JP COLLEGE OF ARTS & SCIENCE

(AUTONOMOUS)

(Run by DMI Sisters)

(Affiliated to Manonmaniam Sundaranar University –Tirunelveli)

Accredited by NAAC with "B++" Grade

2(f) status of UGCAct, 1956 | ISO 9001:2015 Certified Institution

Ayikudy, Tenkasi District - 627852.

SYLLABUS

Bachelor of Science - Physics

Choice Based Credit System (CBCS)

(w.e.f. June 2026-2027)

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SYLLABUS

PROGRAMME OUTCOMES (PO) FOR UG PROGRAMME

The successful completion of the B.Sc Physics programme shall enable the students to:

PO1	**Disciplinary Knowledge** Demonstrate comprehensive knowledge and a clear understanding of one or more disciplines that form part of the undergraduate programme of study.
PO2	**Communication Skills** Express ideas effectively in oral and written forms; communicate confidently using appropriate media; listen actively; read and write analytically; and present complex information clearly and concisely to diverse audiences.
PO3	**Critical Thinking** Apply analytical thinking to evaluate arguments, evidence, claims, and theories; identify assumptions and implications; formulate coherent arguments; and critically assess practices and policies using a scientific approach.
PO4	**Problem Solving** Apply acquired knowledge and skills to solve unfamiliar and real-life problems; extrapolate learning beyond curriculum content and demonstrate practical application of concepts.
PO5	**Analytical Reasoning** Evaluate the reliability and relevance of evidence; identify logical in consistencies in arguments; analyze and synthesize data from multiple sources; and draw valid conclusions supported by appropriate evidence.
PO6	**Research-Related Skills** Demonstrate inquiry-based learning by identifying problems, formulating hypotheses, designing and conducting investigations, analyzing and interpreting data, establishing cause-and-effect relationships, and effectively reporting research findings.
PO7	**Scientific Reasoning** Analyze and interpret quantitative and qualitative data; evaluate ideas and evidence objectively; and draw reasoned conclusions based on systematic and logical thinking.
PO8	**Reflective Thinking** Develop self-awareness and critically reflect on personal experiences and societal contexts to enhance personal growth and responsible citizenship.
PO9	**Leadership Readiness** Demonstrate leadership qualities by setting clear goals, formulating shared vision, motivating and guiding team members, managing tasks efficiently, and contributing effectively to organizational success.
PO10	**Lifelong Learning** Recognize the need for continuous learning; acquire and apply new knowledge and skills independently; adapt to changing professional and societal demands; and engage in self-directed learning for personal and professional development.

Regulations 2026 – 2027 for Undergraduate Programme

Learning Outcomes Based Curriculum Framework (LOCF) model with Choice Based Credit System (CBCS)

Programme: Bachelor of Physics (B. Sc Physics)

(Applicable for the Students admitted during the Academic Year2026 - 2027onwards)

Preamble

The undergraduate Physics programme, revised as per UGC Learning Outcome-Based Course Framework (LOCF), provides a strong foundation in core areas such as mechanics, optics, electricity and magnetism, atomic and nuclear physics, solid state physics, and electronics. It combines theoretical knowledge with practical laboratory training, data analysis, and error estimation. The curriculum enhances problem-solving, analytical, and logical skills through courses like classical mechanics, quantum mechanics, statistical physics, numerical methods, and microprocessors. Elective courses in areas such as astrophysics and medical physics allow students to specialize and broaden their interdisciplinary knowledge, preparing them for higher studies, research and industry.

Vision

To promote active learning and critical thinking associated with ethical values and to produce globally competent physicists furnished to address real world challenges promoting them for the up liftment of the society.

Mission

- To provide quality education in both theoretical and experimental physics.
- To improve the quality of learning and increase the impact in development of the society.
- To impart state of the art knowledge in physics and develop the competency skills

Program Outcomes (POs)

The successful completion of the B.Sc Physics programme shall enable the students to:

PO1	**Disciplinary Knowledge:** Demonstrate comprehensive knowledge and a clear understanding of one or more disciplines that form part of the undergraduate programme of study.
PO2	**Communication Skills:** Express ideas effectively in oral and written forms; communicate confidently using appropriate media; listen actively; read and write analytically; and present complex information clearly and concisely to diverse audiences.
PO3	**Critical Thinking:** Apply analytical thinking to evaluate arguments, evidence, claims, and theories; identify assumptions and implications; formulate coherent arguments; and critically assess practices and policies using a scientific approach.
PO4	**Problem Solving:** Apply acquired knowledge and skills to solve unfamiliar and real-life problems; extrapolate learning beyond curriculum content and demonstrate practical application of concepts.
PO5	**Analytical Reasoning:** Evaluate the reliability and relevance of evidence; identify logical inconsistencies in arguments; analyze and synthesize data from multiple sources; and draw valid conclusions supported by appropriate evidence.
PO6	**Research-Related Skills:** Demonstrate inquiry-based learning by identifying problems, formulating hypotheses, designing and conducting investigations, analyzing and interpreting data, establishing cause-and-effect relationships, and effectively reporting research findings.
PO7	**Scientific Reasoning:** Analyze and interpret quantitative and qualitative data; evaluate ideas and evidence objectively; and draw reasoned conclusions based on systematic and logical thinking.
PO8	**Reflective Thinking:** Develop self-awareness and critically reflect on personal experiences and societal contexts to enhance personal growth and responsible citizenship.
PO9	**Leadership Readiness:** Demonstrate leadership qualities by setting clear goals, formulating a shared vision, motivating and guiding team members, managing tasks efficiently, and contributing effectively to organizational success.
P10	**Lifelong Learning:** Recognize the need for continuous learning; acquire and apply new knowledge and skills independently; adapt to changing professional and societal demands;andengageinself-directedlearningforpersonalandprofessional Development.

Program Specific Outcomes (PSOs)

PSO1	**Placement:** To prepare the students who will demonstrate respectful engagement with others 'ideas, behaviors, and beliefs and apply diverse frames of reference to decisions and actions.
PSO2	**Entrepreneur:** To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate start-ups and high potential organizations
PSO3	**Research and Development:** Design and implement HR systems and practices grounded in researches that comply with employment laws, leading the organization towards growth and development.
PSO4	**Contribution to Business World:** To produce employable, ethical and innovative professionals to sustain in the dynamic business world.
PSO5	**Contribution to the Society:** To contribute to the development of the society by collaborating with stakeholders for mutual benefit

3 –Year UG Programme B.Sc., Physics Credit Distribution				
1Part	**Details**	**No. of Papers**	**Total Credits**	**Part Credits**
Part-I	Language (3 Credits)	4	12	12
Part-II	English (3 Credits)	4	12	12
Part-III	Core Theory (4 Credits)	10	40	93
	Elective Theory (3 Credits)	6	18	
	Core Practical (4 Credits)	6	24	
	Core Mini Project (3 credits)	1	3	
	Core Project (4 credits)	1	4	
	Elective Practical (2 Credits)	2	4	
Part-IV	Foundation Course (2 Credits)	1	2	26
	Skills Enhancement Course (SEC) (2 Credits)	5	10	
	Ability Enhancement Compulsory Course (AECCC) Soft Skills (2 Credits)	4	8	
	Summer Internship (2 Credits)	1	2	
	EVS (2 Credits)	1	2	
	Value Education (2 Credits)	1	2	
Part-V	Extension Activity (NSS/NCC/YRC/Physical Education) (1 Credit)	1	1	1
		48	**144**	**144**

Consolidated Semester wise and Component wise Credit Distribution

Parts	**Sem-I**	**Sem-II**	**Sem-III**	**Sem-IV**	**Sem-V**	**Sem-VI**	**Total Credits**
Part-I	3	3	3	3	-	-	12
Part-II	3	3	3	3	-	-	12
Part-III	11	11	13	13	22	23	93
Part-IV	6	6	4	4	4	2	26
Part-V	-	-	-	-	-	1	01
Total	**23**	**23**	**23**	**23**	**26**	**26**	**144**

Credit Distribution for B.Sc., Physics Programme, Courses with Laboratory Hours

First Year Semester-I

Part	List of Courses	Credit	No. of Hours
Part-I	Tamil	3	5
Part-II	English	3	5
Part-III	Core Theory1–Properties of Matter and Acoustics	4	4
	Core Practical1–Physics Practical I	4	6
	Elective Theory 1–Allied Mathematics I	3	4
Part-IV	Skill Enhancement Course SEC-1 Physics for Everyday Life	2	2
	Foundation Course– Introductory Physics	2	2
	NME/Basic Physics	2	2
		23	**30**

Semester-II

Part	List of Courses	Credit	No. of Hours
Part-I	Tamil	3	5
Part-II	English	3	5
Part-III	Core Theory 2–Heat,Thermodynamics and Statistical Physics	4	4
	Core Practical 2–Physics Practical II	4	6
	Elective Theory 2–Allied Mathematics II	3	4
Part-IV	Skill Enhancement Course - SEC-2 Astrophysics	2	2
	Skill Enhancement Course-SEC-3– Physics for Competitive Examinations	2	2
	NME/Applied Physics	2	2
		23	**30**

Second Year-Semester-III

Part	List of Courses	Credit	No. of Hours
Part-I	Tamil	3	5
Part-II	English	3	5
Part-III	Core Theory3–Mechanics	4	4
	Core Practical 3–Physics Practical III	4	6
	Elective Theory1–Allied Chemistry I	3	4
	Elective Practical1–Allied Chemistry Practical I	2	2
Part-IV	Skill Enhancement Course-SEC-4(Maintenance of Electrical appliances)	2	2
	Environmental Sciences	2	2
		23	**30**

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part-I	Tamil	3	5
Part-II	English	3	5
Part-III	Core Theory 4–Optics and Laser Physics	4	4
	Core Practical 4–Physics Practical IV	4	6
	Allied Theory 2–Allied Chemistry II	3	4
	Allied Practical 2–Allied Chemistry Practical II	2	2
Part-IV	Skill Enhancement Course-SEC-6(Maintenance of Electronic appliances)	2	2
	Value Based Education	2	2
		23	**30**

Third Year-Semester-V

Part	List of Courses	Credit	No. of Hours
Part-III	Core Theory 5–Electricity, Magnetism and Electromagnetism	4	4
	Core Theory 6–Atomic and Nuclear Physics	4	4
	Core Theory 7–Analog and Communication Electronics	4	4
	Core Practical 5–Physics Practical V	4	6
	Core–Mini Project(Group)	3	6
	Elective Course 1(Generic/Discipline Specific) EC1	3	4
Part-IV	Internship/Industrial Visit /Field Visit/Knowledge Updating Activity	2	-
	Ability Enhancement Course	2	2
		26	**30**

Semester V ELECTIVE COURSES (EC) select any one course

EC1. Spectroscopy
EC2.MathematicalPhysics
EC3.PythonProgramming and Basics of AI and Data Science

Semester– VI

Part	List of Courses	Credit	No. of Hours
Part-III	Core Theory 8–Relativity and Quantum Mechanics	4	4
	Core Theory 9–Solid State Physics	4	4
	Core Theory 10–Digital Electronics and Microprocessor 8085	4	4
	Core Practical 6–Physics Practical VI	4	6
	Elective Course 2(Generic / Subject Specific)EC 2	3	4
	Core–Project–Group	4	6
Part-IV	Ability Enhancement Course	2	2
Part-V	Extension Activity	1	-
		26	**30**

Semester VI ELECTIVE COURSES (EC) Select any one courses

EC 4. Energy Physics
EC5.MaterialScience
EC6.NanoscienceandNanotechnology

Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.

Part I–Tamil/Other Languages

Part II-English

Part III–Core Papers, Electives and Project, Practical

Part IV – Environmental Studies, Value Based Education, Skill Enhancement Courses, Foundation Course and Internship, Non major Elective, Ability Enhancement Course

Part V–Extension Activity

Semester- I									
Course Code	Part	Course category	Course Name	Hours /Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26U1TL11	I	Language– I	Tamil-I	5	3	50	50	100	3
26U1HD11			Hindi – I						
26U1MY11			Malayalam-I						
26U1FR11			French- I						
26U2EN11	II	Language– II	English -I	5	3	50	50	100	3
26UCPH11	III	Core-I	Properties of Matter and Acoustics	4	3	50	50	100	4
26UCPHP1	III	Core Practical-I	Physics Practical-I	6	3	50	50	100	4
26UEMA11	III	Elective- I	Algebra &Differential Equation	4	3	50	50	100	3
26USPH11	IV	SEC-I	Physics For Everyday Life	2	3	50	50	100	2
26UFPH11	IV	Foundation Course	Introductory Physics	2	3	50	50	100	2
26UNPH11	IV	NME -I	Basic Physics	2	3	50	50	100	2
			Total	30				800	23

Semester- II									
Course Code	Part	Course category	Course Name	Hours/ Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26U1TL21	I	Language–I	Tamil-II	5	3	50	50	100	3
26U1HD21			Hindi – II						
26U1MY21			Malayalam–II						
26U1FR21			French–II						
26U2EN21	II	Language–II	English – II	5	3	50	50	100	3
26UCPH21	III	Core-II	Heat, thermodynamics &Statistical Physics	4	3	50	50	100	4
26UCPHP2	III	Core Practical -II	Physics Practical-II	6	3	50	50	100	4
26UEMA21	III	Elective-II	Vector Calculus & Fourier Series	4	3	50	50	100	3
26USPH21	IV	SEC-II	Astrophysics	2	3	50	50	100	2
26USPH22	IV	SEC-III	Physics for Competitive Exam	2	3	50	50	100	2
26UNPH21	IV	NME -II	Applied Physics	2	3	50	50	100	2
			Total	30				800	23

Semester–III									
Course Code	Part	Course category	Course Name	Hours/ Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26U1TL31	I	Language – I	Tamil-III	5	3	50	50	100	3
26U1HD31			Hindi – III						
26U1MY31			Malayalam–III						
26U1FR31			French–III						
26U2EN31	II	Language – II	English – III	5	3	50	50	100	3
26UCPH31	III	Core-III	Mechanics	4	3	50	50	100	4
26UCPHP3	III	Core Practical-III	Physics Practical-III	6	3	50	50	100	4
26UECH31	III	Elective-III	Allied Chemistry-I	4	3	50	50	100	3
26UECHP1	III	Elective Practical-I	Allied Chemistry Practical-I	2	3	50	50	100	2
26USPH31	IV	SEC-4	Maintenance of Electrical Appliances	2	3	50	50	100	2
26UEVS31	IV	Common	Environmental Studies	2	3	50	50	100	2
			Total	30				800	23

Semester–IV									
Course Code	Part	Course category	Course Name	Hours /Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26U1TL41	I	Language – I	Tamil-IV	5	3	50	50	100	3
26U1HD41			Hindi – IV						
26U1MY41			Malayalam– IV						
26U1FR41			French–IV						
26U2EN41	II	Language – II	English – IV	5	3	50	50	100	3
26UCPH41	III	Core-IV	Optics & Laser Physics	4	3	50	50	100	4
26UCPHP4	III	Core Practical – IV	Physics Practical–IV	6	3	50	50	100	4
26UECH41	III	Elective – IV	Allied Chemistry-II	4	3	50	50	100	3
26UECHP2	III	Elective Practical -IV	Allied Chemistry Practical–II	2	3	50	50	100	2
26USPH41	IV	SEC-6	Maintenance of Electronics Appliances	2	3	50	50	100	2
26UVBE41	IV	Common	Value Based Education	2	3	50	50	100	2
			Total	30				800	23

Semester–V									
Course Code	Part	Course category	Course Name	Hours /Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26UCPH51	III	Core-V	Electricity, Magnetism and Electromagnetism	4	3	50	50	100	4
26UCPH52	III	Core–VI	Atomic & Nuclear Physics	4	3	50	50	100	4
26UCPH53	III	Core–VII	Analog &Communication Electronics	4	3	50	50	100	4
26UCPHP5	III	Core Practical – V	Physics Practical–V	6	3	50	50	100	4
26UCPH5P	III	Core-VIII	Mini Project with Viva Voce	6	3	50	50	100	`3
26UEPH51	III	Elective – V	Spectroscopy	4	3	50	50	100	3
26UEPH52		Elective – VI	Mathematical Physics						
26UEPH53		Elective – VII	Python Programming and Basics of AI and Data Science						
26UFIK51	IV	Internship	Internship/Industrial Visit/Field Visit/Knowledge Updating Activity	-	3	50	50	100	2
26UAEC51	IV	AEC-I	Empowered Vocational English	2	3	50	50	100	2
			Total	30				800	26

Semester–VI									
Course Code	Part	Course category	Course Name	Hours/ Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26UCPH61	III	Core-IX	Relativity and Quantum Mechanics	4	3	50	50	100	4
26UCPH62	III	Core– X	Solid State Physics	4	3	50	50	100	4
26UCPH63	III	Core– XI	Digital Electronics &Microprocessor 8085	4	3	50	50	100	4
26UCPHP7	III	Core Practical–VI	Physics Practical–VI	6	3	50	50	100	4
26UCPH6P	III	Core-XII	Project with Viva Voce	6	3	50	50	100	4
26UEPH61	III	Elective–VIII	Energy physics	4	3	50	50	100	3
26UEPH62		Elective–IX	Material Science						
26UEPH63		Elective–X	Nano Science& Nanotechnology						
26UAEC61	IV	AEC-II	Design Thinking	2	3	50	50	100	2
26U5EA61	V	Common	Extension Activity	-	-	-	-	100	1
				30				800	26
Grand Total				**180**				**4800**	**144**

Internship/Industrial Visit/Field Visit/Knowledge Updation Activity::

Internal–50Marks, External –50Marks

Internship (minimum of 30 hours): The students should submit certificate of attendance from the industry stating the nature of work done, duration and role played along with report (minimum of 20 pages) at the end of V semester for external evaluation.

Industrial Visit/Field Visit: A report based on the observation and learning outcome to submitted (minimum of 10 pages) along with suitable evidences at the end of V semester for external evaluation.

Knowledge Updation Activity: A report to be submitted (minimum of 10 pages) based on the study made along with the completion certificate stating the work done (MOOC/NPTEL) at the end of V semester for external evaluation.

Mini and Major Core Project: Group Project report should be submitted for external evaluation. Internal – 50 Marks, External – 50 Marks

Extension Activity: (NSS / NCC / YRC / RRC /Games and Sports / Youth Welfare Activities Outreach Programmes /Migration Awareness in the Tamil Nadu Education System): Individual report should be submitted at the end of VI semester for external evaluation.

External–100Marks

Ability Enhancement Compulsory Course: Empowered Vocational English and Design Thinking subjects are given to students. Internal Marks – 50 Marks, External – 50 Marks

SEMESTER–I

Semester-I									
Course Code	Part	Course category	Course Name	Hours /Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26U1TL11	I	Language–I	Tamil-I	5	3	50	50	100	3
26U1HD11			Hindi – I						
26U1MY11			Malayalam-I						
26U1FR11			French- I						
26U2EN11	II	Language–II	English -I	5	3	50	50	100	3
26UCPH11	III	Core-I	Properties of Matter and Acoustics	4	3	50	50	100	4
26UCPHP1	III	Core Practical-I	Physics Practical-I	6	3	50	50	100	4
26UEMA11	III	Elective- I	Algebra &Differential Equation	4	3	50	50	100	3
26USPH11	IV	SEC-1	Physics For Everyday Life	2	3	50	50	100	2
26UFPH11	IV	Foundation Course	Introductory Physics	2	3	50	50	100	2
26UNPH11	IV	NME -I	Basic Physics	2	3	50	50	100	2
			Total	30				800	23

Course	FIRST SEMESTER–CORE THEORY-I								
Course Title	PROPERTIES OF MATTER AND ACOUSTICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPH11	4	0	0	I	4	4	50	50	100

Course Objectives

Study of the properties of matter leads to information which is of practical value to both the physicist and the engineers. It gives us information about the internal forces which act between the constituent parts of the substance. Students who undergo this course are successfully bound to get a better in sight and understanding of the Subject.

Unit	Course Content	No of Hours
I	**ELASTICITY:** Hooke's law–stress-strain diagram–elastic constants–Poisson'sratio–relationbetweenelasticconstantsandPoisson'sratio–work done in stretching a wire –Twisting couple on a cylinder – Rigidity modulus by torsion pendulum (with and without masses).	12
II	**BENDING OF BEAMS**: Expression for the bending moment – Expression for depression at the loaded end of the cantilever–Experiment to determine Young's modulus by cantilever depression. Experiment to find Young's modulus by non-uniform bending. Uniform bending–Expression for elevation – Experiment to determine Young's modulus by uniform bending method using microscope.	12
III	**FLUID DYNAMICS:** Surface tension: definition –molecular forces -Excess pressure over curved surface – application to spherical and cylindrical drops and bubbles. Viscosity: definition – streamline and turbulent flow – rate of flowofliquidinacapillarytube–Poiseuille'sformula–terminalvelocityand Stoke's formula.	12
IV	**WAVES AND OSCILLATIONS:** Simple Harmonic Motion (SHM) – composition of two SHM in a straight line and at right angles- free, damped, forcedvibrations–resonanceandSharpnessofresonance.Lawsoftransverse vibration in strings –sonometer – determination of AC frequency using sonometer–determination of frequency using Melde's string apparatus	12
V	**ACOUSTICS OF BUILDINGS AND ULTRASONICS:** Intensity of sound–decibel–loudness of sound–reverberation–factors affecting the acoustics of buildings. **Ultrasonic waves:** Production of ultrasonic waves–Piezo electric crystal method – Detection of ultrasonic waves-application of ultrasonic waves.	12
	Total	60

TEXT BOOKS

1. D.S.Mathur,2010,Elements of Properties of Matter, S. Chand and Co
2. BrijlalandN.Subrahmanyam,2003,PropertiesofMatter,S.ChandandCo
3. D.R.KhannaandR.S.Bedi,*TextbookofSound*,RevisedEdition,AtmaRam&Sons,NewDelhi,2015
4. BrijLal and N. Subrahmanyam, *A Textbook of Sound*, 2nd Edition (Revised Reprint), Vikas Publishing House Pvt. Ltd., New Delhi, 2018.
5. R.Murugesan, 2012, Properties of Matter, S.Chand and Co.

REFERENCE BOOKS

1. C. J. Smith, *General Properties of Matter*, Reprint Edition, Orient Black Swan Pvt. Ltd. ,New Delhi,2008.

2. H. R. Gulati, *Fundamentals of General Properties of Matter*,5th Edition(Reprint), S. Chand & Company Ltd., New Delhi, 2015.

3. A.P .French, *Vibrations and Waves*, MIT Introductory Physics Series, CBS Publishers & Distributors/ Arnold-Heinemann (Reprint), New Delhi, 2017.

WEB LINKS

1. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://science.nasa.gov/ems/
2. https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/
3. https://www.physicsclassroom.com/class
   https://onlinecourses.swayam2.ac.in/e-learning/preview/nce24_sc48

COURSE OUTCOMES

CO1	Relate elastic behavior in terms of three modulii of elasticity and working of torsion pendulum.
CO2	Able to appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.
CO3	Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface, soap films provide an analogue solution to many engineering problems.
CO4	Analyze simple harmonic motions mathematically and apply them. Understand the concept of resonance and use it to evaluate the frequency of vibration. Set up experiment to evaluate frequency of ac mains
CO5	Understand the concept of acoustics, importance of constructing buildings with good acoustics. Able to apply their knowledge of ultrasonic in real life, especially in medical field and assimilate different methods of production of ultrasonic waves

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	2	2	3	2	2	3	2	3
CO2	2	3	3	3	2	2	3	2	3	3
CO3	3	2	3	2	3	3	2	3	3	3
CO4	3	3	3	3	3	2	3	2	2	2
CO5	2	2	3	3	2	3	3	3	3	2

Course	FIRST SEMESTER–CORE PRACTICAL 1								
Course Title	PHYSICS PRACTICAL-I								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPHP1	0	0	6	I	4	6	50	50	100

Course Objectives

Apply various physics concepts to understand Properties of Matter & Acoustics, setup experimentation to verify theories, quantify and analyze, able to do error analysis and correlate results

List of Experiments (Any 8)

1. Determination of rigidity modulus without mass using a Torsional pendulum.
2. Determination of rigidity modulus with masses using a Torsional pendulum.
3. DeterminationofYoung‘smodulusbyuniformbendingusingpinandmicroscope.
4. DeterminationofYoung‘smodulusbynon-uniformbendingusingscaleandtelescope.
5. Determination of Young‘s modulus by the cantilever depression method.
6. Determination of rigidity modulus by static torsion
7. Determination of the frequency of AC by using a sonometer.
8. Determination of surface tension and interfacial surface tension by the drop weight method.
9. Determination of the co-efficient of viscosity by Stokes method.
10. Determination of Poisson‘s ratio of a rubber tube.
11. Determination of viscosity by Poiseullie‘s flow method.
12. Determination of frequency of an electrically maintained tuning fork.
13. Determination of g‘using a compound pendulum.

Course	FIRST SEMESTER–Skill Enhancement Course(SEC-1)									
Course Title	PHYSICS FOR EVERYDAY LIFE									
Course Code	L	T	P	S	Credits	Inst. Hours	Marks			
							CIA	External	Total	
26USPH11	2	0	0	I	2	2	50	50	100	

Course Objectives

To know where all physics principles have been put to use in daily life and appreciate the concepts with a better understanding also to know about Indian scientists who have made significant contributions to Physics

Unit	Course Content	No of Hours
I	**MECHANICAL OBJECTS: S**pring scales–bouncing balls–bicycles –rockets and space travel.	6
II	**OPTICAL INSTRUMENTS AND LASER:** vision corrective lenses– Polaroid glasses – UV protective glass – holography and laser	6
III	**PHYSICS OF HOME APPLIANCES:** filament bulb – ceiling fan – hair drier – refrigerator– wet grinder	6
IV	**SOLARENERGY:** Solar constant–General applications of solar energy – Solar water heaters – Solar Photovoltaic cells	6
V	**INDIANPHYSICISTANDTHEIRCONTRIBUTIONS:** C.V. Raman, Homi Jehangir Bhabha, Vikram Sarabhai, Subrahmanyan Chandrasekhar, Dr. APJ Abdul Kalam and their contribution to science and technology.	6
	Total	30

TEXT BOOKS

1. The Physics in our Daily Lives, Umme Ammara, Gugu cool Publishing, Hyderabad, 2019.
2. For the love of physics, Walter Lewin, Free Press, New York, 2011.

COURSE OUTCOMES

CO1	Explain the principles of mechanical objects and space applications using basic laws of physics.
CO2	Describe and apply optical concepts in lenses, lasers, holography, and protective glasses.
CO3	Analyze the working principles of common home appliances using physical laws.
CO4	Explain and evaluate solar energy concepts and their practical applications.
CO5	Summarize the contributions of prominent Indian physicists and their impact on science and technology.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

Course	FIRSTSEMESTER–FOUNDATIONCOURSE								
Course Title	INTRODUCTORY PHYSICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UFPH11	2	0	0	I	2	2	50	50	100

Course Objectives

To help students get an over view of Physics before learning their core courses. To serve as a bridge between the school curriculum and the degree programme.

Unit	Course Content	No of Hours
I	**Vectors, Scalars** Examples for scalars and vectors from physical quantities – addition, subtraction of vectors – resolution and resultant of vectors– units and dimensions– standard physics constants	6
II	**Different types of forces** Gravitational, Electrostatic, Magnetic, Electromagnetic, Nuclear forces – Mechanical Forces like, centripetal, centrifugal forces.	6
III	**Work, Power and Energy** WorkdonebytheforcePowerKineticenergy–potentialenergy–principleof conservation of Energy Work-Energy Theorem - Conservation laws of momentum – angular momentum.	6
IV	**Types of motion** Linear, Projectile, Circular, Angular, Simple Harmonic motions – stream line and turbulent motions – wave motion – comparison of light and sound waves.	6
V	**Properties and types of materials** Conductors, Semi-Conductors and Insulators–Thermal and Electric Properties – Introduction to Super Conductors.	6
	Total	30

TEXT BOOKS

1. D.S.Mathur,2010, Elements of Properties of Matter, S. Chand & Co
2. BrijLal & N. Subrahmanyam, 2003,Properties of Matter, S. Chand & Co.

REFERENCE BOOKS

1. H.R.Gulati,2005,FundamentalofGeneralPropertiesofMatter,Fifthedition,S.Chand&Co.

WEB LINKS

1. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://science.nasa.gov/ems/
2. https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/
3. https://www.physicsclassroom.com/class
4. https://onlinecourses.swayam2.ac.in/e-learning/preview/nce24_sc48

COURSE OUTCOMES

CO1	Apply concept of vectors to understand concepts of Physics and solve problems
CO2	Appreciate different forces present in Nature while learning about phenomena related to these different forces.
CO3	Quantify energy in different process and relate momentum, velocity and energy

CO4	Differentiate different types of motions they would encounter in various courses and understand their basis
CO5	Relatevariouspropertiesofmatterwiththeirbehaviourandconnectthemwith different physical parameters involved.

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the3-point scale of STRONG (**3**), MEDIUM (**2**) and LOW (**1**)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

Course	FIRST SEMSETER–NON-MAJOR ELECTIVE								
Course Title	BASIC PHYSICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UNPH11	2	0	0	I	2	2	50	50	100

Course Objectives

Recall and explain the fundamental concepts and laws of elasticity, motion, fluid mechanics, heat transfer, and optics. Apply appropriate physical principles and mathematical relations to solve problems related to mechanics, properties of liquids, thermal phenomena, and optics. Analyze physical phenomena and distinguish between different physical quantities, laws, mechanisms, and types of motion or flow. Develop appropriate models, diagrams, and experimental approaches to explain and investigate basic physical phenomena.

Unit	Course Content	No. of Hours
I	**Elasticity** Stress and Strain, Elastic Limit & Hooke's law, Young‘s Modulus, Bulk Modules & Modulus of Rigidity, Poisson's Ratio.	6
II	**Motion** Circular Motion and Rectilinear Motion- Motion under Constant Velocity – Motion under Constant Acceleration-Motion under Gravity-Newton's Laws of Motion.	6
III	**Properties of Liquids** Surface Tension-Angle of Contact-Streamline & Turbulent Flow- Reynold Number- Viscosity - Stoke's law	6
IV	**Transfer of Heat** Idea of Conduction, Convection & Radiation-Thermal Conductivity -Black Body- Kirchoff's Laws-Stefan Boltzmann Law	6
V	**Principles of Optics** Concept of mirrors- lenses- reflection & refraction of light- refractive index- Power of lens- astronomical telescope	6
	Total	30

TEXT BOOKS

1. Principles of Physics, N. Subrahmanyam, Brijlal, S.Chand & Co.
2. Applied Physics Vol.-I Hari Harlal, NITTTR
3. Applied Physics Vol.-II Hari Harlal, NITTTR
4. A Text Book of Applied Physics N.S. Kumar

REFERENCE BOOKS

1.Resnick Halliday and Walker (2018). Fundamentals of Physics (11th edition),John Willey and Sons, Asia Pvt. Ltd., Singapore.

2.V.R. Khanna and R.S. Bedi (1998), Textbook of Sound1st Edn. Kedharnaath Publish and Co, Meerut.

3.N. S. Khare and S.S.Srivastava(1983), Electricity andMagnetism10th Edn., Atma Ram and Sons, New Delhi.

CO1	Understand basic concepts of elasticity like stress, strain, and Hooke's law.
CO2	Learn types of motion and apply Newton's laws of motion
CO3	Understand properties of liquids such as surface tension and viscosity
CO4	Learn how heat is transferred by conduction, convection, and radiation.
CO5	Understand basic optics concepts like reflection, refraction, and lenses

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	3	2	2	3	2	2	2
CO3	2	2	3	1	3	3	1	3	3	3
CO4	2	3	3	3	3	3	3	2	1	2
CO5	3	2	3	3	2	2	3	2	2	3

SEMESTER –II

Semester- II									
Course Code	Part	Course category	Course Name	Hours/ Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26U1TL21	I	Language–I	Tamil-II	5	3	50	50	100	3
26U1HD21			Hindi – II						
26U1MY21			Malayalam–II						
26U1FR21			French–II						
26U2EN21	II	Language–II	English – II	5	3	50	50	100	3
26UCPH21	III	Core-II	Heat, thermodynamics &Statistical Physics	4	3	50	50	100	4
26UCPHP2	III	Core Practical-II	Physics Practical-II	6	3	50	50	100	4
26UEMA21	III	Elective-II	Vector Calculus & Fourier Series	4	3	50	50	100	3
26USPH21	IV	SEC-II	Astrophysics	2	3	50	50	100	2
26USPH22	IV	SEC -III	Physics for Competitive Exam	2	3	50	50	100	2
26UNPH21	IV	NME -II	Applied Physics	2	3	50	50	100	2
			Total	30				800	23

Course	SECONDSEMESTER–CORETHEORY-II								
Course Title	HEAT,THERMODYNAMICS & STATISTICAL PHYSICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPH11	4	0	0	II	4	4	50	50	100

Course Objectives

The course focuses to understand a basic in conversion of temperature in Celsius, Kelvin and Fahrenheit scales. Practical exhibition and explanation of transmission of heat in good and bad conductor. Relate the laws of thermodynamics, entropy in everyday life and explore the knowledge of statistical mechanics and its relation

Unit	Course Content	No of Hours
I	**CALORIMETRY:** Specific heat capacity – specific heat capacity of gases C_P and C_V– Meyer's relation – Joly's method for determination of C_V.. **LOW TEMPERATURE PHYSICS:** Joule-Kelvin effect–Porous plug experiment –Boyle temperature–temperature of inversion–liquefaction of gas by Linde's Process.	12
II	**THERMODYNAMICS-I:**Zeroth law and First law of thermodynamics–heat engine–efficiency of heat engine–Carnot's engine, construction, working and Efficiency of petrol engine and diesel engines.	12
III	**THERMODYNAMICS-II**: Second law of thermodynamics – entropy of an ideal gas–entropychangeinreversibleandirreversibleprocesses–T-Sdiagram– Maxwell's thermo dynamical relations – Clasius- Clapeyron's equation (first latent heat equation) –Third law of thermodynamics.	12
IV	**HEAT TRANSFER:** Modes of heat transfer: conduction, convection and radiation. **Conduction:** thermal conductivity –determination of thermal conductivity of a bad conductor by Lee's disc method. **Radiation:** black body radiation (Ferry's method) – distributionofenergyinblackbodyradiation–Wien'slawandRayleighJean's law– Planck's law of radiation–Stefan's law..	12
V	**STATISTICAL MECHANICS:** Definition of phase-space–micro and macro states –ensembles–different types of ensembles–classical and quantum Statistics– Maxwell-Boltzmann statistics – expression for distribution function –Fermi-Dirac statistics – expression for distribution function.	12
	Total	60

TEXT BOOKS

1.BrijLal **and** N.Subrahmanyam, *Heat and Thermodynamics*, Revised Edition, S. Chand & Company, New Delhi, **2019.**

2.Narayana Moorthy **and** Krishna Rao, *Heat*, Triveni Publishers, Chennai,**2006.**

3.V.R.Khanna **and** R. S.Bedi, *Textbook of Sound*, Kedarnath RamNath Publishers,Meerut ,**2018.**

4.BrijLal **and** N.Subrahmanyam, *Waves and Oscillations*, Vikas Publishing House, New Delhi, **2018**.

5.D.K.Ghosh, *Textbook of Sound*, S. Chand & Company, New Delhi, **2012**

6.BrijLal **and** N.Subrahmanyam, *Heat and Thermodynamics*, Revised Edition, S.Chand& Company, New Delhi, **2019**

REFERENC EBOOKS
1. J.B. Rajam and C.L. Arora, *Heat and Thermodynamics*, Revised Edition (Reprint), S. Chand & Company Ltd., New Delhi, 2019. 2. D.S. Mathur, Heat and Thermodynamics, Sultan Chand and Sons. 3.Gupta, Kumar, Sharma,2013, Statistical Mechanics,26th Edition, S. Chand and Co. 4.Resnick, Halliday and Walker, 2010, Fundamentals of Physics, 6th Edition. Sears, Zemansky, Hugh D.Young, Roger A.Freedman, 2021 University Physics with Modern Physics 15th Edition, Pearson. 5. https://onlinecourses.nptel.ac.in/noc26_ph13/preview

COURSE OUTCOMES	
CO1	Acquires knowledge on how to distinguish between temperature and heat.
CO2	Derive the efficiency of Carnot's engine. Discuss the Implications of the laws of Thermodynamics in diesel and petrol engines
CO3	Able to analyze performance of thermodynamic systems viz efficiency by problems. Gets an insight into thermodynamic properties like enthalpy, entropy
CO4	Study the process of thermal conductivity and apply it to good and bad conductors.
CO5	Interpret classical statistics concepts such as phase space, ensemble, Maxwell-Boltzman distribution law. Develop the statistical interpretation of Bose-Einstein and Fermi-Dirac. Apply to quantum particles such as photon and electron

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	3	2	3	3	3	2	2	3	2

Course	SECOND SEMESTER–CORE PRACTICAL II								
Course Title	PHYSICS PRACTICAL- II								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPHP1	0	0	3	II	4	6	50	50	100

Course Objectives

Apply their knowledge gained about the concept of heat and sound waves, resonance, calculate frequency of ac mains set up experimentation to verify theories, quantify and analyze, able to do error analysis and correlate results

List of Experiments (Any 8)

1. Verification of Newton‘s Law of Cooling.
2. Determination of thermal conductivity of a bad conductor by Lee‘s disc method.
3. Determination of specific heat capacity of Liquid by Newton‘s Law of Cooling.
4. Determination of specific heat capacity of a solid by method of mixture.
5. Determination of Latent heat of a vaporization of a liquid.
6. Determination of thermal conductivity of a rubber tube.
7. Determination of Velocity of sound through a wire using Sonometer.
8. Verification of the laws of transverse vibration using a sonometer.
9. Verification of the laws of transverse vibration using Melde‘s apparatus.
10. Comparison of the mass per unit length of two strings using Melde‘ sapparatus.

Course	SECOND SEMESTER – Skill Enhancement Course (SEC-1I)								
Course Title	ASTROPHYSICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USPH21	2	0	0	II	2	2	50	50	100

Course Objectives

This course intends to introduce principles of astrophysics describing the science of formation and evolution of stars and interpretation of various heavenly phenomena and provide an understanding of the physical nature of celestial bodies along with the instrumentation and techniques used in astronomical research

Unit	Course Content	No of Hours
I	**TELESCOPES:** Optical telescopes–magnifying power, brightness, resolving power and f/a ratio – types of reflecting and refracting telescopes – detectors and image processing – radio telescopes – Hubble Space telescope.	6
II	**SOLARSYSTEM:** Bode's law of planetary distances–meteors, meteorites, comets, asteroids–Kuiper belt–Oort cloud–detection of Gravitational waves.	6
III	**ECLIPSES:** types of eclipses–solar eclipse–total and partial solar eclipse – lunar eclipse – total and partial lunar eclipse – transits. **THE SUN:** physical and orbital data – solar atmosphere – photosphere – chromosphere – solar corona – prominences – sunspots – 11year solar cycle – solar flares.	6
IV	**STELLAR EVOLUTION:** H-R diagram – birth and death of low mass, intermediate mass and massive stars – Chandrasekar limit – white dwarfs – neutron stars – pulsars – black holes – supernovae.	6
V	**GALAXIES:** Our Milky Way-Galactic structure-Galactic rotation-Galaxy types-Galaxy formation; Cosmology: Expansion of the Universe-red shifts -supernovae-the Big Bang -history of the Universe.	6
	Total	30

TEXT BOOKS

1. Baidyanath Basu, (2001).An introduction to Astrophysics, Second printing, Prentice–Hall of India (P) Ltd, New Delhi
2. K.S. Krishnaswamy,(2002), Astrophysics–a modern perspective, New Age International (P) Ltd, New Delhi.
3. Shylaja, B.S.and Madhusudan, H.R.,(1999),Eclipse: A Celestial Shadow Play, Orient Black Swan,
4. https://va-iitk.vlabs.ac.in/?page=listexp

COURSE OUTCOMES

CO1	Remember basic concepts of telescopes, their types, and how they work.
CO2	Understand the solar system, including planets, comets, asteroids, and space regions.
CO3	Learn different types of eclipses and how they occur
CO4	Learn the Sun, Its structure, and activities like sunspots and solar flares.
CO5	Understand stars and galaxies, their life cycle, and basic ideas about the universe.

Course	SECOND SEMESTER–Skill Enhancement Course (SEC-III)								
Course Title	PHYSICS FOR COMPETITIVE EXAMINATIONS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USPH22	2	0	0	II	2	2	50	50	100

Course Objectives

The course focuses to understand a basic in conversion of temperature in Celsius, Kelvin and Fahrenheit scales. Practical exhibition and explanation of transmission of heat in good and bad conductor. Relate the laws of thermodynamics, entropy in everyday life and explore the knowledge of statistical mechanics and its relation

Unit	Course Content	No of Hours
I	**MECHANICS:** Centre of gravity – Centre of gravity of a solid hemisphere – Hollow hemisphere-Friction –Laws of friction –angle of friction -Impact - Laws of Impact - Direct and oblique impact - Impact between two spheres - Loss of Kinetic energy.	6
II	**PROPERTIES OF MATTER:** Viscosity of liquids-Highly viscous liquids – Searle‘s method- Surface Tension -Method of drops - Surface tension of mercury - Laws of osmotic pressure and experimental determination of osmotic pressure.	6
III	**HEAT AND THERMODYNAMICS:** Vanderwaal's equation - Critical constantsandVanderwaal‘sconstant-Isothermal,adiabatic,isobaric,isochoric processes and entropy changes **ELECTRICITYANDMAGNETISM:** Coulomb‘s law-Permittivity of free space - Relative permittivity - Electric field - Intensity of field due to a point charge - Gauss theorem and its application - Ohm's law - Resistivity and conductivity.	6
IV	**OPTICS:** Snell‘s Law-Laws of reflection and refraction from Fermat‘s principle; Coherent and Incoherent sources, Scattering of light and polarization. **SOUND:** Velocity of sound in solids and gases – Theory and experiment -Ultrasonics - properties and applications	6
V	**NUCLEARPHYSICS:** Properties of nucleus - size, charge, mass, angular momentum, parity and spin - Nuclear magnetic dipole moment - Binding energy - Packing fractions -Semi-empirical mass formula and applications; Nuclear fission and fusion	6
	Total	30

TEXT BOOKS

1. D.S. Mathur, *Mechanics*, Revised Edition, S. Chand & Company, New Delhi**, 2012.**
2. Brij Lal **and** N. Subrahmanyam, *Properties of Matter*, Eurasia Publishing House, New Delhi, **Reprint 2018.**
3. Brij Lal **and** N.Subrahmanyam, *Heat, Thermodynamics and Statistical Physics*, Revised Edition, S. Chand & Company, New Delhi, **2018.**
4. R. Murugeshan, *Electricity and Magnetism*, S. Chand & Company, New Delhi,**2017.**
5. N.Subrahmanyam**,** Brij Lal **and** M.N. Avadhanulu, *A Textbook of Optics*, 25thEdition, S.Chand & Company, New Delhi, **2014.**
6. N.Subrahmanyam **and** Brij Lal, *A Textbook of Sound*, Vikas Publishing House, New Delhi, **Reprint 2018.**
7. D.C. Tayal, *Nuclear Physics*, Himalaya Publishing House, Mumbai, **Revised Edition 2019**

REFERENCE BOOKS
1. J.B.Rajam and C.L.Arora, *Heat and Thermodynamics*, Revised Edition(Reprint),S.Chand& Company Ltd., New Delhi, 2019 2. D.S.Mathur,Heat and Thermodynamics, Sultan Chand and Sons. 3. Gupta, Kumar, Sharma,2013, Statistical Mechanics,26thEdition,S.ChandandCo. 4. Resnick, Halliday and Walker,2010, Fundamentals of Physics,6th Edition. 5. Sears, Zemansky, HughD.Young, RogerA. Freedman, 2021 Universe Physicswith Modern Physics 15th Edition, Pearson

COURSE OUTCOMES	
CO1	Remember basic concepts of telescopes, their types, and how they work.
CO2	Understand the solar system, including planets, comets, asteroids, and space regions.
CO3	Learn different types of eclipses and how they occur
CO4	Learn the Sun, its structure, and activities like sunspots and solar flares.
CO5	Understand stars and galaxies, their lifecycle, and basic ideas about the universe.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	3	2	2	3	2	2	2
CO3	2	2	3	1	3	3	1	3	3	3
CO4	2	3	3	3	3	3	3	2	1	2
CO5	3	2	3	3	2	2	3	2	2	3

Course	SECOND SEMSETER – NON – MAJOR ELECTIVE - II								
Course Title	APPLIED PHYSICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UNPH21	2	0	0	II	2	2	50	50	100

Course Objectives

Identify and describe different conventional and renewable energy sources. Explain the availability, applications, merits, and limitations of fossil fuels and renewable energy sources. Understand the basic working principles of biomass, solar, geothermal, and wind energy systems. Compare different energy sources based on their efficiency, availability, environmental impact, and applications. Evaluate suitable renewable energy options for different practical applications.

Unit	Course Content	No. of Hours
I	**Conventional energy sources** Conventional energy sources –world's reserve of conventional energy sources–various forms of energy-renewable and conventional energy systems-comparison	6
II	**Fossil fuels** Fossil fuels–coal, oil, and natural gas-availability-statistical details-applications-merits and demerits.	6
III	**Biomass energy:** Biomass energy-biomass classification-biomass conversion process-biogas plants- wood gasification-advantages and disadvantages of biomass	6
IV	**Renewable energy sources** Renewable energy sources-solar energy-importance-storage of solar energy -Applications of solar energy-solar pond-solar water heater-solar crop dryers-solar cookers- solar cell.	6
V	**Geo thermal energy** Geo thermal energy-Geo thermal power plant-wind energy and wind farms-wind mills.	6
	Total	30

TEXT BOOKS

1.Non-conventional energy sources-G.DRai – Khanna Publishers, New Delhi

2.Solar energy-MP Agarwal –S Chand & Co.Ltd.

3.Solar energy-Suhas P Sukhative Tata McGraw-Hill Publishing Company Ltd., New Delhi.

COURSE OUTCOMES

CO1	Remember conventional and renewable energy sources
CO2	Understand the fossil fuels and their uses
CO3	Explain biomass energy and its applications.
CO4	Learn solar energy and its uses.
CO5	Explain geothermal and wind energy.

SEMESTER –III

Semester–III									
Course Code	Part	Course category	Course Name	Hours/ Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26U1TL31	I	Language – I	Tamil-III	5	3	50	50	100	3
26U1HD31			Hindi – III						
26U1MY31			Malayalam–III						
26U1FR31			French–III						
26U2EN31	II	Language – II	English – III	5	3	50	50	100	3
26UCPH31	III	Core-III	Mechanics	4	3	50	50	100	4
26UCPHP3	III	Core Practical-III	Physics Practical-III	6	3	50	50	100	4
26UECH31	III	Elective-III	Allied Chemistry-I	4	3	50	50	100	3
26UECHP1	III	Elective Practical-I	Allied Chemistry Practical-I	2	3	50	50	100	2
26USPH31	IV	SEC-4	Maintenance of Electrical Appliances	2	3	50	50	100	2
26UEVS31	IV	Common -I	Environmental Studies	2	3	50	50	100	2
			Total	30				800	23

Course	THIRD SEMESTER–CORE THEORY-III								
Course Title	MECHANICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPH31	4	0	0	III	4	4	50	50	100

Course Objectives

To have a basic understanding of the laws and principles of mechanics; To apply the concepts of forces existing in the system; To understand the forces of physics in everyday life; To visualize conservation laws; To apply Lagrangian equation to solve complex problems.

Unit	Course Content	No of Hours
I	**LAWSOF MOTION:** Newton‘s Laws – forces – equations of motion – frictional force – motion of aparticleinauniformgravitationalfield.*Gravitation*:Introduction–Kepler‘s laws, Newton‘s law of gravitation – Determination of G by Boy‘s method – Earth-moon system – weightlessness – earth satellites –earth density – mass of the Sun – gravitational potential –escape velocity– satellite potential and kinetic energy	12
II	**CONSERVATION LAWS OF LINEAR AND ANGULARMOMENTUM:** **C**onservation of linear and angular momentum – Internal forces and momentum conservation – center of mass – examples – general elastic collision of particles of different masses – system with variable mass – examples–conservation of angular momentum–torque due to internal forces –torque due to gravity –angular momentum about center of mass	12
III	**CONSERVATION LAWS OF ENERGY:** Introduction – significance of conservation laws – law of conservation of energy-concepts of work-power–energy–conservative forces–potential energy and conservation of energy in gravitational field – examples –non-conservative forces – general law of conservation of energy.	12
IV	**RIGIDBODY DYNAMICS:** Translational and rotational motion–angular momentum–moment of inertia – general theorems of moment of inertia – examples – rotation about fixed axis – kinetic energy of rotation – examples – body rolling along a plane surface – body rolling down an inclined plane	12
V	**LAGRANGIAN MECHANICS:** Generalized coordinates –degrees of freedom - principle of virtual work and D‘Alembert‘sPrinciple–Lagrange‘sequationfromD‘Alembert‘sprinciple – application –simple pendulum – Atwood‘s Machine.	12
	Total	60

TEXT BOOKS

1. J.C.Upadhyaya, *Classical Mechanics*, Himalaya Publishing House, Mumbai**, 2019.**
2. P. Durai Pandian**,** Laxmi Durai Pandian **and** Muthamizh Jayapragasam, *Mechanics*, 6th Revised Edition, S. Chand & Company, New Delhi, **2018 (Reprint).**
3. D. S. Mathur **and** P. S. Hemne, *Mechanics*, Revised Edition, S. Chand & Company, New Delhi,**2012 (Reprint).**
4. M.Narayanamurthi **and** N.Nagarathnam, *Dynamics*, The National Publishing Company, Chennai**, 2005 (Reprint).**
5. M.Narayanamurthi **and** N.Nagarathnam, *Statics ,Hydrostatics and Hydrodynamics*, The National Publishing Company, Chennai, **2006 (Reprint)**

REFERENCE BOOKS

1. Herbert Goldstein, *Classical Mechanics*, 3rdEdition, Addison-Wesley/ PearsonEducation,**2002.**
2. David Halliday **and** Robert Resnick, *Physics, Volume I*, New Age International Publishers, New Delhi, **Reprint 2014.**
3. David Halliday**,** Robert Resnick **and** Jearl Walker, *Fundamentals of Physics*, 10th Edition, JohnWiley & Sons, New Delhi, **2014.**

WEBRE SOURCES

1. https://youtu.be/X4_K-XLUIB4
2. https://nptel.ac.in/courses/115103115
3. https://www.youtube.com/watch?v=p075LPq3Eas
4. https://www.youtube.com/watch?v=mH_pS6fruyg
5. https://onlinecourses.nptel.ac.in/noc22_me96/preview
6. https://www.youtube.com/watch?v=tdkFc88Fw-M
7. https://onlinecourses.nptel.ac.in/noc21_me70/preview

COURSE OUTCOMES

CO1	Understand the Newton‘s Law of motion, understand general theory of relativity, Kepler‘s laws and Realize the basic principles behind planetary motion
CO2	Acquire the knowledge on the conservation laws
CO3	Apply conservation law and calculate energy of various systems, understand and Differentiate conservative and non-conservative forces
CO4	Gain knowledge on rigid body dynamics and solve problems Based on this concept
CO5	Appreciate Lagrangian system of mechanics, apply D‘Alemberts principle

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	3	2	3	3	3	2	2	3	2

Course	THIRD SEMESTER–CORE PRACTICAL III								
Course Title	PHYSICS PRACTICAL- III								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPHP3	0	0	4	III	4	6	50	50	100

Course Objectives

Construct circuits to learn about the concept of electricity, current, resistance in the path of current, different parameters that affect a circuit. Set up experiments, observe, analyse and assimilate the concept.

List of Experiments (Any 8)

1. Calibration of low range voltmeter using potentiometer
2. Calibration of ammeter using potentiometer.
3. Determination of field along the axis of a current carrying circular coil.
4. Determination of earth‘s magnetic field using field along axis of current carrying coil.
5. Determination of specific resistance of the material of the wire using PO box.
6. Determination of specific resistance using Carey Foster‘s bridge.
7. Determination of e.m.f of thermo couple using potentiometer
8. Determination of figure of merit of BG or spot galvanometer.
9. Ballistic Galvanometer–Comparison of EMF‘s–E1/E2
10. Series Resonance Circuit
11. Parallel Resonance Circuit
12. Owen‘s Bridge–Determination of self-inductance of the coil
13. Anderson‘s bridge–Self-inductance of the coil
14. Comparison of Magnetic Moments–Deflection Magnetometer(Tan A and Tan B position)
15. M and BH–Vibration magnetometer

*N*ote: Use of digital balance, digital screw gauge, digital calipers are permitted

Course	THIRD SEMESTER – Skill Enhancement Course (SEC-1V)								
Course Title	MAINTANANCE OF ELECTRICAL APPLIANCES								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USPH31	2	0	0	III	2	2	50	50	100

Course Objectives

This course enables the students to understand the operations and safety handling of certaincommonlyuseddomesticappliances.Thepaperneedsabasicknowledgeinelectricityandmagnetism and the learners are expected to gain knowledge to design and trouble shoot electrical circuits.

Unit	Course Content	No of Hours
I	**Basic Electric components** Active & passive components-Resistance – capacitance types - inductance–its units - -Galvanometer, ammeter, voltmeter and multimeter- Transformers-types-coils –wire gauges- Electrical energy - power - consumption of electrical power.	6
II	**Basic home Electrical appliances** Electric bulbs-working principles of-LED lamps - Electric Fans-Wet Grinder- Water purifier basics and working maintenance-Mixie –electric Iron box	6
III	**High Power Electrical appliances and safety requirements** Water Heater-Storage and Instant types–basics and working of microwave oven-Washing Machine-Air conditioner-its maintenance-concept of water pumping motor -over loading-short circuiting-ground earthing of appliances.	6
IV	**Thermal electrical appliances** Room heater-basics and working of- electric iron & immersion rod-automatic rice cooker electric kettle- toaster& hair dryer induction cooker& stove	6
V	**Relays & Switches Electrical protection** - Relays - Fuses – Electrical switches - Circuit breakers-MCB - basics and working of ELCB - RCCB - ground fault protection	6
	Total	30

TEXT BOOKS

1.J.C.Upadhyaya, *Classical Mechanics*, Himalaya Publishing House, Mumbai, 2019**.**

2.P.DuraiPandian**,** Laxmi Durai Pandian **and** Muthamizh Jayapragasam, *Mechanics*, 6th Revised Edition, S. Chand & Company, New Delhi, **2018 (Reprint).**

3.D.S.Mathur **and** P.S.Hemne, *Mechanics*, Revised Edition,S. Chand&Company,NewDelhi,**2012.**

4.M.Narayanamurthi **and** N.Nagarathnam, *Dynamics*, The National Publishing Company, Chennai**, 2005.**

5.M. Narayanamurthi **and** N. Nagarathnam, *Statics, Hydrostatics and Hydrodynamics*, The National Publishing Company, Chennai, **2006**

COURSE OUTCOMES

CO1	Remember the basic components of active & passive elements
CO2	Understand home electrical appliances such as grinder, bulb
CO3	Apply the concept in high power electrical appliances
CO4	Analyse the thermal electrical appliances like as room heater etc
CO5	Describe the relays and switches

Course	THIRD SEMESTER –Common								
Course Title	ENVIRONMENTAL STUDIES								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UEVS31	2	0	0	III	2	2	50	50	100

Course Objectives	
LO1	To study the multidisciplinary nature of environmental studies, including the scope, importance, and sustainable management of natural resources such as forests, water, minerals, food, energy, and land.
LO2	To understand different types of ecosystems, energy flow, ecological succession, food chains, food webs, and ecological pyramids.
LO3	To examine the levels of biodiversity, its distribution in India and globally, threats to biodiversity, and conservation strategies including in-situ and ex-situ methods.
LO4	To identify causes, effects, and control measures of various types of pollution, and to understand solid waste management and disaster management techniques.
LO5	To analyze social and environmental issues such as climate change, global warming, and population growth, along with environmental protection laws and sustainable development practices.

Unit	Course Content	No of Hours
I	**THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES** Definition, scope and importance Natural resources and associated problems: **a) Forest resources:** Use and over-exploitation, deforestation, timber extraction, dams and their effects on forests and tribal people. **b) Water resources**: Use and over-utilization of surface and ground water, floods, drought, dams-benefits and problems, water conservation and watershed management. **c) Mineral resources**: Use and exploitation, environmental effects. **d)Food resources:** World food problems, changes, effects of modern agriculture, fertilizer-pesticide problems. **e) Energy resources:** Growing energy needs, renewable lion renewable energy sources, alternate energy sources. **f) Land resources:** Land as a resource, land degradation, man-induced landslides, soil erosion and desertification.	6
II	**ECOSYSTEMS** Forest Ecosystem b) Grass land Ecosystem c) Desert ecosystem d)Aquatic Ecosystem (Ponds, rivers, oceans, estuaries) Energy flow in the ecosystem Ecological succession Food Chains, Food Webs and Ecological Pyramids.	6
III	**BIODIVERSITY AND ITS CONSERVATION** Introduction Definition: Genetic, species and ecosystem diversity. Bio geographically classification of India, Values of Biodiversity, Biodiversity at global, national and local levels India as a mega-diversity nation, Hot-Spots of biodiversity Threats to biodiversity Endangered and endemic species of India , Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity	6

IV	**ENVIRONMENTAL POLLUTION** Definition-Causes, effects and control measures of:-a)Air Pollution b)Water Pollution c)Soil Pollution d)Marine Pollution e) Noise Pollution f)Thermal Pollution Solid Waste Management, Disaster Management: Floods, earthquake, cyclone and landslides.	**6**
V	**SOCIAL ISSUES AND THE ENVIRONMENT** Climatic change, global warming, acid rain, ozone depletion. Wasteland reclamation Consumerism and Waste products, use and through plastics Environment Protection Act Air (Prevention and Control of Pollution)Act Water (Prevention and Control of Pollution) Act Wildlife Protection Act Forest Conservation Act Population Explosion - Family Welfare Programme Human Rights	**6**
	Total	**30**

TEXT BOOKS

1. G.S.Vijayalakshmi, A.G. Murugesan and N. Sukumaran. 2006. Basics of Environmental Science, Manonmaniam Sundaranar University Publications, Tirunelveli , pp.160.
2. Agarwal.K.C.2001.EnvironmentalBiology,NidiPublicationsLimited, Bikaner
3. A.K.De.1999.Environmental Chemistry, Wiley Eastern Limited, India.
4. Jadhav, H. and Bhosale, V.M.1995. Environmental Protection and Laws, Himalaya Publishing House, Delhi. pp284
5. Odum, E.P.1971. Fundamentals of Ecology, W.B. Saunders Co., USA. pp.574.

COURSE OUTCOMES

CO1	Students will be able to explain the scope and importance of environmental studies and analyze the use, over-exploitation, and conservation of natural resources.
CO2	Students will be able to describe ecosystem types, energy flow, ecological succession, and relationships such as food chains, food webs, and ecological pyramids.
CO3	Students will be able to assess biodiversity at different levels, identify threats, and explain conservation methods including in-situ and ex-situ approaches.
CO4	Students will be able to identify various types of pollution, analyze their causes and effects, and suggest control measures along with waste and disaster management practices.
CO5	Students will be able to evaluate major environmental issues such as climate change and population growth, and understand environmental protection laws and sustainable Practices.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**3**	**2**	**2**	**2**	**2**	**2**
CO2	**2**	**3**	**2**	**2**	**2**	**2**
CO3	**2**	**3**	**3**	**3**	**2**	**2**
CO4	**2**	**3**	**2**	**2**	**2**	**2**
CO5	**3**	**3**	**2**	**2**	**2**	**2**

Course	THIRD SEMESTER–ALLIED PAPER								
Course Title	ALLIED PHYSICS– I								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UEPH31	4	0	0	III	3	4	50	50	100

Course Objectives

To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

Unit	Course Content	No of Hours
I	**WAVES, OSCILLATIONS AND ULTRASONICS:** simple harmonic Motion (SHM)–composition of two SHMs at right angles(periods in the ratio 1:1)–laws of transverse vibrations of strings–determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonic in medical field.	12
II	**PROPERTIES OF MATTER:** *Elasticity*: elastic constants–bending of beam–theory of non-uniform bending–determination of Young's modulus by non-uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum *Viscosity*: streamline and turbulent motion–critical velocity–coefficient of viscosity–Poiseuille's formula *Surface tension*: definition–molecular theory–droplets formation–shape, size and lifetime–drop weight method	12
III	**HEAT AND THERMODYNAMICS:** Joule-Kelvin effect – Joule Thomson porous plug experiment – theory – temperature of inversion – thermodynamic system –thermodynamic equilibrium Laws of thermodynamics–heat engine–Carnot's cycle–efficiency–entropy – change of entropy in reversible	12
IV	**ELECTRICITY AND MAGNETISM:** potentiometer – principle – measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor–Biot-Savart's law–field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit-fuses and circuit breakers in houses	12
V	**DIGITAL ELECTRONICS AND DIGITAL INDIA:** logic gates, OR, AND, NOT, NAND, NOR, EXOR logic gates–universal building blocks–Boolean algebra–De Morgan's theorem–verification–overview of Government initiatives: semiconductor laboratories under Dept. of Space – an introduction to Digital India	12
	Total	60

TEXT BOOKS

1. R. Murugesan (2001), Allied Physics, S. Chand and Co, New Delhi.
2. Brijlal and N.Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi.
3. Brijlal and N. Subramaniam (1994), Properties of Matter, S. Chand and Co., New Delhi.
4. J.B. Rajam and C.L. Arora (1976).Heat and Thermodynamics (8^{th}edition), Chand and Co., New Delhi.
5. R. Murugesan (2005), Optics and Spectroscopy, S. Chand and Co, New Delhi.

6. A. Subramaniyam, Applied Electronics 2nd Edn., National Publishing Co., Chennai

REFERENCE BOOKS

1.Resnick Halliday and Walker (2018). Fundamentals of Physics (11thedition), John Willey and Sons, Asia Pvt. Ltd., Singapore.

2.V.R. Khanna and R.S. Bedi (1998), Textbook of Sound1stEdn. Kedharnaath Publish and Co, Meerut.

3.N.S. Khareand S.S. Srivastava (1983), Electricity and Magnetism10th Edn., Atma Ramand Sons, New Delhi.

4.D.R. Khanna and H.R. Gulati (1979). Optics, S. Chand and Co. Ltd., New Delhi.

5.V.K. Metha (2004). Principles of electronics 6th Edn. S. Chand and company.

WEB RESOURCES

1. https://youtu.be/M_5KYncYNyc
2. https://youtu.be/ljJLJgIvaHY
3. https://youtu.be/7mGqd9HQ_AU
4. https://youtu.be/h5jOAw57OXM
5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/
6. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://www.youtube.com/watch?v
7. =gT8Nth9NWPMhttps://www.youtube.com/watch?v=9mXOMzUru MQandt=1shttps://www.youtube.com/watch?v=m4u-
8. SuaSu1sandt=3shttps://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

COURSE OUTCOMES

CO1	Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with Practical applications in medical field.
CO2	Explain their knowledge of understanding about materials and their Behaviors and apply it to various situations in laboratory and real life. Connect droplet theory with Corona transmission.
CO3	Comprehend basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of Flow temperature physics in the back ground of growth of this technology
CO4	Articulate the knowledge about electric current resistance, capacitance in terms of potential electric field and electric correlate the connection between electric field and magnetic field and Analyze them mathematically verify circuits and apply the concepts To construct circuits and study them.
CO5	Interpret the real life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and Acquire elementary ideas of IC circuits. Acquire information about various Govt. programs/ institutions in this field.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	2	3	3	3	3	2
CO3	2	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	2	3	3	3	3	3	3	3	3	3

Course	THIRD SEMESTER–ALLIED PRACTICAL-I								
Course Title	ALLIED PHYSICS PRACTICAL-I								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UEPHP1	0	0	2	III	2	2	50	50	100

Course Objectives

Apply various physics concepts to understand Properties of Matter and waves, set up experimentation

To verify theories, quantify and analyse, able to do error analysis and correlate results

List of Experiments (Any8)

1.Young‘s modulus by non-uniform bending using pin and microscope

2.Young‘s modulus by uniform bending using optic lever, scale and telescope

3.Rigidity modulus by torsional oscillations without mass

4.Verification of Newton’s Law of Cooling

5.Co-efficient of viscosity-Stoke‘s method

6.Surface tension and interfacial Surface tension–drop weight method

7.Index of prism using spectrometer

8.Verification of laws of transverse vibrations using sonometer

9.Calibration of low range voltmeter using potentiometer

10. Thermo emf using potentiometer

11.Thickness of a wire using air wedge

12. Construction of AND, OR, NOT gates using diodes and transistor.

Note: Use of digital balance, digital screw gauge, digital calipers are permitted

SEMESTER– IV

Semester–IV									
Course Code	Part	Course category	Course Name	Hours /Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26U1TL41	I	Language – I	Tamil-IV	5	3	50	50	100	3
26U1HD41			Hindi – IV						
26U1MY41			Malayalam–IV						
26U1FR41			French–IV						
26U2EN41	II	Language – II	English – IV	5	3	50	50	100	3
26UCPH41	III	Core-IV	Optics & Laser Physics	4	3	50	50	100	4
26UCPHP4	III	Core Practical–IV	Physics Practical–IV	6	3	50	50	100	4
26UECH41	III	Elective–IV	Allied Chemistry-II	4	3	50	50	100	3
26UECHP2	III	Elective Practical-IV	Allied Chemistry Practical–II	2	3	50	50	100	2
26USPH41	IV	SEC-6	Maintenance of Electronics Appliances	2	3	50	50	100	2
26UVBE41	IV	Common-II	Value Based Education	2	3	50	50	100	2
			Total	30				800	23

Course	FOURTHS EMESTER–CORE THEORY-IV								
Course Title	OPTICS AND LASER PHYSICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPH41	4	0	0	IV	4	4	50	50	100

Course Objectives

To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics; To explain the behavior of light in different mediums; To understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life; To understand the design of optical systems and methods to minims aberrations; To understand the working and applications of laser

Unit	Course Content	No of Hours
I	**LENSANDPRISMS:** **Lens:** Lenses and its types – Equivalent focal length of two thin lenses in contact and separated by a distance – power of a lens. Aberrations: Spherical aberration, Methods of minimizing Spherical Aberration and chromatic aberrations. **Prism:** Dispersion by a prism, Angular dispersion and Dispersive power, Achromatic combination of prisms- Deviation without dispersion and Dispersion without deviation. Eyepieces: Eyepiece - Huygen‘s and Ramsden‘s eyepieces, construction and working – comparison	12
II	**INTERFERENCE:** Interference – Conditions – Theory of Interference - Fresnel‘s biprism – Experimental determination of the wavelength of light - Colours of thin films - Production of colours in thin films – Air wedge (Wedge-shaped film) – Newton‘s rings. Michelson‘s interferometer – Applications,(i)determinationofthewavelengthofamonochromaticsource of light and (ii) determination of a thickness of a mica sheet.	12
III	**DIFFRACTION:** Fresnel and Fraunhofer diffraction -Fresnel‘s explanation of Rectilinear propagation of light - zone plate – action of zone plate for an incidentsphericalwavefront–differencesbetweenazoneplateandaconvex lens–diffractionpatternduetoastraightedge–planetransmissiondiffraction grating–experiment to determine wavelengths.	12
IV	**POLARISATION:** Polarisation of light -double refraction – Nicol prism – Plane, circularly and elliptically polarized light –quarter wave plate – half wave plate – production and detection of circularly and elliptically polarized lights–Optical activity-Fresnel‘s explanation–Laurent half shade Polarimeter–experiment to determine specific rotator power.	12
V	**LASERS:** General principles of lasers–properties of lasers action–spontaneous and stimulated emission–population inversion–optical pumping He-Nelaser (principle and working)–CO_2 laser(principle and working) Laser applications –holography and its applications.	12
	Total	60

TEXT BOOKS
1. Subrahmanyam. N,Brijlal and Avadhanulu.M.N,2014,A textbook of optics,25th Edition,S.Chandand Co. 2. Murugeshan. R and Kiruthiga Sivaprasath,2014, Optics and Spectroscopy,9th Edition, S. Chand and Co.

REFERENCE BOOKS
1. Sathya prakash, 1990, Optics, VII edition, Ratan Prakashan Mandhir, NewDelhi. 2. Ajoy Ghatak, 2009, Optics, 4th Edition, PHI Pvt Ltd, New Delhi. 3. JenkinsA. Francis and White, 2011, Fundamentals of Optics, 4th edition, McGraw HillInc., NewDelhi.

COURSE OUTCOMES	
CO1	Outline basic knowledge of methods of rectifying different defects in lenses, articulate technological applications of eyepieces
CO2	Discuss the principle of superposition of wave, use these ideas To understand the wave nature of light through working of interferometer
CO3	Extend the knowledge about nature of light through diffraction techniques; apply mathematical principles to analyse the optical instruments
CO4	Interpret basic formulation of polarization and gain knowledge about polarimeter, appraise its usage in industries
CO5	Relate the principles of optics to various fields of IR, Raman And UV spectroscopy and understand their instrumentation and application in industries

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	3	2	2	2	3	3	2	2
CO2	2	3	2	3	2	3	2	2	3	3
CO3	3	2	3	2	3	2	3	3	2	2
CO4	3	2	3	2	2	3	2	2	3	2
CO5	3	2	3	2	3	3	2	3	3	3

Course	FOURTH SEMESTER–CORE PRACTICAL IV								
Course Title	PHYSICS PRACTICAL- IV								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPHP4	0	0	6	IV	4	6	50	50	100

Course Objectives

Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results. Also, construct circuits to learn about the concept of electricity and magnetism.

List of Experiments(Any8)

1. Determination of refractive index of prism using spectrometer.
2. Determination of refractive index of liquid using hollow prism and spectrometer
3. Determination of dispersive power of a prism.
4. Determination of radius of curvature of lens by forming Newton‘s rings.
5. Determination of thickness of a wire using air wedge.
6. Determination of Cauchy‘s Constants.
7. Determination of resolving power of grating
8. Determination of refractive index of a given liquid by forming liquid lens
9. Determination of refractive index –by forming Newton‘s rings
10. Spectrometer-grating–oblique incidence-dispersive power
11. Tangent Galvanometer– Horizontal earth‘s magnetic induction
12. Spectrometer-grating–oblique incidence-Wave length of Mercury spectral lines
13. Ballistic Galvanometer–Absolute capacity of a condenser
14. Ballistic Galvanometer–Comparison of Capacitances (C1/C2)
15. Determination of refractive index using Laser.

Note: Use of digital balance, digital screw gauge, digital calipers are permitted

Course	FOURTHS EMESTER–Skill Enhancement Course (SEC-VI)								
Course Title	MAINTANANCE OF ELECTRIONICS APPLIANCES								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26USPH41	2	0	0	IV	2	2	50	50	100

Course Objectives

This course enables the students to understand the operations and safety handling of certaincommonlyuseddomesticappliances.Thepaperneedsabasicknowledgeinelectricityandmagnetismand the learners are expected to gain knowledge to design and trouble shoot electrical circuits.

Unit	Course Content	No of Hours
I	**SOLDERING TECHNIQUES** Soldering tools- soldering iron-soldering station-dry solder joint, cold solder joints-Good and bad solders joints. Groove board, bread board and printed circuit board	6
II	**POWER SUPPLY AND MEASURING INSTRUMENTS** Transformer Zener voltage regulators-Dual Power supply IC'S 7805, 7905-switch mode power supply (SMP'S), principle of SMP'S – block diagram of SMP'S. Practical uses of Multimeter (analog and digital) –testing and measurements of resistor, capacitor and transistor	6
III	**MAINTENANCE OF ELECTRONICS HOME APPLIANCES** LED/LCD TV-music player, CCTV Camera block diagram-its working - cathode ray oscilloscope –its principle and block diagram- Measurement of Frequency, AC and DC using CRO	6
IV	**MAINTENANCE OF COMPUTER SYSTEMS** Various parts of computer-its assembling-installing windows operating systems, software and antivirus computer hardware maintenance-formatting and maintenance-Basic networkinstallation-IPaddresssettinganditsmaintenance.Modem-workingprinciple.	6
V	**SOLAR POWER SYSTEMS AND INVERTERS** Solar Panels-Solar Inverter – their principle & operation, power rating-, Protection circuits used in inverters– Solar Battery- battery level, over load, over charging. Various faults and its rectification.	6
	Total	30

TEXT BOOKS

1.Principles of Electronics by VK Mehta, S Chand&Co.,5th edition 2001.0

2.Functional Electronics by Ramanan. Solar Power Hand Book, Dr.H. Naganagouda (2014)

3.Green Power: Eco-Friendly Energy Engineering‖, Khartchenko.N.V,—Tech Books, and New Delhi, 2008.

REFERENCE BOOKS

1.Basic Electronics, 6th edition by B Grob, Mc Graw Hill NY1

2. Integrated electronics – Millman and Halkias

3.Electronic principles – Malvino 6 th edition

4.Operational amplifier–Gyakwar

Basic electronics B. Basavaraj, H. N.Shivasankar University press	
COURSE OUTCOMES	
CO1	Recall basics soldering techniques and tools.
CO2	Explain powers Supplies and measuring instruments.
CO3	Use electronic tools like multimeter and CRO for testing.
CO4	Analyze faults in home appliances and computer systems
CO5	Evaluate solar power systems, inverters, and trouble shoot faults

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	3	2	2	3	2	2	2
CO3	2	2	3	1	3	3	1	3	3	3
CO4	2	3	3	3	3	3	3	2	1	2
CO5	3	2	3	3	2	2	3	2	2	3

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Course	FOURTH SEMESTER- Common								
Course Title	VALUE BASED EDUCATION								
Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UVBE41	2	0	0	IV	2	2	50	50	100

Learning Objectives	
LO1	To provide basic knowledge of the Indian Constitution and its framework.
LO2	To understand fundamental rights, duties, and directive principles.
LO3	To create awareness about human rights and their protection mechanisms.
LO4	To develop analytical skills regarding constitutional and human rights issues.
LO5	To promote values of equality, justice, and democracy among students.

Unit	Contents	No. of Hours
I	**Introduction to Indian Constitution** **Introduction**: Meaning and importance of Constitution - Historical background of Indian Constitution-Making of the Constitution (Constituent Assembly) - Salient features of Indian Constitution - Preamble – Meaning, Objectives and Values.	6
II	**Fundamental Rights and Duties** Fundamental Rights – Types and significance - Right to Equality, Freedom, Religion, Cultural & Educational Rights- Right to Constitutional Remedies- Fundamental Duties – Meaning and importance.	6
III	**Directive Principles of State Policy** Meaning and objectives-Classification of Directive Principles-Relationship between Fundamental Rights and DPSP - Role in governance and welfare state.	6
IV	**Human Rights– Concepts and Development** Meaning and definition of Human Rights - Evolution of Human Rights – Universal Declaration of Human Rights(UDHR)-Types of Human Rights– Civil, Political, Economic, Social & Cultural	6
V	**Human Rights in India** Human Rights Protection Act, 1993-NationalHumanRightsCommission (NHRC) – Structure and functions - Role of NGOs in Human Rights protection - Issues: Women, Children, Minorities & Environment - Contemporary Human Rights challenges in India.	6
	Total	30

Course Outcomes	
CO1	Explain the structure and features of the Indian Constitution.
CO2	Identify and interpret Fundamental Rights and Duties.
CO3	Analyze the role of Directive Principles in governance.

CO4	Understand the concept and importance of Human Rights.
CO5	To create a congenial climate in the organization

TEXT BOOKS

1.Durga Das Basu– Introduction to the Constitution of India

REFERENCE BOOKS

1. V.N.Shukla– Constitution of India
2. M.Laxmikanth –Indian Polity
3. UpendraBaxi – The Future of Human Rights
4. H.O. Agarwal–Human Rights
5. P.M. Bakshi–The Constitution of India

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**3**	**2**	**2**	**2**	**2**	**3**
CO2	**3**	**2**	**2**	**2**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**2**	**2**
CO4	**3**	**2**	**2**	**2**	**2**	**3**
CO5	**3**	**3**	**2**	**2**	**3**	**2**

Course	THIRD SEMESTER–ALLIED PAPER								
Course Title	ALLIED PHYSICS– II								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UEPH41	4	0	0	IV	3	4	50	50	100

Course Objectives

To understand the basic concepts of optics, modern Physics, concepts of relativity and quantum physics, semiconductor physics, and electronics.

Unit	Course Content	No of Hours
I	**OPTICS: i**nterference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – normal incidence–experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster's law – optical activity – application in sugar industries	12
II	**ATOMIC PHYSICS:** atom models–Bohr atom model–mass number – atomic number–nucleons–vector atom model–various quantum numbers Pauli's exclusion principle–electronic configuration–Bohr magneton Stark effect–Zeeman effect	12
III	**NUCLEAR PHYSICS:** nuclear models – liquid drop model – magic numbers– nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses nuclear fission–chain reaction– critical reaction– critical size-atom bomb–nuclear fusion– Thermo nuclear reactions–differences between fission and fusion.	12
IV	**INTRODUCTIONTORELATIVITY** Frame of reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation –	12
V	**SEMICONDUCTOR PHYSICS:** p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment) – USB cell phone charger	12
	Total	60

TEXT BOOKS

1.R. Murugesan (2005), Allied Physics, S. Chand and Co, New Delhi.

2.K. Thangaraj and D. Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai.

3.Brijlal and N. Subramanyam (2002), Textbook of Optics, S. Chand andCo, New Delhi.

4.R. Murugesan (2005), Modern Physics, S. Chand and Co, New Delhi.

5.A. Subramaniyam Applied Electronics, 2nd Edn., National Publishing Co., Chennai.

REFERENCE BOOKS

1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Willey and Sons, Asia Pvt. Ltd., Singapore.
2. D.R. Khanna and H.R. Gulati (1979). Optics, S. Chand and Co. Ltd., New Delhi.
3. A. Beiser (1997), Concepts of Modern Physics, Tata McGraw Hill Publication, New Delhi.
4. Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, New Delhi.
5. V.K. Metha (2004), Principles of electronics, 6th Edn., S. Chand and Company, New Delhi.

WEB RESOURCES

1.https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318andv=D38BjgUdL5Uandfeature=emb_logo

2.https://www.youtube.com/watch?v=JrRrp5F-Qu4

3.https://www.validyne.com/blog/leak-test-using-pressure-transducers/

4.https://www.atoptics.co.uk/atoptics/blsky.htm

5.https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects

COURSE OUTCOMES

CO1	Explain the concepts of interference diffraction using principles of Superposition of waves and rephrase the concept of polarization based on wave patterns
CO2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation. Appreciate inter disciplinary nature of science and in solar energy related applications.
CO3	Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear model Solve problems on delay rate half –life and mean-life. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy, safety measures carried and get our Govt. agencies like DAE guiding the country in the nuclear field.
CO4	To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice versa. Relate this with current research in this field and get an overview of research projects of National and International importance,
CO5	Summarize the working of semiconductor devices like junction diode, Zener diode, transistors and practical devices we daily use like USB chargers.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	2	3	3	3	3	2
CO3	2	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	2	3	3	3	3	3	3	3	3	3

Course	FOURTH SEMESTER–ALLIED PRACTICAL-II								
Course Title	ALLIED PHYSICS PRACTICAL-II								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UEPHP1	0	0	2	IV	2	2	50	50	100

Course Objectives

Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

List of Experiments (Any 8)

1. Radius of curvature of lens by forming Newton‘s rings
2. Spectrometer-grating—normal incidence method
3. LCR Series resonance circuit
4. LCR Parallel resonance circuit
5. Determination of AC frequency using sonometer
6. Thermal conductivity of poor conductor using Lee‘s disc
7. Determination of figure of merit table galvanometer
8. Characterization of Zener diode
9. Construction of Zener regulated power supply
10. Verification of truth tables of basic logic gates using ICs
11. Verification of De Morgan‘s theorems using logic gate ICs.
12. Deflection Magnetometer(Tan A)

Note:Useofdigitalbalance,digitalscrewgauge,digitalcalipersarepermitted

SEMESTER-V

Semester–V									
Course Code	Part	Course category	Course Name	Hours /Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26UCPH51	III	Core-V	Electricity, Magnetism and Electromagnetism	4	3	50	50	100	4
26UCPH52	III	Core–VI	Atomic & Nuclear Physics	4	3	50	50	100	4
26UCPH53	III	Core–VII	Analog &Communication Electronics	4	3	50	50	100	4
26UCPHP5	III	Core Practical – V	Physics Practical–V	6	3	50	50	100	4
26UCPH5P	III	Core-VIII	Mini Project with Viva Voce	6	3	50	50	100	3
26UEPH51	III	Elective – V	Spectroscopy	4	3	50	50	100	3
26UEPH52		Elective – VI	Mathematical Physics						
26UEPH53		Elective – VII	Python Programming and Basics of AI and Data Science						
26UFIK51	IV	Internship	Internship/Industrial Visit/Field Visit/ Knowledge Updation Activity	-	3	50	50	100	2
26UAEC51	IV	AEC-I	Empowered Vocational English	2	3	50	50	100	2
			Total	30				800	26

Course	FIFTH SEMESTER –CORE THEORY V								
Course Title	ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPH51	4	0	0	V	4	4	50	50	100

Course Objectives

To classify materials based on their electrical and magnetic properties. To analyse the working principles of electrical gadgets .To understand the behavior of dc, ac and transient currents. To know about the communication by electromagnetic waves.

Unit	Course Content	No of Hours
I	**CAPACITORS AND THERMO ELECTRICITY** Capacitor - principle - capacitance of a parallel plate capacitor (with and without dielectrics lab)-effect of dielectric-Carey Foster bridge-temperature coefficient of resistance-Seebeck effect-Laws of thermo emf - Peltier effect -Thomson effect-Thermo electric diagrams and their uses-thermodynamics of thermo couple.	12
II	**MAGNETIC EFFECT OF CURRENT** Biot and Savart‘s law - magnetic induction due to circular coil - force on a current element by magnetic field - force between two infinitely long conductors - torque on a current loop in a field - moving coil galvanometer - damping correction - Ampere‘s circuital law - differential form – divergence of magnetic field - magnetic induction due to toroid.	12
III	**MAGNETISM AND ELECTROMAGNETIC INDUCTION** Magnetic induction B - Magnetization M - relation between B, H and M - magnetic susceptibility - magnetic permeability - experiment to draw B-H curve-energylossduetohysteresis-importanceofhysteresiscurve-Faraday and Lenz laws - vector form - self-inductance -coefficient of self-inductance of solenoid - Anderson‘s method - mutual inductance - coefficient of mutual inductance between two coaxial solenoids - coefficient of coupling.	12
IV	**TRANSIENT AND ALTERNATING CURRENTS** Growth and decay of current in a circuit containing resistance and inductance - growth and decay of charge in a circuit containing resistance and capacitor-growth and decay of charge in an LCR circuit (expression for charge only)-peak, average and rms values of ac-LCR series-parallel circuits-resonance condition -Q factor -power factor.	12
V	**MAXWELL’S EQUATIONS AND ELECTROMAGNETIC WAVES** Maxwell‘s equations in vacuum, material media- physical significance of Maxwell‘s equations-displacement current-plane electromagnetic waves in free space-velocity of light-Poynting vector-electromagnetic waves in a linear homogeneous media-refractive index.	12
	Total	60

TEXT BOOKS

1. Murugeshan. R.,-Electricity and Magnetism, 8thEdn,2006, S. Chand and Co, New Delhi. Al N.K., Electricity and Magnetism, Sultan Chand and Sons, New Delhi.
2. M. Narayanamurthy and N. Nagarathnam, Electricity and Magnetism,4th Edition. National Publishing Co., Meerut.

REFERENCE BOOKS

1. Brijlal and Subramanian, Electricity and Magnetism, 6th Edn., Ratan and Prakash, Agra.
2. Brijlal, N.Subramanyan and Jivan Seshan, Mechanics and Electrodynamics(2005), Eurasia Publishing House(Pvt.)Ltd.,NewDelhi.
3. David J. Griffiths, Introduction to Electrodynamics, 2ndEdn.1997,Prentice Hall of India Pvt. Ltd., New Delhi
4. D.Halliday, R.Resnik and J.Walker-Fundamentals of Physics,6thEdn.,Wiley,NY,2001.

WEBRE SOURCES

1. https://www.edx.org/course/electricity
2. https://www.udemy.com/courses/electricity
3. https://www.edx.org/course/magnetismhttp://www.hajim.rochester.edu/optics/undergraduate/courses.html

COURSE OUT COMES

CO1	Describe various thermo-electric effects and their properties.
CO2	Apply Biot and Savart law to study the magnetic effect of electric current.
CO3	Use Faraday and Lenz laws in explaining self and mutual inductance.
CO4	Analyze the time variation of current and potential difference in AC circuits.
CO5	Relate different physical quantities used to explain magnetic properties of materials.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	3	2	3	3	3	2	2	3	2

Course	FIFTH SEMESTER –CORE THEORY VI								
Course Title	ATOMIC AND NUCLEAR PHYSICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPH52	4	0	0	V	4	4	50	50	100

Course Objectives

To make students understand the development of atom models, quantum numbers, coupling schemes and analysis of magnetic moments of an electron.
To gain knowledge on excitation and ionization potentials, splitting of spectral lines in magnetic and electric fields.
To get knowledge on radioactive decay.
To know the concepts used in nuclear reaction.
To understand the quark model of classification of elementary particles.

Unit	Course Content	No of Hours
I	**VECTOR ATOM MODEL**: Introduction – Vector atom model – electron spin – spatial quantization –quantum numbers associated with vector atom model. Coupling Schemes L-S and j-j coupling. Pauli's Exclusion Principle. Magneticdipolemomentduetoorbitalmotionandspinmotionoftheelectron –Bohr magnetron–Stern-Gerlach experiment.	12
II	**ATOMIC SPECTRA**: Spectral terms and notations –Zeeman Effect – quantum mechanical explanation of normal Zeeman effect. Anomalous Zeeman Effect–quantum mechanical theory–fine structure of sodium D-lines. Paschen-Back Effect, Stark Effect.	12
III	**STRUCTURE OF NUCLEI**: General Nuclear Properties – charge, size, shape, mass, density, spin, parity. Mass defect and Binding energy –Binding energy curve. Nuclear force – characteristics of nuclear forces. Nuclear Models –Liquid Drop Model–similarities between nucleus and liquid drop –mass formula. Shell Model-magic numbers–evidences that led to shell	12
IV	**RADIOACTIVITY**: Discovery of radioactivity – exponential decay law– half-life, mean-life. Natural and Artificial radio activity. Properties of alpha rays, beta rays and gamma rays–Gamow's theory of alpha decay(qualitative study)–Geiger-Nuttal law– beta decay spectra	12
V	**Nuclear Reactor, Accelerator and Detectors**: Nuclear fusion – Nuclear fission. Nuclear Reactor – construction and working – radio isotopes and its applications. Charged Particle Accelerators-Cyclotron–Detectors of Nuclear Radiation–Geiger Muller Counter–Scintillation Counter. Nuclear facilities in India.	12
	Total	60

TEXT BOOKS

1. R.Murugesan,ModernPhysics,S.ChandandCo.**(**Allunits**)**(UnitsIandII-Problems)
2. BrijlalandN.Subrahmanyam,AtomicandNuclearPhysics,S.ChandandCo.(All units)
3. J.B. Rajam, Modern Physics, S. Chand and Co.
4. Sehgal and Chopra, Modern Physics, Sultan Chand, New Delhi
5. Arthur Beiser–Concept of Modern Physics, McGraw Hill Publication, 6th Edition.

REFERENCE BOOKS

1.Perspective of Modern Physics, Arthur Beiser, McGraw Hill.

2.Modern Physics, S. Ramamoorthy, National Publishing and Co.

3.Tayal, D.C.2000–NuclearPhysics, Edition, Himalaya Publishing House, Mumbai.

4.Irving Kaplan, Nuclear Physics, 2nd Edition, Oxford & IBH Publishing, New Delhi, **2010.**

5.J.B. Rajam, Atomic Physics, 7th Edition, S. Chand & Company, NewDelhi, **2016.**

6.R.R. Roy **and** B.P. Nigam, Nuclear Physics: Theory and Experiment, Wiley Eastern Limited, New Delhi,**2008.**

WEB RESOURCES

1. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
2. https://makingphysicsfun.files.wordpress.com/2015/01/photoelectric-effect.pptx
3. https://www.khanacademy.org/science/physics/quantum-physics/in-in-nuclei/v/types-of-decay
4. https://www.khanacademy.org/science/in-in-class-12th-physics-india/nuclei

COURSE OUTCOMES

CO1	List the properties of electrons and positive rays, define specific charge of positive rays and know about different mass spectrographs.
CO2	Outline photoelectric effect and the terms related to it, State laws of photoelectric emission, Explain experiments and applications of photoelectric effect, Solve problems based on photoelectric equation.
CO3	Explain different atom models, Describe different quantum numbers and different coupling schemes.
CO4	Differentiate between excitation and ionization potentials, Explain Davis and Goucher‘s experiment, Apply selection rule, Analyse Paschen-Back effect, Compare Zeeman and Stark effect.
CO5	Understand the condition for production of laser; Appreciate various properties and applications of lasers.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	2	3	3	3
CO4	2	3	3	3	2	2	3	2	2	2

CO5	3	2	3	3	2	3	3	2	2	3

Course	**FIFTH SEMESTER –CORE THEORY VII**								
Course Title	**ANALOG AND COMMUNICATION ELECTRONICS**								
Course Code	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
							CIA	**External**	**Total**
26UCPH53	**4**	0	0	**V**	4	4	**50**	**50**	**100**

Course Objectives

To study the design, working and applications of semiconducting devices. To construct various electronic circuits. To study them in details. To study the basis of audio and video communication systems and the aspects of satellite and Fiber Optic Communications**.**

Unit	**Course Content**	**No of Hours**
I	**DIODES:** Diode characteristics–half wave rectifier, center tapped and bridge full wave rectifiers, calculation of efficiency and ripple factor - clipper circuits, clamping circuits. DC power supply: Block diagram of a power supply, Zener diode as voltage regulator.	**12**
II	**TRANSISTOR AMPLIFIERS:** Transistor configurations: CB, CE and CC modes – I-V characteristics and hybrid parameters – DC load line – Q point self-bias-RC coupled CE amplifier–power amplifiers–push pull amplifiers – tuned amplifiers.	**12**
III	**TRANSISTOR OSCILLATORS:** feedback amplifier - principle of feedback, positive and negative feedback - voltage and current gain – advantages of negative feedback-Barkhausen's criterion-Transistor oscillators: Hartley, Colpitts, Phase shift oscillators.	**12**
IV	**OPERATIONAL AMPLIFIERS AND TIMER:** Differential amplifiers**–**OP-AMP characteristics–IC741 pin configuration Inverting and non-inverting amplifiers–summing and difference amplifiers – differentiator and integrator –IC 555pin configuration- astable multivibrator (square wave generator) – monostable vibrator	**12**
V	**MODULATION AND DEMODULATION: T**heory of amplitude modulation - frequency modulation – comparison of AM and FM –phase modulation – pulse width modulation – pulse modulation systems: PAM, PPM, and PCM – D**emodulation:** AM and FM detection.	**12**

Total	60

TEXT BOOKS

1. V.K. Mehta -Principles of Electronics, S. Chand and Co. Ltd., 2004.
2. V. Vijayendran-Integrated Electronics, S. Vishwanathan Publishers, Chennai.
3. B.L. Theraja-A Text Book of Electrical Technology.
4. John D. Ryder-Electronic fundamentals and Applications.
5. Malvino - Electronic Principles, Tata McGraw Hill.

REFERENCE BOOKS

1. B. Grob-Basic Electronics, 6th edition, McGraw Hill, NY, 1989.
2. Herbert Taub and Donald schilling-Digital Integrated Electronics, McGraw Hill, NY.
3. Ramakant A.–Op amp principles and linear integrated circuits, Gaykward
4. Bagdeand S.P. Singh-Elements of Electronics.
5. Millman and Halkias-Integrated Electronics, Tata McGraw Hill.

WEB RESOURCES

1. https://www.queenmaryscollege.edu.in/eresources/undergraduateprogram/py157
2. www.ocw.mit.edu>...>Circuits and Electronics
3. www.ocw.mit.edu>...>Introductory Analog Electronics Laboratory
4. https://www.elprocus.com> semiconductor deviceshttps://www.britannica.com>technology

COURSE OUTCOMES

CO1	Explain the basic concepts of semi conductor's devices.
CO2	Know and classify the basic principles of biasing and transistor amplifiers
CO3	Acquire the fundamental concepts of oscillators.
CO4	Understand the working of operational amplifiers
CO5	Learn and analyze the operations of sequential and combinational digital circuits

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	3	2	2	3	2	2	2
CO3	2	2	3	1	3	3	1	3	3	3
CO4	2	3	3	3	3	3	3	2	1	2
CO5	3	2	3	3	2	2	3	2	2	3

Course	FIFTH SEMESTER – ELECTIVE THEORY - V								
Course Title	SPECTROSCOPY								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UEPH51	4	0	0	V	3	4	50	50	100

Course Objectives

This course facilitates an understanding of atomic and molecular spectra and the instrumentations. The paper needs a basic knowledge about atomic structure and the learners are expected to gain knowledge to identify materials with the help of various spectra

Unit	Course Content	No of Hours
I	**MICROWAVE SPECTROSCOPY**: Rotation of molecules – Classification of molecules – Rotation spectra of diatomic molecules – Intensities of spectral lines – Effect of isotopic substitution – non-rigid rotator – Spectrum of a non-rigid rotator-Techniques and Instrumentation of Microwave spectroscopy (Microwave spectrometer)	12
II	**INFRAREDSPECTROSCOPY**: I.R. spectroscopy–Vibrating diatomic molecules –Simple Harmonic Oscillator-Anharmonic oscillator–Diatomic vibrating rotator- Analysis by IR techniques. Difference between IR and Microwave spectroscopy.	12
III	**RAMANSPECTROSCOPY**: Raman effect-Discovery–Quantum theory of Raman effect– Classical theory of Raman Effect–Pure rotational Raman spectra of Linear molecules –Advantages and disadvantages of Raman spectroscopy-Raman spectrometer.	12
IV	**ULTRAVIOLET SPECTROSCOPY:** Introduction–Principle of Ultraviolet Spectroscopy–Transmittance and absorbance–Lamber- Beer law–UV Spectrophotometer and spectrum recording–shifts of bands with solvents– Analytical uses of UV Spectroscopy	12
V	**NMR SPECTROSCOPY:** Introduction –Theory of NMR spectroscopy and origin of NMR signal – NMR instrumentation – Application of NMR spectroscopy - Magnetic resonance imaging (MRI) – Interpretation of NMR spectra- Advantages and disadvantages of MRI.	12
	Total	60

TEXT BOOKS

1.Fundamentals of Molecular Spectroscopy-Colin N Banwell Elaine-M Mccash Fifth Edition

2. Molecular Structure and Spectroscopy-G. Aruldhas, PHI Learning Pvt. Ltd, India

REFERENCE BOOKS

1. Handbook of Analytical Instruments-R.S. Khandpur, Tata MCGrow Hill Ltd.

2. Spectroscopy-G.R. Chatwaland S.K. Anand, Himalaya publishing House, New Delhi.

COURSE OUTCOMES

CO1	Recall the basic principles of microwave and IR spectroscopy.

CO2	Explain Raman and UV spectroscopy and their working principles.
CO3	Apply spectroscopy techniques to analyze molecular structures
CO4	Analyze NMR spectra and interpret molecular information.
CO5	Evaluate different spectroscopic methods and their applications in science and medicine.

Course	**FIFTH SEMESTER–ELECTIVE THEORY-VI**								
Course Title	**MATHEMATICAL PHYSICS**								
Course Code	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
							CIA	**External**	**Total**
26UEPH52	**4**	0	0	**V**	**3**	**4**	**50**	**50**	**100**

Course Objectives

To understand higher mathematical concepts which are applied to solve problems in Physics and similar situations

Unit	Course Content	No of Hours
I	**MATRICES:** Types of matrices symmetric, Hermitian, unitary and orthogonal matrices–characteristic equation of a matrix–Cayley-Hamilton theorem–inverse of matrix by Cayley-Hamilton theorem–diagonalization of 2x2 real symmetric matrices.	**12**
II	**VECTOR CALCULUS:** Vector differentiation– directional derivatives–definitions & Physical significance of gradient, divergence, curl and Laplace operators–vectoridentities–line,surfaceandvolumeintegrals–statementand proof for Gauss‘s divergence theorem and Stoke‘s theorem	**12**
III	**ORTHOGONAL CURVILINEAR COORDINATES:** Basis vectors –unit vectors in Cartesian, cylindrical and spherical coordinate systems–gradient of a scalar–divergence and curl of a vector–Laplacian in these coordinate systems.	**12**
IV	**FOURIER SERIES:** Periodic functions – Dirichlet‘s conditions – general Fourier series–even and odd functions and their Fourier expansions–Fourier cosine and sine –Fourier analysis of square wave, saw-tooth wave, half wave/full wave rectifier wave forms. **FOURIER TRANSFORMS**: Fourier Integral theorem (Statement only)–Fourier, Fourier sine and Fourier cosine transforms,–Fourier transform of single pulse – trigonometric, exponential and Gaussian functions – inverse Fourier transform	**12**
V	**NUMERICAL METHODS:** Determination of zeros of polynomials–roots of algebraic and transcendental equations using bisection methods – Newton-Raphson method to find square root and cube roots – Evaluation of definite integral using trapezoidal rule, Simpson‘s 1/3 and 1/8 rule	**12**
	Total	**60**

TEXT BOOKS

1.Mathematical Physics –*Satyaprakash*, Sultan Chand, Meerut

2.Mathematical Physics –B.D. Gupta.

3.Mathematical Physics –H.K. Das, S. Chand & Co, New Delhi.

4.Numerical methods, Singaravelu, Meenakshipublication, 4th Edn., 1999.

5.NumericalmethodsP.Kandasamy,K.Thilagavathy,K.Gunavathi,S.Chand,2016

REFERENCE BOOKS

1.Fourier Analysis by M.R. Spiegel, 2004, Tata McGraw-Hill.
2.Engineering Mathematics III-B,M.K. Venkataraman,
3.Applied Mathematics for Scientists and Engineers, Bruce R. Kusse & Erik A. Westwig, 2nd Ed, WILEY-VCH Verlag, 2006.
4.Vector space & Matrices– J. C. Jain, Narosa Publishing House Pvt. Ltd.

COURSE OUTCOMES

CO1	Recall basic concepts of matrices and their types.
CO2	Explain vector calculus operations like gradient, divergence, and curl.
CO3	Apply orthogonal curvilinear coordinate systems in vector problems.
CO4	Analyze Fourier series and Fourier transforms for different functions
CO5	Evaluate numerical methods for solving equations and integrals.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	3	2	2	3	2	2	2
CO3	2	2	3	1	3	3	1	3	3	3
CO4	2	3	3	3	3	3	3	2	1	2
CO5	3	2	3	3	2	2	3	2	2	3

Course	FIFTH SEMESTER–ELECTIVE THEORY-VII								
Course Title	PYTHON PROGRAMMING AND BASICS OF AI & DATA SCIENCE								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UEPH53	4	0	0	V	3	4	50	50	100

Course Objectives

Objective of the course is to provide knowledge about the basics of Computer programming in Python and to solve problems by writing programs. Basic knowledge of AI and Data Science. The paper does not need any special prerequisite and the learners are expected to come out with the ability to apply the computer language PYTHON to solve PHYSICS problems.

Unit	Course Content	No of Hours
I	**BASICS**-PythonIntroduction–Tokens:literals,Variables,ReservedWords, Operators, Delimiters and Escape sequences - Standard Data Types - Expressions–Comments in Python–Input and Output functions-Simple Physics formula based programming in Python..	12
II	**CONTROL STATEMENTS**: Control Flow Statements and Syntax with examples-Looping statements-string operations-LISTS: List-list slices-list methods - list loop –Tuples assignment– sets - Dictionaries.	12
III	**FUNCTIONS:** Definition and types- Passing parameters to a Function-Scope –Type conversion-Passing Functions to a Function- Modules-Standard Modules–Inbuilt Function- Scope of Variables.	12
IV	**OBJECT ORIENTED FEATURES:** Introduction-Defining Classes- Public and private Data member-Creating Object-Accessing class members-Using objects. Constructors-Destructors- Introduction of simple Inheritance – Introduction of simple Polymorphism-**ERROR HANDLING**: Run Time Errors-Exception Model	12
V	**ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**: Introduction-History of AI - Applications of AI – Defining Algorithm – A* Algorithm. DATASCIENCE: Introduction–Defining Data, Information and Data structure-Basic concept of Probability and Statistics.	12
	Total	60

TEXT BOOKS

1. Fundamental of Pythons-First program by Kenneth A. Lambert
2. Python Programming-A modular approach by pearson-sheetal Taneja
3. Hand son AI for beginners by Patric D. Smith Introduction to Data Science by Dr. Sushil Dohare, Dr. V Selva Kumar Sachin Raval

REFERENCE BOOKS

1.Python Crash Course–Eric MatthesNostarchpress,sanfransisco

2.Python programming using problem solving approach–Reema Thareja-Oxford university press

3.Python: The Complete Reference by MartinC.Brown
AI for beginners by Jassim M

WEB RESOURCES

1. https://youtu.be/eWRfhZUzrAc
2. https://youtu.be/kqtD5dpn9C8
3. https://youtu.be/9IgscYw7BnYhttps:/youtu.be/ua-CiDNNj30

COURSE OUTCOMES

CO1	Recall basics of Python programming, syntax, and data types.
CO2	Explain control statements, loops, lists, tuples, and dictionaries.
CO3	Apply functions, modules, and OOP concepts in Python programs.
CO4	Analyze errors, exceptions and object-oriented features like inheritance and polymorphism.
CO5	Evaluate basic concepts of Artificial Intelligence and Data Science including algorithms and data concepts

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	3	2	2	3	2	2	2
CO3	2	2	3	1	3	3	1	3	3	3
CO4	2	3	3	3	3	3	3	2	1	2
CO5	3	2	3	3	2	2	3	2	2	3

Course	FFIFTH SEMESTER – CORE PRACTICAL V								
Course Title	PHYSICS PRACTICAL - V								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPHP5	0	0	6	V	4	6	50	50	100

Course Objectives

Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.

List of Experiments (Any10)

1. Potentiometer–Calibration of Voltmeter(High Range)
2. Spectrometer–Grating-Normal incidence-Wavelength of Mercury spectral lines.
3. Spectrometer–Grating-Minimum deviation-Wavelength of Mercury spectral lines.
4. Thevenin‘s and Norton‘s Theorem verification
5. V-I Characteristics of Junction diode and Zener diode
6. OPAMP–Adder & Subtractor
7. OPAMP–Low Pass & High Pass Filter
8. Characteristics of a transistor–(CE mode)
9. RC coupled CE transistor amplifier – single stage.
10. Colpitt‘s oscillator-transistor
11. Spectrometer–(i-d) curve.
12. Spectrometer–(i-i′) curve.
13. Ballistic Galvanometer–High resistance by leakage
14. Desauty‘sBridge–DeterminationofC,C1&C2inseriesandparallel
15. Astablemultivibratorusing555timer
16. Bistablemultivibrator–555timer

Course	ABILITY ENHANCEMENT COURSE-I								
Course Title	EMPOWERED VOCATIONAL ENGLISH								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UAEC51	2	0	0	V	2	2	50	50	100

Learning Objectives

LO1	To build self- assurance in students by mastering interpersonal, team- management, and leadership abilities.
LO2	To equip aspiring learners with skills that transforms them into effective young managers.
LO3	To sharpen communication proficiency for professional and workplace contexts.
LO4	To foster strategic thinking and problem-solving through advanced writing & presentation techniques.
LO5	To develop etiquette and corporate-ready competencies for modern business environments

Unit	Contents	No. of Hours
I	Communication Skills, Current English Usage, Aptitude and Attitude, Team Building and Leadership, Psychological Tests, Effective Resume Writing	6
II	Précis Writing, Essay Writing, Goal Setting, Conflict Management, Appearing for an Interview , Myths regarding Group Discussion	6
III	Debates, Presentation for Small and Large Groups, Prioritization, Time Management ,Stress Interview , Prerequisites of a Group Discussion	6
IV	Marketing and Business Presentations, Report Writing , Cross- Cultural Communication, Lateral Thinking, Qualities of a Candidate for an Interview, Generating Ideas for Discussion	6
V	Telephone Etiquette, Email Etiquette, Concepts of Leadership, Insights from Great Leaders, Mock Interview, Mock Group Discussion	6
	Total	**30**

Course Outcomes

CO1	Students will demonstrate strong inter personal and leadership skills in team settings.
CO2	Learners will apply effective communication strategies in current English usage.
CO3	Graduates will craft professional résumés and master interview-ready writing styles.
CO4	Participants will manage conflicts, set goals, and deliver impactful presentations.
CO5	Individuals will exhibit polished telephone & email etiquette alongside refined leadership insights

SEMESTER– VI

Semester–VI									
Course Code	Part	Course category	Course Name	Hours/ Week	Examination				Credits
					Duration in hours	Max Marks			
						CIA	ESE	Total	
26UCPH61	III	Core-IX	Relativity and Quantum Mechanics	4	3	50	50	100	4
26UCPH62	III	Core– X	Solid State Physics	4	3	50	50	100	4
26UCPH63	III	Core– XI	Digital Electronics & Microprocessor 8085	4	3	50	50	100	4
26UCPHP7	III	Core Practical– VI	Physics Practical– VI	6	3	50	50	100	4
26UCPH6P	III	Core-XII	Project with Viva Voce	6	3	50	50	100	4
26UEPH61	III	Elective– VIII	Energy physics	4	3	50	50	100	3
26UEPH62		Elective– IX	Material Science						
26UEPH63		Elective–X	Nano Science& Nanotechnology						
26UAEC61	IV	AEC-II	Design Thinking	2	3	50	50	100	2
26U5EA61	V	Common	Extension Activity	-	-	-	-	100	1
				30				800	26

Course	SIXTH SEMESTER –CORE THEORY IX								
Course Title	RELATIVITY & QUANTUM MECHANICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPH61	4	0	0	VI	4	4	50	50	100

Course Objectives

To understand the theory of relativity, its postulates and the consequences. To learn the importance of transformation equations. And also, to learn special theory of relativity. To interpret the wave theory of matter with various theoretical and experimental evidences. To derive and use Schrodinger‘s wave equation and also learn about various operators. To solve Schrodinger‘s wave equation for simple problems and analyse to understand the solutions.

Unit	Course Content	No of Hours
I	**SPECIAL THEORY OF RELATIVITY**: Frames of reference – Galilean Relativity – Postulates of special theory of relativity – Lorentz transformations–lengthcontraction–timedilation–conceptofsimultaneity – variation of mass with velocity – Einstein‘s mass-energy relation – relativistic momentum – energy relation.	12
II	**FAILURE OF CLASSICAL PHYSICS**: Black body radiation – Failure of Classical Physics to explain energy distribution in the spectrum of a black body–Planck‘s Quantum theory–Wein‘s distribution law–Rayleigh Jean‘s law. Photo Electric Effect – Difficulty with Classical Physics – Einstein‘s Photo Electric Equation – work function.	12
III	**CONCEPT OF MATTER WAVES**: de Broglie‘s concept of matter waves – expression for de Broglie‘s wavelength–phase velocity–group velocity–relationship. Heisenberg‘s Uncertainty Principle – Elementary proof of Heisenberg‘s uncertainty relations.	12
IV	**OPERATORS AND SCHRÖDINGER EQUATION**: Postulates of quantum mechanics –Wave function and its interpretation –linear operators– Eigen value – Hermitian operator – Properties of Hermitian operator – Commutator Algebra. **SCHRÖDINGER EQUATION**: Schrodinger‘s wave equation in time dependent form – Steady state Schrodinger‘s wave equation – extension to three dimensions.	12
V	**APPLICATIONS OF SCHRÖDINGER EQUATIONS**: Particle in a one-dimensional box – Particle in a rectangular three-dimensional box. Simple harmonic oscillator–One dimensional simple harmonic oscillator in quantum mechanics–zero-point energy. Reflection at a step potential– Transmission across a potential barrier – Barrier Penetration (tunneling effect).	12
Total		60

TEXT BOOKS

1. Modern Physics, R. Murugeshan, Kiruthiga Sivaprasath, S. Chand and Co., 17th Revised Edition, 2014.
2. Concepts of Modern Physics, A.Beiser, 6th Ed., McGraw-Hill, 2003.
3. *Special Theory of Relativity, S.P. Puri*, Pearson Education, India, 2013.
4. Quantum Mechanics, Ghatak and Loganathan, Macmillan Publications.
5. Quantum mechanics–Satya prakash and Swati Saluja.Kedar Nath Ram Nath andCo.

REFERENCEBOOKS

1. Fundamentals of Modern Physics, Peter J. Nolan, 1st Edition, 2014, by Physics anathan, Narosa Pub. House, Chennai, 2005.
2. Quantum Mechanics, V.K. Thangappan, New Age International, New Delhi.
3. A Text Book of Quantum Mechanics, Mathews and Venkatesan, Tata McGraw Hill, New Delhi.
4. Introduction to Quantum Mechanics, Pauling and Wilson, McGraw Hill Co., New York.

WEB RESOURCES

1. http://hyperphysics.phy-astr.gsu.edu/hbase/qapp.html
2. https://swayam.gov.in/nd2_arp19_ap83/preview
3. https://swayam.gov.in/nd1_noc20_ph05/preview
4. https://www.khanacademy.org/science/physics/special-relativity/minkowski-spacetime/v/introduction-to-special-relativity-and-minkowski-spacetime-diagrams

COURSE OUTCOMES

CO1	Understand various postulates of special theory of relativity.
CO2	Appreciate the importance of transformation equations and also the general theory of relativity.
CO3	Realize the wave nature of matter and understand its Importance
CO4	Derive Schrodinger equation and also realize the use of operators.
CO5	Apply Schrödinger equation to simple problems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	3	2	2	3	2	2	2
CO3	2	2	3	2	3	3	2	3	3	3
CO4	2	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	2	2	3	2	2	3

Course	SIXTH SEMESTER –CORETHEORYX								
Course Title	SOLID STATE PHYSICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPH62	4	0	0	VI	4	4	50	50	100

Course Objectives

To understand constituents, properties and models of nucleus. To give reason for radioactivity and study their properties. To learn about the principles of various particle detectors and accelerators. To acquire Knowledge on different types of nuclear reactions and their applications. To know there as on for cosmic rays and their effect on the surface of earth and also understand the classification of elementary particles.

Unit	Course Content	No of Hours
I	**BONDING IN SOLIDS, CRYSTAL STRUCTURE**: types of bonding– Ionic bonding – bond energy of NaCl molecule –covalent bonding — Van-der-Waalsbonding–crystallattice–latticetranslationalvectors–latticewith basis–unit cell– Bravai's lattices–crystal structure–packing of SCC, BCC, and FCC structures–structures of NaCl and diamond crystals–Millerindices – procedure for finding them.	12
II	**ELEMENTARY LATTICE DYNAMICS**: lattice vibrations and phonons: linear monoatomic and diatomic chains. Acoustical and optical phonons –Dulong and Petit's Law –properties of metals – classical free electron theory of metals (Drude-Lorentz) – Ohm's law – electrical and thermal conductivities – Weidemann-Franz' law.	12
III	**MAGNETIC PROPERTIES OF SOLIDS**: permeability, susceptibility, relation between them – classification of magnetic materials – properties of dia, para,ferro, ferri and antiferromagnetism – Langevin's theory of diamagnetism – Weiss theory of paramagnetism – Curie-Weiss law – Weiss theoryofferromagnetism(qualitativeonly)–domains–B-Hcurve–hysteresis and energy loss – soft and hard magnets.	12
IV	**DIELECTRIC PROPERTIES OF MATERIALS**: Basic definitions - polarization and electric susceptibility –local electric field of an atom – dielectric constant and polarisability – polarization processes: electronic polarization– calculation of polarisability – ionic, orientational and space charge polarization –internal field – Clausius - Mosotti relation – frequency dependence of dielectric constant –dielectric loss – effect of temperature on dielectric constant.	12
V	**FERROELECTRIC & SUPERCONDUCTING PROPERTIES OF MATERIALS**: ferroelectric effect: Curie-Weiss Law – ferroelectric domains,– elementary band theory: band gap(no derivation) — Hall effect – measurement of conductivity (four probe method) - Hall coefficient. Superconductivity: general properties of superconducting materials – critical temperature –critical magnetic field – Meissner effect –isotope effect– type-I and type-II superconductors – London's equation and penetration depth.	12
	Total	60

TEXT BOOKS

1. Introduction to Solid State Physics, Kittel, Willey Eastern Ltd (2003).
2. Solid state Physics, Rita John,1st edition, Tata Mc Graw Hill publishers(2014).
3. Solid State Physics, R L Singhal, Kedarnath Ram Nath & Co., Meerut (2003)
4. Elements of Solid State Physics,J.P.Srivastava,2ndEdition,2006,Prentice-Hall of India
5. Introduction to Solids, Leonid V. Azaroff, 2004,Tata Mc-Graw Hill
6. Solid State Physics, N.W. Ashcroft and N.D.Mermin,2011,Cengage Learning
7. Solid State Physics, H.I bachandH.Luth,2009,Springer
8. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India
9. Solid State Physics,M.A.Wahab,2011,Narosa Publishing House, ND

REFERENCE BOOKS

1. Puri&Babber–Solid State Physics–S. Chand & Co. New Delhi.
2. Kittel-Introduction to solid state physics, Wiley and Sons,7th edition.
3. Raghavan- Materials science and Engineering, PHI
4. Azaroff- Introduction to solids, TMH
5. S.O. Pillai- Solid State Physics, Narosa publication
6. A.J. Dekker- Solid State Physics, Mc Millan India Ltd.
7. Elements of Solid State Physics,J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India
8. Solid State Physics, K. Ilangovan, 1st Edition, MJP Publishers, 2021.

WEBRE SOURCES

1. https://nptel.ac.in/courses/115105099/
2. https://nptel.ac.in/courses/115106061/

COURSEOUTCOMES

CO1	Classify the bonding and crystal structure also learn about the crystal structure analysis Using X ray diffraction.
CO2	Understand the lattice dynamics and thus learn the electrical and thermal properties of Materials.
CO3	Give reason for classifying magnetic material on the basis of their behaviour.
CO4	Comprehend the dielectric behavior of materials.
CO5	Appreciate the ferroelectric and superconducting properties of materials.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	3	3	3	3	3	2	3	3
CO2	2	3	2	3	2	2	S	2	2	2
CO3	3	2	3	2	3	2	2	3	3	3
CO4	3	3	3	3	2	3	3	2	2	2
CO5	3	2	2	3	3	2	3	2	2	3

Course	SIXTH SEMESTER –CORETHEORYXI								
Course Title	DIGITAL ELECTRONICS & MICROPROCESSOR 8085								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPH63	4	0	0	VI	4	4	50	50	100

Course Objectives

To learn all types of number systems, Boolean algebra and identities, digital circuits for addition and subtraction,flip-flops,registers,counters.Togettheknowledgeonfundamentalsof8085architecture, instruction sets and simple programs.

Unit	Course Content	No of Hours
I	**Decimal, binary, octal, hexadecimal numbers systems and their conversions – codes**: BCD, gray and excess-3 codes –code conversions — binary addition, binary subtraction using 1‘s & 2‘s complement methods – Booleanlaws–De-Morgan‘stheorem–basiclogicgates-universallogicgates (NAND & NOR) –standard representation of logic functions (SOP& POS)– minimization techniques (Karnaugh map: 2, 3, 4 variables).	12
II	**Adders:**half&fulladder–subtractors:half&fullsubtractor–parallelbinaryadder– magnitudecomparator–multiplexers(4:1) & demultiplexers (1:4),encoder(8-line-to-3-line)and decoder(3- line-to-8-line), BCD to seven segment decoder.	12
III	**Flip-flops:**R-SFlip-flop,J-KFlip-flop,TandDtypeflip-flops,master-slave flip-flop,truthtables,registers:-serialinserialoutandparallelinandparallel out–countersasynchronous:-mod-8,mod-10,synchronous-ringcounterand **up-downcounter – A/DandD/Aconverter.**	12
IV	**General memory operations**,ROM, RAM (static and dynamic),PROM, EPROM,EEPROM,EAROM.IC–logic families: RTL, DTL, TTL logic ,CMOSNAND & NOR Gates ,CMOS Inverter, Programmable Logic Devices–Programmable Logic Array(PLA), Programmable Array Logic (PAL).	12
V	8085 Microprocessor: Introduction to microprocessor – pin configuration of 8085 – Flags – Registers (General and special purpose) –interrupts and its priority – instruction set of 8085 – addressing modes of 8085 - Assembly language programming using 8085 – programs for addition, subtraction, multiplication and division (8-Bit only).	12
	Total	60

TEXT BOOKS

1. M.Morris Mano,—Digital Design—3rd Edition, PHI, NewDelhi.
2. Ronald J. Tocci. —Digital Systems-Principles and Applications‖ 6/e. PHI. New Delhi. 1999.

(UNITS I to IV)

3. S. Salivahana & S.Arivazhagan – Digital circuits and design
4. Microprocessor Architecture, Programming and Applications with the 8085 – Penram International Publishing, Mumbai.- Ramesh S.Gaonakar
5. MicrocomputerSystemsthe8086/8088family–YU-ChengLiuandGlenSA

REFERENCE BOOKS

1. Herbert Taub and Donald Schilling.—Digital Integrated Electronics‖. Mc Graw Hill. 1985.
2. S.K.Bose.—Digital Systems‖.2/e.New Age International.1992.
3. D.K. Anvekar and B.S. Sonade.—Electronic Data Converters: Fundamentals &Applications‖.TMH.1994.
4. Malvino and Leach.—Digital Principles and Applications‖. T M G Hill Edition
5. Microprocessors and Interfacing – Douglas V. Hall
6. Microprocessor and Digital Systems– Douglas V. Hall

WEB RESOURCES

1. https://youtu.be/-paFaxtTCkI
2. https://youtu.be/s1DSZEaCX_g

COURSE OUTCOMES

CO1	Learn about number systems, Boolean algebra, logical operation and logic gates
CO2	Understand the working of adder, subtractors, multiplexers and demultiplexers.
CO3	Get knowledge on flip-flops and storage devices.
CO4	Gain inputs on architecture of microprocessor 8085.
CO5	Develop program writing skills on microprocessor 8085.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	3	3	3	3	3	2	3	3
CO2	2	3	2	3	2	2	3	2	2	2
CO3	3	2	3	2	3	2	2	3	3	3
CO4	3	3	3	3	2	3	3	2	2	2
CO5	3	2	2	3	3	2	3	2	2	3

Course	SIXTH SEMESTER–ELECTIVE THEORY-VIII								
Course Title	ENERGY PHYSICS								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UEPH61	4	0	0	VI	3	4	50	50	100

Course Objectives

To get the understanding of the conventional and non-conventional energy sources, their conservation and storage systems.

Unit	Course Content	No of Hours
I	**INTRODUCTION TO ENERGY SOURCES:** World **reserve of** energy sources–energysourcesandtheiravailability–conventionalenergysources– non-conventional and renewable energy sources – comparison – merits, demerits **and applications of fossil fuels**.	12
II	**SOLAR ENERGY:** Introduction–solar constant–solar radiation at the Earth's surface -Photovoltaic principle - Basic Silicon Solar cell-Basic photovoltaic system for power generation-Advantages and disadvantages-Types of solar cells-Application of solar photo voltaic systems–solar pond–solar cooker–solar Water heater–solar crop dryer-solar greenhouse– types of green houses	12
III	**WIND ENERGY:** Introduction - Classification and description of Wind Energy Conversion Systems(WECS)–Principle and working of wind energy collectors - Ocean Thermal Energy Conversion (OTEC)- tidal energy - advantages and disadvantages of WECS, OTEC and Tidal energy	12
IV	**BIOMASS ENERGY:** Introduction – classification – biomass conversion technologies–Thermochemicalandbiochemicalconversion–biogasgeneration – classification of biogas plants – floating drum plant – fixed dome type plant - advantages & disadvantages.	12
V	**ENERGY STORAGE:** Importance of energy storage-batteries-lead acid battery -nickel-cadmium battery – fuel cells – types of fuel cells – Advantages and disadvantages of fuel cells–applications of fuel cells.	12
	Total	60

TEXT BOOKS

1. G.D.Rai,Non-Conventional Sources of Energy, Khanna Publishers,2009,4th Edn.
2. SP Sukhstme, JK Nayak, Solar Energy, Principles of Thermal Collection and Storage, McGraw Hill, 2008, 3rdEdn.
3. D P Kothari, K P Singal, Rakesh Rajan, PHI Learning Pvt Ltd, 2011, 2nd Edn.

REFERENCE BOOKS
1. John Twidell &Tony Weir, Renewable Energy Resources, Taylor&Francis,2005, 2nd Edn. 2. S.A.Abbasi and Nasema Abbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd, 2008. 3. M.P.Agarwal, Solar Energy,S.Chand&Co.Ltd.,NewDelhi,1982 4. H.C.Jain, Non-Conventional Sources of Energy, Sterling Publishers,1986.

COURSE OUTCOMES	
CO1	Recall different energy sources and their availability.
CO2	Explain solar energy systems and their applications.
CO3	Apply concepts of wind, tidal, and ocean energy systems.
CO4	Analyze biomass energy conversion and biogas plants.
CO5	Evaluate energy storage systems like batteries and fuel cells.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	3	2	2	3	2	2	2
CO3	2	2	3	1	3	3	1	3	3	3
CO4	2	3	3	3	3	3	3	2	1	2
CO5	3	2	3	3	2	2	3	2	2	3

Course	SIXTH SEMESTER–ELECTIVE THEORY-IX								
Course Title	MATERIAL SCIENCE								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UEPH62	4	0	0	VI	3	4	50	50	100

Course Objectives

To learn imperfections in crystals, deformation of materials and testing of materials. To get knowledge on behavior of a material, under the action of light and their applications. To know the applications of crystal defects.

Unit	Course Content	No of Hours
I	**CRYSTAL IMPERFECTIONS:** introduction – point defects: vacancies**(***problems***)**,interstitials,impurities,electronicdefects–pointdefects – linedefects:edgedislocation**(***problems***)**,screwdislocation–surfacedefects: extrinsicdefects–intrinsicdefects:grainboundaries,tilt&twistboundaries, twinboundaries,stackingfaults–volumedefects–effectofimperfections.	**12**
II	**MATERIAL DEFORMATION: I**ntroduction–elastic behavior of materials – atomic model of elastic behavior–modulus as a parameter in design–rubber like elasticity–in elastic behavior of materials–relaxation process– Viscoelastic behavior of materials.	**12**
III	**PERMANENT DEFORMATION AND STRENGTHENING METHODS OF MATERIALS:** introduction –plastic deformation: tensile stress-strain curve–plastic deformation by slip–creep: mechanism of creep–creep resistant materials – strengthening methods: strain hardening, grain refinement – solid solution strengthening.	**12**
IV	**OPTICAL MATERIALS:** introduction – optical absorption in metals, semiconductors and insulator s–NLO materials and their applications – display devices and display materials: fluorescence and phosphorescence – light emitting diodes –liquid crystal displays.	**12**
V	**MECHANICAL TESTING:** destructive testing: tensile test, hardness test–nondestructive testing(NDT):radio graphic methods–thermal methods of NDT: thermograph– equipment used for NDT: metallurgical microscope	**12**
	Total	**60**

TEXT BOOKS

1.Materials science and Engineering, Raghavan V, Prentice Hall of India, Sixth Edition,2015

2.Materials science, V. Rajendran, Mc Graw Hill publications2011

REFERENCE BOOKS

1.William D. Callister, Jr., Material Science & Engineering – An Introduction, 8th Edition,John Wiley & Sons, Inc., 2007

2. W. Bolton,—Engineering materials technology‖, 3rd Edition, Butter worth & Heinemann, 2001.

3.Donald R. Askeland, Pradeep P.Phule,—The Science and Engineering of Materials‖,5th Edition, Thomson Learning, First Indian Reprint, 2007.

4.William F.Smith,—Structure and Properties of Engineering Alloys‖, Mc-Graw-HillInc., U.S.A, 2nd edition,1993.

COURSEOUTCOMES	
CO1	Recall different types of crystal imperfections and defects.
CO2	Explain elastic and inelastic behavior of materials
CO3	Apply concepts of plastic deformation and strengthening methods
CO4	Analyze optical properties and applications of materials.
CO5	Evaluate mechanical testing methods including destructive and non-destructive testing.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	3	2	2	3	2	2	2
CO3	2	2	3	1	3	3	1	3	3	3
CO4	2	3	3	3	3	3	3	2	1	2
CO5	3	2	3	3	2	2	3	2	2	3

Course	SIXTH SEMESTER–ELECTIVE THEORY-X								
Course Title	NANOSCIENCE & NANOTECHNOLOGY								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UEPH63	4	0	0	VI	3	4	50	50	100

Course Objectives

This course aims to provide an overall understanding of Nanoscience and Nanotechnology and introduces different types of nonmaterial's, their properties, fabrication methods, characterization techniques and a range of applications.

Unit	Course Content	No of Hours
I	**NANOSCIENCE AND NANOTECHNOLOGY:** Introduction Nanoscale.**Nanostructures:**0D,1D,2D–surface to volume ratio–size effect – excitons – quantum confinement– metal-based nanoparticles (metal and metaloxide)–nanocomposites(non-polymerbased)–carbonnanostructures –fullerene–SWCNT and MWCNT	12
II	**PROPERTIES OF NANOMATERIALS:** Introduction–mechanicalbehavior–elasticproperties–hardnessandstrength – ductility and toughness– optical properties – surface plasm on resonance – electrical properties–dielectric materials and properties–magnetic properties super paramagnetism – properties of CNTs.	12
III	**FABRICATION METHODS AND VACUUM TECHNIQUES:** Top-down and bottom-up approaches –electrochemical method –chemical & physical vapor depositions (CVD & PVD) – thermal evaporation. **Lithography**: photolithography–sol-gel methods– Synthesis of CNT.	12
IV	**CHARACTERIZATION TECHNIQUES:** Atomic force microscopy – scanning electron microscopy – transmission electron microscopy. **Powder XRD method**: determination of structure and grain size analysis – UV-visible and photoluminescence spectroscopy.	
V	**APPLICATIONS OF NANOMATERIALS:** **Medicine**: drug delivery–photodynamic therapy **Energy:** fuelcells– rechargeable batteries–super capacitors. **Sensors:** nanosensors based on Optical and physical properties–**Nano electronics:** CNTFET–display screens– GMR read/write heads —applications of CNTs.	12
	Total	60

TEXT BOOKS

1.K.K.Chattopadhyay and A.N.Banerjee, (2012), Introduction to Nanoscience and Nanotechnology, PHI Learning Pvt. Ltd.,

2.M.A.Shah,Tokeer Ahmad(2010),Principles of Nanoscience and Nanotechnology, NarosaPublishing House Pvt Ltd.

3.MickWilson,etal(2005) Nanotechnology, Overseas Press.

REFERENCE BOOKS
1. Richard Booker and Earl Boysen,(2005)Nanotechnology, WileyPublishingInc.USA 2. J.H.Fendler(2007)Nano particles and nano structured films; Preparation, Characterization and Applications, John Wiley & Sons 3. B.S.Murty,etal(2012)Textbook of Nanoscience and Nanotechnology, Universities Press

COURSE OUTCOMES	
CO1	Recall basic concepts of nanoscience and nanomaterials.
CO2	Explain properties of nanomaterials and their behavior.
CO3	Apply fabrication methods and vacuum technique to nanomaterial synthesis.
CO4	Analyze nanomaterials using different characterization techniques.
CO5	Evaluate applications of nanomaterials in medicine, energy, sensors, and electronics.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	3	2	2	3	2	2	2
CO3	2	2	3	1	3	3	1	3	3	3
CO4	2	3	3	3	3	3	3	2	1	2
CO5	3	2	3	3	2	2	3	2	2	3

Course	SIXTH SEMESTER–CORE PRACTICALVI								
Course Title	PHYSICS PRACTICAL- VI								
Course Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UCPHP7	0	0	6	VI	4	6	50	50	100

Course Objectives

Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.

List of Experiments(Any10)

1. Spectral response of photoconductor (LDR).
2. Potentiometer–Resistance and Specific resistance of the coil.
3. Potentiometer–E.M.F of a thermocouple.
4. CareyFoster‘sbridge-Temperaturecoefficientofresistanceofthecoil..
5. Conversion of Galvanometer in to Voltmeter and Ammeter
6. Young‘s Modulus –Hyperbolic Fringes
7. Potentiometer–Temperature Coefficient of Resistance
8. Spectrometer-Hartmann‘s interpolation formula
9. Self-inductance–Rayleigh‘s Bridge
10. Impedance and power factor–LR Circuit
11. Comparison of mutual inductance M1/M2-Ballistic Galvanometer
12. Moment of Magnet-Tan C position
13. Study of gate ICs–NOT,OR,AND,NOR,NAND, XOR
14. Verification of De Morgan's theorem using ICs–NOT,OR,AND
15. Operational Amplifier Operational amplifier –differentiator and integrator.
16. Verification of Boolean Algebra(any four)
17. Hartley oscillator-transistor
18. Wein‘s Bridge Oscillator using IC741

Course	ABILITY ENHANCEMENT COURSE-II								
Course Title	DESIGN THINKING								
Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
26UAEC61	2	0	0	VI	2	2	50	50	100

Learning Objectives	
LO1	To recall and describe the key concepts, stages, and principles of Design Thinking.
LO2	To explain the importance of empathy, ideation, and prototyping in solving user-Entered problems.
LO3	To apply Design Thinking methods such as brainstorming, empathy mapping, and SCAMPER to real-world problems.
LO4	To analyze user needs and problem statements using observation and structured frame works.
LO5	To design innovative solutions and develop prototypes based on insights gained through the Design Thinking process.

Unit	Contents	No of Hours
I	**Introduction to Design Thinking:** Introduction to Design Thinking, Essential Design Thinking Skills, Core Principles of Design Thinking, Foundations of Design Thinking, Building an Effective Design Thinking Team, Discussion of Problems from IT sector.	6
II	**Design Thinking Phases:** Stages of Design Thinking, Role of observationinunderstandingproductandprocesschallenges,Preparation of AEIOU and other can vases with defined problem statement, Exploring Design Thinking innovations, Understanding the Role of Design Thinking in Product and Process Innovation, Double Diamond model and its applications.	6
III	**Design Thinking Techniques:** Understanding, listening and Empathizing Techniques, Exploring observation methods, Utilizing structured, open-ended approach for effective communication, Ideation Labs, Brainstorming techniques foride a generation, Applying innovation to Foster creativity, Application of SCAMPER technique to support Problem Statement	6
IV	**Prototyping Methods:** Methods and Tools for Design Thinking Practice; Empathize: Ask five why questions, Empathy map, storytelling, critical items diagram, mind map, journey map; Ideate: Brainstorming, 2x2 matrix, Need-Approach-Benefit-Competition (NABC) Methods; Prototype: Exploration map, Minimum Viable Product(MVP),Feasibility Testing, Viability Testing, A/B Testing, Sustainability Verification, Collect Feedback, Iterate and Improve, PDC canvas versioning	6

V	**Case Studies: M**Quick-Commerce Applications – Food and Grocery Delivery (eg. Swiggy, Instamart), Uber, OLA, Rapido, E-Commerce Applications – Online Shopping (eg. Amazon), Online Publishing (eg. Canva), Online Ticket Booking (eg. Book My Show), Fin tech apps (eg. Google Pay, Razorpay etc.)	6

COURSE OUTCOMES	
CO1	UnderstandthefundamentalprinciplesandimportanceofDesignThinkinginfostering innovation, ethics and its relevance.
CO2	Apply systematic problem identification, problem framing, articulation, and problem-solving approaches in the context of Design Thinking
CO3	AnalyzeandevaluatedifferenttoolsandmethodologiesusedinDesignThinking,such as observation, ethnographic research and mind mapping to gain insights into users' needs
CO4	Develop and refine product concepts by preparing product development canvases (PDC) that consider product experience, functions, features, and sustainable development of the components
CO5	Create a final working prototype for projects with limitations, documenting the functionality and features, viability, sustainability, scalability, cost and resource utilization for the product

WEB RESOURCES

1.Google Workspace: Docs, Sheets and Slides
2.Google Jamboard
3.Mind-mapping tools: Wise mapping, Free plane, Semantik

REFERENCE BOOKS

1. Soni, Pavan. Design Your Thinking: The Mindsets, Tool sets and Skill Sets for Creative Problem-solving. Penguin Random House India Private Limited, 2020
2. Tim Brown,Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins e-books (2009)
3. Liedtka, Jeanne, Randy Salzman, and Daisy Azer. Design thinking for the greater good: Innovation in the social sector. Columbia University Press, 2019

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
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CO2	3	3	2	3	2	2	3	2	2	2
CO3	2	2	3	1	3	3	1	3	3	3
CO4	2	3	3	3	3	3	3	2	1	2
CO5	3	2	3	3	2	2	3	2	2	3