	2	1	1
CO 4	2	2	2	2	3	2	2	2	1	1
CO 5	2	2	2	2	3	2	2	2	1	1

"1" – Slight (Low) Correlation　　　　"2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation　　　　"-" - indicates there is no correlation

Syllabus

LIST OF EXPERIMENTS (ANY 8)

1. Spectrometer – Prism - Dispersive power.
2. Spectrometer - Cauchy's constants.
3. Koenig's method – Uniform bending.
4. Regulated power supply using Zener diode - Percentage of regulation.
5. FET Characteristics.
6. Emitter follower.
7. Astable Multivibrator.
8. AND, OR and NOT gates using discrete components.
9. Op - Amp -Adder and Subtractor.
10. Transistor Characteristics – Common Base.
11. Full wave Bridge rectifier.
12. Hartly oscillator.

Text Book

1. Ouseph C.C., Rao, U.J., &Vijayendran, V. (2009), *Practical Physics and Electronics*, S. Viswanathan, Printers & Publishers Pvt Ltd
2. Dr. Somasundaram S, (2012), *Practical Physics*, Apsara Publications
3. S. Poornachandra *Electronic Laboratory Primer a design approach*, B. Sasikala, Wheeler Publishing, New Delhi.
4. *Electronic lab manual Vol I*, K A Navas, Rajath Publishing

Reference Book

1. Jones, B.K., (1986). *Electronics for Experimentation and Research*. Prentice-Hall.
2. Zbar, P.B., Malvino, A.P., & Miller, M.A., (1994). *Basic Electronics: A Text-Lab Manual. Tata Mc-Graw Hill*, New Delhi.
3. *Advanced Practical Physics*, S.P Singh, Pragati Prakasan.
4. *An advanced course in Practical Physics*, D. Chattopadhaya, C.R Rakshit, New Central Book Agency Pvt. Ltd
5. *Op-Amp and linear integrated circuit*, Ramakanth A Gaykwad, Eastern Economy Edition.

Web References

1. https://www.msuniv.ac.in/Download/Pdf/b2efcbdbc4be452
2. https://www.studocu.com/in/document/reva-institute-of-technology-and-management/bachelors/MSc electronics-lab-student-copy/17586392
3. https://www.vlab.co.in/broad-area-physical-sciences

Pedagogy

Demonstration, Practical Sessions and Viva Voce

Course Designer

Dr. S. Priya

Semester V	Internal Marks: 25			External Marks: 75
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/ WEEK**	**CREDITS**
23UPH5CC7	**ATOMIC AND NUCLEAR PHYSICS**	**CC – VII**	**6**	**5**

Course Objectives

- To acquire the knowledge of Atomic Structure.
- To understand the concepts of electronic structure of atoms.
- To know the structure of atom and nucleus using different models.
- To familiarize the concepts of nuclear reactions.
- To impart the knowledge of nuclear detector and accelerators.

Pre-Requisites

- Basic properties of electromagnetic rays.
- Impart knowledge in electronic configuration of atoms.
- Develop knowledge about the concepts of nuclear physics.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be able to,	Cognitive Level
CO 1	Understand the knowledge of basic properties of Cathode rays and Positive rays. Calculate the values of e/m and Critical potential.	K1, K2
CO 2	Extend the concept of vector atom model to draw the electronic configuration of atoms and the Periodic classification.	K2
CO 3	Apply the Quantum mechanical principles in Spectral transitions (Lande's 'g' factor)	K3
CO 4	Recall the properties of Thomson's Parabola method, spin motion of electrons, experimental methods to detect particles.	K4
CO 5	Discuss the concept of quantum numbers, special lines, nuclear transformations and particle detector in nuclear physics.	K5

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	3	3	3	3	3	3	2	2	2
CO 2	2	3	3	3	3	3	3	2	2	2
CO 3	2	3	3	3	3	3	3	2	2	2
CO 4	2	3	3	2	3	3	3	2	2	2
CO 5	2	3	3	2	3	3	3	2	2	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation   "-" - indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**CATHODE RAYS AND POSITIVE RAYS** Cathode rays–properties–e/m of cathode rays–Milliken's oil drop method–Positive rays–Properties–e/m of Positive rays: Thomson's parabola method–Aston's Bainbridge-Determination of critical Potential–Franck and Hertz's experiment - Davi's and Goucher method	17	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**VECTOR ATOM MODEL** Various quantum numbers, L-S and J-J Coupling–Pauli's exclusion principle–electronic configuration of elements and periodic classification–magnetic dipole moment of electron due to orbital and spin motion–Bohr magneton-Stern and Gerlach experiment.	17	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**FINE STRUCTURE OF SPECIAL LINES** Special terms and notations–selection rules- intensity rule and internal rule–Fine structure of sodium D lines–Alkali spectra–Fine structure in Alkali spectra– spectrum of Helium–Zeeman effect-Larmor's theorem–Debye's quantum mechanical explanation of the normal Zeeman effect–Anamolous Zeeman effect–theoretical explanation Lande's 'g' factor and splitting of D1 and D2 lines of sodium.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**STRUCTURE OF NUCLEI AND NUCLEAR TRANSFORMATIONS** **Nuclear Structure:** Basic properties of nuclei-Mass defect and Binding energy-Packing Fraction-Stable Nuclei-Liquid drop model - Shell Model. **Nuclear Transformations:** Radioactive decay-Half life-Mean life-Properties of α, β, γ-rays- successive disintegration and equilibriums-Cross section—Nuclear reactions-Nuclear fission and fusion-Nuclear reactors.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**PARTICLE DETECTORS AND PARTICLE ACCELERATORS** **Particle Detectors:** Wilson Cloud chamber – ionization chamber-Geiger Muller Counter-solid state detectors. **Particle Accelerators:** Cyclotron-Betatron-Synchrotron-electron synchrotron and proton synchrotron.	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5

VI	SELF STUDY FOR ENRICHMENT (Not to be included for External Examination) Electronic structure of atoms-Elementary particles-Interactions and particles-Leptons-Hadrons-Elementary Particle Quantum numbers-Quarks-Field Bosons	-	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5

Text Books

1. Subrahmanyam N and Brijlal and seshan, (2007), *Atomic and nuclear Physics*, S. Chand, Revised edition.
2. Murugesan Kiruthiga Sivaprasath R, (2011), *Modern Physics*, S. Chand, Revised edition.
3. Beiser. Shobhit mahajan S. Rai Choudhury, (2009), *Perspectives of Modern Physics*, Tata McGraw Hill, 6th edition.

Reference Books

1. Serway R. A., Moses C. J. and Moyer C. A., (2004), *Modern Physics*, 3rd Edition, Brooks/Cole Publications.
2. Semat H, and Albright J. R., (1985), *Introduction to Atomic and Nuclear Physics*, 5th Edition, Chapman and Hall.
3. Ghosal S. N., (2007), Atomic Physics, S. Chand, Revised edition.
4. Ghosal S. N., (2008), Nuclear Physics, S. Chand, Reprint.

Web References

1. https://oyc.yale.edu/physics
2. https://ocw.mit.edu/courses/physics/
3. https://www.digimat.in/nptel/courses/video/115104043/L01.html

Pedagogy

Chalk and talk, PPT, Quiz, Seminars, Assignment and Group discussion.

Course Designer

Dr. R. Mekala

Semester V	Internal Marks: 25			External Marks: 75
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
23UPH5CC8	**ANALOG ELECTRONICS**	**CC - VIII**	**6**	**5**

Course Objectives

- To provide the knowledge of intrinsic, extrinsic semiconductors.
- To acquire a diversified knowledge on semiconductors and diodes
- To impart the knowledge about the transistor characteristics in different configurations and its charcteristics.
- To grasp the basic ideas of feedback and its application in amplifiers and oscillators
  To gain the knowledge on the special semiconductor devices and operational amplifiers.

Pre-Requisites

- Basic ideas on semiconductors and oscillators.
- Import basic mathematical knowledge.
- Understanding of Transistors and other electronic devices and its operations.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be able to,	Cognitive Level
CO 1	Outline knowledge of semiconductors, transistors, rectifiers, operational amplifiers and different types of semiconductor devices.	K1,K2
CO 2	Outline the idea on action of transistors, diodes, special semiconductor devices and operational amplifiers.	K2,K3
CO 3	Identify the operation of transistor, diodes, amplifiers, oscillators, operational amplifier and special semiconductors devices and its characteristics	K3,K4
CO 4	Construct the various mathematical operations of transistors, diodes, amplifiers, oscillators, operational amplifier and special semiconductors devices	K4, K5
CO5	Analyze the amplitude and frequency response and characteristics of transistors, diodes and special semiconductors devices	K4, K5

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	2	2	3	2	3	2	3	3	3
CO 2	2	2	2	2	2	3	2	3	3	3
CO 3	3	3	3	3	3	3	2	3	3	3
CO 4	2	3	3	2	3	3	2	3	3	3
CO 5	3	2	2	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" – indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**SEMICONDUCTORS AND DIODES** Intrinsic and Extrinsic semiconductor-n-type semiconductor-p-type semiconductor-PN junction diode-Biasing of PN junction –V-I characteristics of PN junction – Rectifier - Half wave rectifier- Full wave rectifier and Full wave bridge rectifier-Zener diode-Characteristics of zener diode-Zener as a voltage stabiliser-Light Emitting Diode (LED)-Photo diode-LED-Tunnel diode- Filters – Types of filters.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**CIRCUIT ANALYSIS AND TRANSISTORS** Circuit Analysis: Kirchhoff's Current law (KCL)-and Voltage law (KVL)-Thevenin's theorem- Norton's theorem. Transistor - Naming the transistor terminals-Transistor Action - Transistor as a Amplifier - Transistor Connections-Common Base and Common Emitter connection- Characteristics of Common Base and Common Emitter connection - Transistor load line analysis- Operating point -Faithful amplification - Transistor Biasing- stabilization- stability factor.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**AMPLIFIERS AND OSCILLATORS** Single stage Transistor amplifier-Practical Circuit of transistor Amplifier- D.C and A.C Equivalent circuits-Power amplifiers-Classification of Power Amplifiers-Expression for Collector Efficiency-Efficiency of Class A and Class B amplifiers- Push- pull amplifiers. Feedback-Negative voltage feedback in amplifier-Principle-Gain-Emitter Follower-Sinusoidal Oscillator-Types-Oscillatory Circuit- Positive feedback amplifier - Barkhausen criterion-Colpitt's oscillator- Hartley oscillator.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**SPECIAL SEMICONDUCTOR DEVICES** Types of Field Effect Transistor-Junction Field Effect Transistor (JFET)-Difference between JFET and Bipolar Transistor-Metal Oxide Semiconductor FET (MOSFET)-Types of MOSFET- Silicon Controlled Rectifier (SCR)- V-I Characteristics of SCR-SCR as a switch –Uni junction Transistor (UJT)-UJT relaxation oscillator.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**OPERATIONAL AMPLIFIERS** Op-amp characteristics-Common mode rejection ratio (CMRR)-Inverting and Non inverting amplifier-Adder, Subtractor, Integrator, Differentiator-Voltage follower-Op-amp comparator-Log & antilog amplifier- Filters-low, high pass and band pass filters.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**SELF STUDY FOR ENRICHMENT** **(Not to be included for External Examination)** Astable multivibrator - Monostable multivibrator – bistable - Methods of transistor biasing- Base resistor method-Voltage divider bias method.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Mehta V.K. & Rohit Mehta (2012). *Principles of Electronics* (11th edition) S.Chand.
2. Chattopadhyay. D, Raxshit P.C, Sara B.and Purkait (2006). *Foundations of electronics (*7th edition) New Age International.
3. Vijayendran.V, (2010). *Introduction to Integrated Electronics*.(6th edition)
   S. Viswanathan Printers and Publishers Pvt. Ltd., Chennai.
4. Salivahanan S, Suresh Kumar N, (2011). *Electronic Devices and Circuits*. (2nd edition) Tata McGraw Hill Education New Delhi.

Reference Books

1. Theraja. B.L, (2012) *Basic electronics solid state*. (Reprint (2012)) S.Chand
2. Millman and Halkias, (2008) *Integrated Electronics* (48th Reprint) Tata McGraw Hill Education. New Delhi.

Web References

1. https://www.educba.com/digital-computer-fundamentals/
2. https://collegedunia.com/exams/number-system-mathematics-articleid-3097
3. https://www.tutorialspoint.com/difference-between-half-adder-and-full-adder
4. https://electronicsdesk.com/8085-microprocessor.html
5. https://www.digimat.in/nptel/courses/video/108105102/L01.html

Pedagogy

Chalk and Talk, Seminars, Power Point Presentation, Quiz, Assignment and Group discussion.

Course Designer

Dr.T.Noorunnisha

Semester V	Internal Marks: 25			External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**	
23UPH5DSE1A	MATERIALS SCIENCE	DSE-I	5	3	

Course Objectives

- To formulate the knowledge in material science and to understand the chemical structure and bonding between the molecules
- To gain cognition on the defects in materials
- To acquire the knowledge about smart materials and its mechanical properties
- To develop the understanding of Nanomaterials and its property correlation
- To know the concept of materials for nuclear and space applications

Pre-requisites
- To know the relationship between different types of crystal structures with the properties of materials
- To gain the physical property of condensed matter is intimately related to their electronic structure
- To emphasise the structure-property correlation in materials

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be able to	Cognitive Level
CO 1	Interpret the different types of crystal structure and bonding in solids, and the physical ramifications of these differences.	K1
CO 2	Explain out the different kinds of technological properties of materials	K2
CO 3	Identify the Smart materials in the material engineering and to understand their role in materials behavior	K3
CO 4	Examine the Nanomaterials on explaining the mechanical behavior of materials	K4
CO 5	Develop the Nuclear materials and their use in space	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	2	3	3	2	3	3	2	3
CO 2	2	3	3	2	3	2	3	3	2	2
CO 3	3	3	3	2	3	2	2	3	3	3
CO 4	3	2	3	3	3	3	2	3	2	2
CO 5	2	2	3	3	3	2	3	3	2	2

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation   "-" – indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**CRYSTAL STRUCTURE AND CHEMICAL BONDS** Introduction to crystals – Classification of crystal system –Bravais lattice – Lattice planes and Miller indices – Interplanar spacing in a cubic lattice – Cubic lattice – SC – BCC – FCC – Sodium chloride and Diamond crystal structure – Bonding of solids (Ionic, Covalent, Metallic, Hydrogen and Vander Waal)	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**TECHNOLOGICAL PROPERTIES** Introduction to material science – Classification of engineering materials – Structure – Property relationships in materials - Stability and metastability – Selection of materials – Weldability – Machineability – Formability – Castability.	14	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**SMART MATERIALS** Metallic glass – Fiber reinforced materials – SAW materials – Biomaterials – Ceramics -Nuclear engineering materials-Nanophase materials - SMART materials- Conducting polymers- Optical materials - Fiber optic materials and their applications.	11	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**NANO MATERIALS AND MECHANICAL BEHAVIOUR OF MATERIALS** Nanoscience and nanotechnology – Nanomaterials-Properties of nanomaterials (size dependent) - synthesis of nanomaterials- Fullerenes-Application of nanomaterials – Carbon nanotubes- Fabrication and structure of carbon nano tubes Different mechanical Properties of engineering materials – Fracture – Creep – Testing technique –factors affecting mechanical properties of material- Heat treatment-cold and hot working-types of mechanical tests- Metals forming process – Deformation of crystals and polycrystalline materials.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**MATERIALS FOR NUCLEAR AND SPACE APPLICATIONS** Nuclear fuels - fuel cladding- moderators, control materials -coolants - shielding materials - Space programme - structural material and their properties - system requirements - extreme high temperature materials - materials for thermal protection - pressure vessels - lubrication.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**SELF STUDY FOR ENRICHMENT:** **(Not to be included for External Examination)** Hybridisation - Delocalised chemical bonding-Diamond and Zinc sulphide structures. Close packed structures - packing efficiency and density of materials.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Arumugam, M., (2009). *Material Science* (1st edition) Anuradha agencies, Kumbakonam.
3. Raghavan V., (2004). *Material Science Engineering*. (5thedition) PrIntice Hall ,India
4. Avadhanulu, M.N., (2014) *Material Science*, S.Chand & Company, New Delhi, 2014.
5. Hayra Choudhury S.K., (1991). *Materials Science and Processes.* (1st edition) Indian Book Distributing Co, New Delhi.

Reference Books

1. Pillai S.O., (2005). *Solid State Physics (6th edition)* New age International Private Limited

Web References

1. https://archive.nptel.ac.in/courses/113/102/113102080/
2. https://archive.nptel.ac.in/courses/122/102/122102008/
3. https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/Lecture_Notes/MLN_01.pdf
4. https://nptel.ac.in/courses/118104008

Pedagogy

Chalk and Talk, Power point presentation, Interaction, Problem solving Assignment.

Course Designer

Dr.S.Gowri

Semester V	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
23UPH5DSE1B	**LASER PHYSICS**	**DSE - I**	**5**	**3**

Course Objectives

- To gain knowledge in the basic of lasers.
- To explain the fundamentals of lasers and its types.
- To analyze the properties of laser.
- To differentiate the types of lasers.
- To familiarize with the diverse applications of laser.

Pre-requisites

- Basic knowledge about electromagnetic radiation.
- Fundamental knowledge on absorption and emission.
- Basic ideas on application of lasers.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, the students will be able to	Cognitive Level
CO1	Define the characteristics of electromagnetic radiation and their interaction with matter.	K1
CO2	Explain the basic principle of laser.	K2
CO3	Apply the functions of laser for practical applications in various field.	K3
CO4	Differentiate the various types of lasers and their working principle.	K4
CO5	Summarize properties of laser and its applications.	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	1	3	3	3	3	3	2	1	2	3
CO 2	2	3	3	3	2	3	2	1	2	2
CO 3	1	3	3	3	3	3	3	1	3	3
CO 4	2	3	3	3	3	3	3	1	3	2
CO 5	3	3	3	3	3	3	3	2	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" – indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**PRINCIPLES OF LASER** Introduction to electromagnetic radiation - Principle of lasers - Conditions of lasing action - Absorption - Emission - Einstein's co-efficient - Population inversion - Laser pumping - Stimulated and spontaneous emission - Two and three level laser systems.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**CHARACTERISTICS OF LASER** Monochromaticity - Coherence - Directionality and divergence - Brightness - Laser modes: Longitudinal mode - Transverse mode - Beam quality - Threshold condition - Line shape functions - Mode locking - Q - Switching.	14	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**TYPES OF LASERS** Solid state lasers - Ruby laser- Nd: YAG Laser - Semiconductor lasers - Features of semiconductor lasers- Diode lasers - Gas laser: He-Ne laser - CO_2 laser - Liquid lasers: dye lasers - Chemical lasers.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**LASERS IN INDUSTRY AND COMMUNICATION** Laser cutting - Welding - Drilling - Hardening - Fibre optic communication -Total internal reflection - Block diagram of fibre optic communication system - Advantages of fibre optic communication - Hologram - Recording and reconstruction of hologram - LIDAR.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**LASERS IN MEDICAL AND MILLITARY APPLICATIONS** Lasers in Surgery - Ophthalmology - Dentistry- Dermatology - Lasers in cancer diagnosis and therapy- Cardiology - Laser range finder - Target designation.	14	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**SELF-STUDY FOR ENRICHMENT** (**Not included for End Semester Examinations**) Laser induced photochemical processes - Multiphoton Infrared Excitation - Unimolecular Laser Induced Reaction.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Nagabhushana S (2013). *Laser and Optical Instrumentation*. I. K. International Publishing House, New Delhi.
2. Srivastava S K (2019). *Laser Systems and Applications*. 3rd Edition. New Age International Publisher, New Delhi.
3. Laud B B (2011).   *Laser and Nonlinear Optics.* 3rd Edition. New Age International Publisher, New Delhi.
4. Thyagarajan K et. al. (1986). *Lasers Theory and Application.* 2rd Edition. Plenum Press

Reference Books

1. Seigman, (1986) *Lasers*. 3rd Edition. Oxford University Press.
2. Seelto O, (20*10) Principles of Laser.* 5th Edition. Springer Publication.

Web References

1. [Interaction of Radiation with Matter - Physics LibreTexts](#)
2. [Types of Lasers - Search (bing.com)](#)
3. [Properties of Lasers (worldoflasers.com)](#)
4. [Applications of Lasers - Search (bing.com)](#)
5. https://application.wiley-vch.de/books/sample/3527327150_c01.pdf
6. https://nptel.ac.in/courses/104/104/104104085/

Pedagogy

Chalk and Talk, Seminar, Assignment, Power point Presentation, Group discussion and Quiz.

Course Designer

Dr. G. Maheswari

Semester V	Internal Marks: 25			External Marks: 75
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
23UPH5DSE1C	ASTROPHYSICS AND COSMOLOGY	DSE - I	5	3

Course Objectives

- To learn the composition and nature of the universe from solar system.
- To gain the knowledge of astronomy and celestial mechanics.
- To gain knowledge about stars and stellar evolution, interstellar matter, galaxies, and clusters of galaxies.
- To provide the basic knowledge about the theory and techniques of observational astronomy and physics of the astrophysical phenomenon.
- To learn the large scale structure of the Universe and its history.

Pre-requisites

- Basic knowledge of the principles of Physics
- Knowledge about astronomical concepts
- Experience to interpret data through the use of mathematical tools.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be able to	Cognitive Level
CO 1	Understand Tools of Astronomy and celestial mechanics.	K1, K2
CO 2	Apply mathematical tools and physics laws to understand the nature of Planets, Stars and Galaxies.	K3
CO 3	Understand the astronomical observations for the celestial objects.	K4
CO 4	Analyses the results and interpret the nature of the solar system, variety of stars and galaxies.	K5
CO 5	Interpret the concepts of projects in astronomy.	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	3	3	2	3	3	2	2	2	3
CO 2	3	2	3	3	2	3	2	2	2	2
CO 3	2	3	2	3	3	2	2	3	2	3
CO 4	3	3	3	2	3	3	3	3	2	2
CO 5	3	3	3	3	2	3	3	3	2	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" – indicates there is no correlation

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**ASTRONOMICAL SCALES** Astronomical Distance, Mass and Time Scales-Brightness, Radiant Flux and Luminosity-Measurement of Astronomical Quantities-Astronomical Distances-Stellar Radii - Masses of Stars Stellar Temperature	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**BASIC CONCEPTS OF POSITIONAL ASTRONOMY** Celestial Sphere -Geometry of a Sphere-Spherical Triangle - Astronomical Coordinate Systems: Geographical Coordinates - Horizon System-Equatorial System-Conversion of Coordinates-Measurement of Time: Sidereal Time - Apparent Solar Time-Mean Solar Time - Equation of Time-Calendar	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**ASTRONOMICAL TECHNIQUES** Basic Optical Definitions for Astronomy-Magnification Light Gathering Power-Resolving Power and Diffraction-Limit-Atmospheric Windows-Optical Telescopes Types of Reflecting Telescopes-Telescope Mountings Space Telescopes-Detectors and their Use with Telescopes-Types of Detectors-Detection Limits with Telescopes	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**NATURE OF STARS AND GALAXIES** Classification of binary stars- Mass determination using visual binaries –Formation of spectral line-Hertzsprug –Russel diagram – Hubble sequence-Spiral and Irregular galaxies – Spiral structure-Elliptical galaxies - Interaction of galaxies – Formation of galaxies	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**COSMOLOGY** **Newtonian Cosmology** Olbers's Paradox- Cosmological principle- Dust model of the universe- Evaluation of the pressureless dust universe **Microwave background** Steady state model of the universe- Cooling of the universe after the big bang- Discovery of the Cosmic micro wave background - origin cosmic microwave background **Relativistic cosmology** Euclidean - Elliptic and Hyberbolic geometries - Robertson Walker Matric for curved space time-Friedmann equation - Cosmological constant-Effects of dark energy **Observational cosmology** Origin of the cosmological red shift- Distance to the most remote objects in the universe- Particle Horizon and Horizon distance	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	**SELF STUDY FOR ENRICHMENT:** **(Not to be included for External Examination)** The shape and size of our Galaxy- Interstellar extinction and Reddening-Galactic coordinates, Galactic rotation-Stellar population-Inter Stellar Medium- The galactic magnetic field and Cosmic rays	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Bradley W. Carroll & Dale A. Ostlie (2006), *An introduction to Modern Astrophysics* (Second Edition) Pearson
2. IGNOU(2006), *Basics of Astronomy - IGNOU course book PHE-15 Astronomy and Astrophysics* (First Edition), Neeraj Publications

Reference Books

1. Harwit M. (2000), *Astrophysical concepts*(Second Edition),Springer
2. G. B. Rybicki & Lightman A. P.(1986), *Radiative processes in astrophysics* (Second Edition), *Wiley-VCH)*

Web References

1. https://egyankosh.ac.in/handle/123456789/19452
2. https://egyankosh.ac.in/handle/123456789/6051

Pedagogy

Chalk and Talk, Assignment, Group discussion and Quiz

Course Designer

Dr.R.Meenakshi

Semester V	Internal Marks:40			External Marks: 60
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22UPH5SEC2P	**PHYSICS CONCEPTS THROUGH ANIMATION (P)**	**SEC-II**	**2**	**2**

Course Objectives

- To provide a basic skill in Simulation and Photoshop
- To create a physics-oriented animations using Flash package
- To expose the Photoshop tools to prepare physics-oriented objects
- To develop the skill of animation diagrams through physics concepts
- To formulate 3D-Animation to prepare physics-oriented objects

Pre-requisites

- Explore and understand the phenomenon of physics
- Create animation to learn physics and understand the concepts
- Output the concept in physics-based animation

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement **On the successful completion of the Course, the Students will be able to**	Cognitive Level
CO 1	Develop the skills to simulate physics concepts.	K1, K2
CO 2	Construct the animation of physics-oriented objects using flash.	K3
CO 3	Construct the basic circuit diagram of physics using photoshop.	K4
CO 4	Examine the skill of animation to prepare physics-oriented objects.	K5
CO 5	Develop video through physics concepts 3D Animation.	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	1	1	1	2	1	3	2	1	2	1
CO 2	2	3	2	2	2	3	3	1	2	1
CO 3	1	1	2	3	1	3	2	1	3	1
CO 4	2	3	3	3	2	1	3	1	3	2
CO 5	2	3	3	2	2	2	2	1	2	2

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation

Syllabus

LIST OF EXPERIMENTS (Any 8)
1. Create an animation of Simple Pendulum

2. Create an animation of Atomic Model

3. Create an animation of Dispersion of Light

4. Create an animation of Projectile Motion

5. Create an animation of Law of Gravitation

6. Create an animation of Newton's Law

7 Create an animation of Kepler's law of ellipses

8 Create an animation of Photoelectric effect

9. Create an animation of Magnetic Forces on the Segments of a Current Carrying Loop

10. Draw a simple Physics Circuit

Text Book

1. Kogent Learning Solutions.,(2013) *Flash CS6 in simple Steps*(Revised edition). Dreamtech Press.

2. DT Editorial Services., (2018), *Photoshop CS6 in Simple Steps*,(New edition) Dreamtech Press.

Reference Book

1. Daven Brown and et.al.,(1997) ,*Web Development for the Designer*, Macmillion

Web References

1. https://www.udemy.com/course/animation-in-flash/

2. http://www.floobynooby.com/flashcourseA.html

3. https://phys23p.sl.psu.edu/phys_anim/EM/mag_torque_loop.mp4

Pedagogy

Demonstration, Practical sessions, Group discussion and Survey.

Course Designer

Dr.S.Gowri

Semester VI	Internal Marks: 25			External Marks: 75
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS / WEEK**	**CREDITS**
23UPH6CC9	**FUNDAMENTALS OF MICROPROCESSOR**	**CC-IX**	**6**	**5**

Course Objectives

- To understand the architecture of Intel 8085.
- To impart knowledge about the instruction set.
- To understand the interfacing circuits for various applications.
- To introduce the architecture of microprocessors Intel 8086.
- To analyze the basic concepts and programming of Intel 8085.

Pre-requisites

- Knowledge about digital circuits.
- Concepts of programming languages.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, students will be able to	Cognitive Level
CO 1	Understand the architecture and functioning of the Intel 8085/8086 microprocessor.	K1, K2
CO 2	Demonstrate proficiency in programming using the instruction set of the Intel 8085 microprocessor.	K3
CO 3	Develop skills in troubleshooting and debugging programs written for the Intel 8085/8086 microprocessor.	K3
CO 4	Apply knowledge of microprocessor architecture and programming to analyze and optimize performance in microcontroller-based systems.	K4
CO 5	Interpret technical concepts related to microprocessor 8085/8086 effectively through written reports, presentations, and documentation.	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	1	1	3	1	1	1	3	2	2
CO 2	2	2	1	3	1	3	3	2	2	3
CO 3	1	1	2	3	1	2	3	1	2	2
CO 4	1	1	2	3	1	3	3	3	2	3
CO 5	2	2	1	3	1	3	3	3	2	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation   "-" – Indicates there is no Correlation.

UNIT	CONTENT	HOURS	Cos	CONGNITIVE LEVEL
I	**ARCHITECTURE OF INTEL 8085** Architecture of 8085 - Registers in 8085- Pin configuration of 8085 – Data and Address buses- Instruction cycles – Fetch operation – Execute operation – Machine cycle and State – Instruction and data flow – Timing diagram – Memory read and memory write cycles – I/O read - I/O write	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**INSTRUCTION SETS OF INTEL 8085** Instruction types -Data transfer - Arithmetic - Logical-Branching- Stack and I/O instructions – Instruction word size - Addressing modes of 8085- Direct-Register-Register Indirect-Immediate-Implicit – STACK – Subroutine- MACRO.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**INTEL 8085 PROGRAMING** Assembly language Programming - Addition of two 8-bit numbers: Sum 8- bit, Sum 16-bit - Subtraction of two 8-bit numbers – Finding one's complement of 8 bit number - Shift an 8-bit number left by one bit- Finding the largest number in a data array – Finding the smallest number in a data array – Sum of a series - Multiplication- Division-Arranging the numbers in ascending order – Arranging a numbers in descending order.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**INTEL 8086** Introduction – Pin Configuration-Operating modes of 8086 –Functional units- Interrupts-8086 bus cycle-classification of 8086 instructions- Data transfer- Arithmetic-Logical-Rotate- Shift- Branch – Binary address of 8086 registers-Addressing modes	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**PERIPHERAL DEVICES AND THEIR INTERFACING** Address space partitioning- Memory mapped I/O scheme-I/O mapped I/O scheme- Memory and I/O interfacing-Data transfer schemes: Synchronous data transfer-Asynchronous data transfer- Interrupt driven data transfer – Hardware and Software Interrupts-Programmable peripheral interface (Intel 8255) –Programmable DMA controller – Intel 8257.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**SELF STUDY FOR ENRICHMENT** **(Not included for End Semester Examination)** Assembly language Programs using Microprocessor – 8 - bit decimal subtraction-Decimal to Hexadecimal Conversion- Shift an 8-bit number left by 2 bit - Shift a 16-bit number left by one bit - Mask off Most Significant 4 bits of an 8-bit number - Intel 8237 A.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Ram B. (2013) *Fundamental of Microprocessor and Microcontroller. (* 8th Edition) Dhanpat Rai Publications(P) Ltd, New Delhi.
2. Godse A. P Godse D.A. (2017) *Microprocessors and microcontrollers*. (4th Edition), Technical Publications, Pune.

Reference Books

1. Ramesh Gaonkar (2013) *Microprocessor Architecture, Programming, and Applications with the 8085. (*6th Edition), Penram International Publishing, Mumbai.
2. Nagoorkani A. (2012*) Microprocessors & Microcontrollers*. (2nd Edition) RBA Publications, Chennai.

Web References

1. https://www.elprocus.com/8085-microprocessor-architecture/

2. https://archive.nptel.ac.in/courses/108/105/108105102/

3. https://www.youtube.com/watch?v=hwwhsNOqqm8

4. http://classcentral.com/course/swayam-micropocessor-an-interfacing-17694.

5. https://kanchiuniv.ac.in/coursematerials/VIJAYARAGHAVAN_mp%20_mc

Pedagogy

Chalk and Talk, Seminar, Assignment, Power point Presentation, Group discussion and Quiz

Course Designer

Dr.D.Devi

Semester VI	Internal Marks: 25			External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK		CREDITS
23UPH6CC10	CLASSICAL AND QUANTUM PHYSICS	CC-X	5		4

Course Objectives

- To expose the fundamentals of Theoretical Physics.
- To provide the knowledge of the applications in Quantum Physics.
- To list the fundamental principles of D'Alembert and Hamiltonian principles.
- To apply the Schrodinger's wave equation.

Pre-Requisites

- Understand the fundamental Principles of Classical mechanics.
- Apply the concepts of wave mechanics.
- Represent the quantum theories.
- Study the applications of Quantum mechanics.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to,	Cognitive Level
CO1	Understand the fundamental principles of classical mechanics.	K1
CO2	Understand the Hamilton's formulation.	K1
CO3	Learn the classical concepts and explain the De Broglie's matter waves.	K2
CO4	Identify the basic principles of Quantum mechanics.	K3
CO5	Develop the knowledge about solvable quantum states.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3	3	2	3	2	3
CO2	3	2	3	3	2	3	2	3	2	3
CO3	3	2	2	3	2	3	3	3	3	3
CO4	3	3	2	2	3	3	3	2	2	3
CO5	3	3	2	2	3	3	3	2	2	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation   "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	Cos	COGNITIVE LEVEL
I	**ELEMENTARY PRINCIPLES OF CLASSICAL MECHANICS** Newtonian mechanics: Conservation laws for a single particle and a system of particles – Types of constraints – Generalized coordinates – D'Alembert's principle and Lagrange's equation of motion – Applications to: (a) Compound Pendulum (b) Atwood's machine and (c) Simple Pendulum.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**HAMILTONIAN FORMALISM** Variational principle and derivation of Hamilton's equation of motion –Principle of least action – Phase space – cyclic coordinates – conservation theorems: generalized momenta and energy.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**GENESIS OF QUANTUM TRANSITION** Inadequacy of classical concepts: Black body radiation - Planck's hypothesis – Photoelectric effect – Compton effect – de Broglie's hypothesis – matter waves – wave length, wave velocity and group velocity –Experimental evidences for de Broglie's matter waves: Davison and Germer experiment – G.P. Thomon's experiment – Heisenberg's uncertainty Principle – Electron microscope – Gamma ray microscope.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**BASICS OF QUANTUM MECHANICS** Basic postulates of wave mechanics – Development of Schrödinger wave equation – Time Independent and Dependent forms of equations – Properties of wave function – Orthogonal and normalized wave function – Eigen function and Eigen values – Expectation values and Ehrenfest's theorem.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**EXACTLY SOLVABLE SYSTEMS** Free particle - Linear harmonic oscillator – Particle in a box –Rectangular barrier potential and tunnel effect –Rigid rotator.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**SELF STUDY FOR ENRICHMENT** **(Not to be included for External Examination)** Lagrangian and Hamiltonian Formulation of relativistic mechanics - Theory of small oscillations – Normal modes of oscillations and frequencies (frequencies) - CO_2 as linear symmetrical molecule, its normal frequencies and its normal modes.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Murughesan R, (2016), *Modern Physics*, (Revised Edition), S. Chand & Company Ltd, New Delhi
2. Gupta S L, Kumar V and Sharma H V, (2012), *Classical Mechanics*, (Revised Edition) S. Chand & Company Ltd, New Delhi.
3. Goldstein H, (2011), *Classical Mechanics*, (3rd edition) Narosa Book distributors, New Delhi.
4. Sathya Prakash, (2007), *Quantum Mechanics*, (Revised Edition), Pragathi Prakashan, Meerut.
5. Mathew P M and Venkatesan K, (1987), *A Text Book of Quantum Mechanics*, Tata McGraw Hill, New Delhi.

Reference Books

1. Aruldhas G, (2008), *Classical Mechanics*, (Revised Edition), PHI Publisher, New Delhi.
2. Mathews P M and Venkatesan K, (1987), *A Text Book of Quantum Mechanics*, (Revised Edition) Tata McGraw Hill, New Delhi,
3. Ajoy Ghotak and Loganathan S, (1999), *Quantum Mechanics: Theory and Applications*, (6th Edition) McGraw Hill, New Delhi.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_ph17/preview

2. https://onlinecourses.nptel.ac.in/noc24_ph15/preview

Pedagogy

Chalk and Talk, Seminars, Power Point Presentation, Quiz, Assignment and Group discussion.

Course Designer

Dr. R. Mekala

Semester VI	Internal Marks: 40			External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS	
22UPH6CC6P	ELECTRONICS AND MICROPROCESSOR (P)	CP - VI	3	3	

Course Objectives

- To enable the student to gain practical knowledge.
- To acquire basic understanding of laboratory technique.
- To investigate the basic idea behind digital technology.
- To develop the programming skills of Microprocessor.
- To understand the theory and develop practical application skills.

Pre -requisites

- Basic knowledge on usage of scientific apparatus.
- Develop the knowledge of 8085 Programme.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, the students will be able to	Cognitive Level
CO1	Recall the principles of electronics.	K1
CO2	Understand the basic operations of 8085.	K2
CO3	Make use of fundamental principles and experiment circumstances.	K3
CO3	Analyze working principles of electronic circuits.	K4
CO5	Design simple program using microprocessor.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2	3	2	1	2	3
CO2	3	3	2	3	2	3	3	2	3	3
CO3	3	3	2	3	3	3	3	3	3	3
CO4	3	2	2	3	3	3	1	3	3	2
CO5	3	2	3	3	3	3	2	3	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" – indicates there is no correlation.

LIST OF EXPERIMENTS (Any 8)

Digital Electronics

1. Construction of Half Subtractor and Full Subtractor.
2. Flip flops using gates.
3. Demorgan's theorem.
4. BCD to 7 segment decoder- 7segment LED display.
5. Digital to analog converter.
6. Analog to digital converter.
7. Solving Boolean expression using K-Map.

Microprocessor 8085

1. 8-bit addition and 8-bit subtraction.
2. 8-bit multiplication and 8-bit division.
3. Conversion from decimal to hexadecimal.
4. Conversion from hexadecimal to decimal system.
5. Finding the largest number in a data array.
6. Find the sum of series.

Text Books

1. Ouseph, C.C., Rao, U.J., Vijayendran, V., (2016). *Practical Physics and Electronics*. S.Viswanathan,Printers & Publishers Pvt Ltd., Chennai.
2. Vijayendran.V, (2009). *Introduction to Integrated Electronics: Digital and Analog* (Revised Edition). Viswanathan S., Printers & Publishers Pvt Ltd., Chennai.
3. Ram.B, (2013). *Fundamental of Microprocessor and microcontrolle*r (8th Edition). Dhanpat Rai Publications (P) Ltd., New Delhi.

Reference Books

1. Anand Kumar.A, (2016). Fundamentals of Digital Electronics. (4th Edition). PHI Learning Pvt. Ltd., New Delhi.

Web References

1. https://de-iitr.vlabs.ac.in/exp/truth-table-gates/simulation.html
2. https://de-iitr.vlabs.ac.in/exp/half-full-adder/simulation.html
3. http://vlabs.iitkgp.ernet.in/coa/exp13/index.html#
4. https://www.vlab.co.in/
5. https://de-iitr.vlabs.ac.in/exp/realization-of-logic-functions/theory.html

Pedagogy

Demonstration and practical sessions.

Course Designer

Dr.A.Mary Girija

Semester VI	Internal Marks: 25			External Marks: 75
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
23UPH6DSE2A	**COMMUNICATION PHYSICS**	**DSE - II**	**5**	**3**

Course Objectives
- To acquire knowledge in basic concepts of communication systems.
- To learn about function of various communication systems.
- To develop knowledge in various communication systems.
- To explore various applications of communication systems.
- To analyze various concepts in communication systems.

Pre-requisites
- Knowledge about the concepts of communication systems.
- Fundamental knowledge in basic principle of communication systems.
- Concept of communication systems and its applications.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be able to	Cognitive Level
CO 1	Outline the basic concepts of communication systems	K1. k2
CO 2	Critique the ideas of radio and radar system and its applications	K3
CO 3	Predict the parameters such as total internal reflection, acceptance angle and numerical aperture in order to formulate the optical sensor	K3
CO 4	Utilization of GSM, Cell, FAX, Modem and Wi–Fi in mobile communication system	K4
CO 5	Design and analysis of satellite communication systems	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3	2	2	3	3	2
CO 2	3	2	3	3	3	2	3	3	2	2
CO 3	3	3	3	2	3	3	3	3	2	2
CO 4	3	3	2	3	3	3	3	3	3	3
CO 5	3	3	3	3	2	2	2	3	2	2

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" –Substantial (High) Correlation   "-" – indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**BASICS COMMUNICATION SYSTEM** Communication systems – Modulation – need for modulation – Bandwidth requirements- Noise - Thermal noise – Noise calculations - Signal to noise Ratio - Noise figure - Calculation of noise figure – Measurement of noise figure.	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**RADIO AND RADAR COMMUNICATION** Radio Broadcasting, Transmission and Reception – Amplitude modulation – Frequency modulation – Demodulation – Essentials in demodulation – AM radio receivers – FM radio receivers – Basic radar system – Doppler effect - Pulsed radar system – CW doppler radar -Frequency modulator CW Radar.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**OPTICAL FIBER COMMUNICATION** Structure of optical fiber – Principal and propagation of light in optical fiber – Total internal reflection – Acceptance angle – Numerical aperture – Types of optical fibers based on material – Number of modes – Refractive index profile – Fiber optical communication system – Fiber optic sensors.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**WIRELESS COMMUNICATION** GSM – Mobile services– Concept of cell – System architecture – Radio interface – Logical channels and frame hierarchy – Protocols – Localization and calling – Handover– Facsimile (FAX) – Application – VSAT (very small aperture terminals) – Modem – IPTV (internet protocol television) – Wi–Fi – 3G – 4G.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**SATELLITE COMMUNICATION** Introduction to satellite communication system – Satellite orbits – Classification of satellites – Types of satellites – Basic components of satellite communication – Constructional features of satellites – Satellite foot points – Satellite communication in India.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**SELF STUDY FOR ENRICHMENT:** **(Not to be included for External Examination)** Passive Radars – 3D Radars – 5G – laser-based communications	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Metha V.K (2013), *Principles of Electronics* (Revised)*,* S. Chand and Co., New Delhi.
2. Anokh Singh and Chopra A.K (2013), *Principles of communication Engineering* (Revised), S. Chand and Co., New Delhi.
3. Mani I. P(2014), *A text book of Engineering Physics*(Revised)*,* Dhanam Publications, India.

Reference Books

1. Dennis Roddy, John Coolen (1990), *Electronic Communication,* (3rd edition), PHI, India
2. Gerd Keiser (2000), *Optical fiber communications* (Revised), McGrw Hill, India.
3. William C.Y. lee (1991) , *Cellular telecommunication* (2nd edition), Tata Mcraw hill, India.

Web References
1. https://electronicsdesk.com/radar-system.html
2. https://www.toppr.com/guides/physics/communication-systems/satellite-communication/
3. https://www.sciencedirect.com/topics/social-sciences/mobile-communication

Pedagogy

Lecture with Discussion, Power point presentation, Seminar, Assignment.

Course Designer

Dr. G. Maheswari

Semester VI	Internal Marks: 25			External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**	
23UPH6DSE2B	**COMPUTATIONAL PHYSICS**	**DSE-II**	**5**	**3**	

Course Objectives

- To solve the problems in physics using computational methods using MAT Lab.
- To Learn Scientific Word Processing using programming tools for preparing articles, papers etc. which include mathematical equations, picture and tables
- To introduce the exciting world of programming to the students through MATLAB.
- To introduce the techniques of Numerical methods.
- To provide Data Analysis and Visualization.

Pre-requisites

- Basic Computer Programming Knowledge and Understanding
- Basic Mathematical Knowledge on solving equations.
- Fundamental idea about MATLAB software
- Knowledge on numerical methods.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to	Cognitive Level
CO 1	To understand the basic programming techniques in MATLAB.	K1
CO 2	To address analytically intractable problem errors	K2
CO 3	To Create user-interface graphics objects in MAT LAB	K2
CO 4	To understand various numerical techniques using MATLAB	K2
CO 5	To show how physics can be applied in a much broader context than discussed in a traditional curriculum	K3

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3	3	3	3	2	2
CO 2	2	2	2	3	2	2	3	2	2	2
CO 3	2	2	2	3	3	3	3	3	2	2
CO 4	3	3	3	2	2	3	3	3	2	2
CO 5	2	2	2	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**INTODUCTION TO MATLAB:** Example of problems in physics requiring computational approach - MATLAB Environment: Getting Started –Saving your works – Predefined MATLAB Functions – Using Predefined Functions – Manipulating Matrices – Computational Limitations-Special Values and Functions.	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**ERROR ANALYSIS** Need for error analysis - Definition of error - Absolute error - Relative error - Precision - Addition - Subtraction -Multiplication - Division - Error in numerical methods - Truncation error - Round off Errors - Methods for reducing error - Mean - Median - Mode - Standard deviation -Variance - Correlation	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**MATLAB AND DATA VISUALIZATION** Creation of arrays and matrices - Arithmetic Operations– Saving and Restoring - Solution of simultaneous equations- MATLAB plot module – Import export data - Plotting graphs-1D plot – 2D plot – mesh – surf – 3D plots	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**NUMERICAL METHODS USING MAT LAB** Roots of algebraic and transcendental equations – bisection method, Newton Raphson method-Interpolation – Lagrangian interpolation-Numerical Integration: Trapezoidal, Simpson's Method	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**APPLICATIONS IN PHYSICS USING MAT LAB** Calculate time period using Simple Pendulum - Verify Hooke's Law - Falling object in one dimension - Two-dimensional motion- Projectile motion - V-I Characteristics of Junction and Zener diode	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**SELF STUDY FOR ENRICHMENT** Curve Fitting – Fitting Linear and parabolic curves by the method of least squares- Symbolic Math -Creating symbolic objects -Creating symbolic expressions.		CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Amos Gilat, 2007, *"MATLAB An Introduction with Applications",* (4th Edition), John Wiley & Sons.
2. Kincaid D. and Chenney W, 2009, *"Numerical Analysis: Mathematics of Scientific Computing"*, (1st Edition), AMS, University Press, Hyderabad.
3. Rizwann Butt, 2008, *"Introduction to Numerical Analysis using MATLAB"*, (1st Edition), Jones and Publishers.
4. Sastry S.S, 2005, *"Introductory Methods of Numerical Analysis",* (4th Edition), Prentice Hall of India.
5. V.K.Mittal, R.C.Verma & S.C.Gupta, 2009, "Computational Physics", (1st Edition), ANE Books.

Reference Books

1. Joel Franklin, 2018, *"Computational Methods for Physics,* (1st Edition), Cambridge Press University.
2. Gupta, Agarwal and Varshney, 2008, *"Design and Analysis of Algorithms",*(2nd Edition), PHI Learning, New Delhi, India.

Web References

1. https://www.mathworks.com/videos/introduction-to-matlab-81592.html
2. https://www.educba.com/introduction-to-matlab/
3. https://ocw.mit.edu/courses/18-s997-introduction-to-matlab-programming-fall-2011/

Pedagogy

Chalk and Talk, Power Point Presentation, Seminar, Quiz, Assignment and Group discussion.

Course Designer

Dr. T. Noorunnisha.

Semester VI	Internal Marks: 25			External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS / WEEK**		**CREDITS**
23UPH6DSE2C	**MEDICAL PHYSICS**	**DSE -II**	**5**		**3**

Course Objective
- To gain knowledge in general concepts of human body mechanism.
- To understand the principles, features, and applications of ECG, EMG and EEG
- To Provide the working of laser radiation on tissues
- To Understand effects of imaging-properties in X -rays
- To get knowledge about NMR and Clinical MRI
- To enhance the ability to know the generation and detection of ultrasound

Pre-requisites
- A Thorough Knowledge of physics in medicine
- Strong Insight in the mechanics of a human body
- Grasping Power in the concepts and application of lasers in medicine
- Ability to make use of medical imaging techniques in day today life.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, thestudents will be able to	Cognitive Level
CO 1	Remember and understand the basic concepts across all areas of medical physics.	K1,K2
CO 2	Identify the mechanics of a human body.	K3
CO 3	Analyze the principles of ECG, EMG and EEG.	K4
CO 4	Explain the production, types and application of lasers in medicine.	K5
CO 5	Explain the ultrasound imaging method and its application in medical field.	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	2	1	3	3	2	2	2
CO 2	3	3	2	2	2	3	1	2	2	2
CO 3	2	3	3	2	2	3	3	1	2	2
CO 4	3	3	2	2	2	1	2	2	2	2
CO 5	3	2	2	2	1	3	3	2	3	1

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation,

"3" – Substantial (High) Correlation   "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**MECHANICS OF HUMAN BODY** Static, Dynamic and Frictional forces in the Body – Composition, properties and functions of Bone – Heat and Temperature – Temperature scales – Clinical thermometer – thermography – Heat therapy – Cryogenics in medicine–Heat losses from body – Pressure in the Body – Pressure in skull, Eye and Urinary Bladder.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**MEDICAL INSTRUMENTATION** Measurements of Non electrical parameters-Respiration-heart rate-temperature-blood Pressure - Electrical activity of the heart-effect of electrified on cardiac muscles stimulation laws- Arhythmias its detection - principles of Electrocardiography, Electromyography – Electroencephalography - measurement and displaying and recording of ECG- features of EMG &EEG and their applications	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**LASERS IN MEDICINE** Introduction to laser-principle and production of laser- effects of laser radiation on tissues, Different types of lasers-photo thermal effects, photochemical effects – photodynamic therapy, Laser applications in therapy and diagnosis- ophthalmology, Fiberoptic endoscopy and dentistry. Laser as a beautician's tool-laser hazards- biological effects	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**X-RAY PHYSICS** Production and properties of X-rays, characteristics and continuous spectra, basic requirements of medical diagnostic and therapeutic tubes, safety devices in X-ray tubes, technology of modern X-ray tubes, insulation and cooling of X-ray tubes. filtration and beam quality, mobile and dental units, limitations on loading, control panels.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**GENERATION OF ULTRASOUND** Ultrasound imaging- generation and detection of ultrasound - Properties -reflection - Transmission - attenuation - Ultrasound Transducers, Ultrasound instrumentation Mechanical and electronic probes for external and internal use-Principles of A-mode-B-mode- M- mode-Scanning. Hazards and safety of ultrasound.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	**SELF STUDY FOR ENRICHMENT:** (Not to be included for External Examination) Improving circulation and blood flow - Application on cardiology, lung function - Medical device to remove tissues - Malfunctions of X-ray tubes - image intensifiers: technology of electron accelerators	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. J.R.Cameron and J.G Skofonick (1978) *Medical Physics,* (1st Edition) John Wiley & Sons, New York.
2. R. W Wayanant (2001) *Lasers in Medicine*, (1st Edition), Plenum, New York.
3. S.Webb (1988) *The physics of medical imaging, (*2nd Edition), Hilger, New Delhi.
4. R. S Khandpur (1997) *Handbook of Biomedical Instrumentation, (*3rd Edition), Tata McGraw-Hill, India.
5. S.Atheena Milagi Pandian (2019) *Biomedical Engineering*,(1st Edition) Amazon, Notion Press, Chennai.
6. W.Mark Saltzman (2009) Biomedical Engineering , (1st Edition), Cambridge University Press, UK

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Reference Books

1. O.Glasser (1946) *Medical Physics, Volume 1-3, (*2nd Edition), Chicago review press, US.

2. Leslie Cromwell (1999) *Biomedical Instrumentation and measurement, (*2nd Edition),
   Prentice Hall of India, New Delhi,India.

3. John G. Webster (1998) *Medical Instrumentation Application and Design,* (3rd Edition),
   John Wiley and sons, New York.

Web References

1. https://comp-ocpm.ca/english/about-comp/what-is-medical-physics/what-is-medical-physics.html
2. https://www.iomp.org/medical-physics/
3. https://www.news-medical.net/health/The-Role-of-Physics-in-Medicine.aspx
4. https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-bt50/

Pedagogy

Chalk and Talk, Seminar, Assignment, Power point Presentation, Group discussion and Quiz

Course Designer

Dr.K.Kannagi