PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM – 636011

DEGREE OF BACHELOR OF SCIENCE

CHOICE BASED CREDIT SYSTEM

Syllabus for

B.Sc., PHYSICS

(SEMESTER PATTERN)

(For Candidates admitted in the College affiliated to Periyar University from 2023-2024 onwards)

B.Sc - PHYSICS SYLLABUS

PROGRAMME OBJECTIVES

Mentor the young students to face global challenges with unique proficiency in Physics.

To apply basic Physics principles in everyday life.

Promote analytical thinking and experimental skills in Physics.

PROGRAMME OUTCOMES

Acquire academic excellence with an aptitude for higher studies and research.

Apply appropriate scientific methods and modern technology to solve complex problems related to society.

REGULATIONS

1. ELIGIBILITY

Candidates seeking admission to the first year of the Bachelor of Science – Physics shall be required to have passed the Higher Secondary examination with Mathematics, Physics and Chemistry conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereto by the Syndicate subject to the conditions as may be prescribed there to are permitted to and qualify for B.Sc., (Physics) degree examinations of this University after a course of study of three academic years.

2. DURATION OF THE COURSE

The course for the degree of Bachelor of Science shall consist of three years divided into six semesters within ternal assessment under a choice-based credit system.

3. COURSE OF STUDY AND SCHEME OF EXAMINATION

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time. The scheme of examination of the different semester shall be as follows;

Total Marks:	**4700**
Part I:	400
Part II:	400
Part III:	2800
Part IV:	1100

Total Credits:	**140**
Part I:	12
Part II:	12
Part III:	92
Part IV:	24

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**B.Sc. PHYSICS**
Programme Code:	**08**
Duration:	**3 years [UG]**
Programme Outcomes:	**PO1:** Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study **PO2:** Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one‟s views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3:** Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4:** Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one‟s learning to real life situations. **PO5:** Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO6:** Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation **PO7:** Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.

	PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective. **PO9:** Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society. **PO10:**Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. **PO 11:**Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion. **PO 12:**Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups. **PO 13:**Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one‟s life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one‟s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work. **PO 14:**Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way. **PO15:** Lifelong learning: Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.

Programme Specific Outcomes: **(These are mere guidelines. Faculty can create POs based on their curriculum or adopt from UGC or University for their Programme)**	**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. **PSO 2: 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. **PSO 5: Contribution to the Society:** To contribute to the development of the society by collaborating with stakeholders for mutual benefit.

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PSO 1	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
PSO 2	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
PSO3	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
PSO 4	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
PSO 5	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**

3 – Strong, 2- Medium, 1- Low

COURSE OF STUDY AND SCHEME OF EXAMINATION

Part	Paper Code	Subject Title	Hours/week	Exam Hrs.	Credits	University Examination			Page No.
						Internal	External	Total	
SEMESTER – I									
I	**23UFTA01**	Language – I	**6**	**3**	**3**	**25**	**75**	**100**	
II	**23UFEN01**	Language – II (English – I)	**6**	**3**	**3**	**25**	**75**	**100**	
III	**23UPHCT01**	Core Course – I (Properties of Matter and Sound)	**5**	**3**	**5**	**25**	**75**	**100**	**17**
III	**23UPHCP01**	Core Course Practical–I*	**3**	**3**	**3**	**40**	**60**	**100**	**20**
III	**23UMAAT01**	Generic - I Allied Mathematics – I	**6**	**3**	**5**	**25**	**75**	**100**	
IV		Skill Enhancement Course SEC1 [NME]	**2**	**3**	**2**	**25**	**75**	**100**	
IV	**23UPHFC01**	Foundation Course – (Introductory Physics)	**2**	**3**	**2**	**25**	**75**	**100**	**15**
SEMESTER – II									
I	**23UFTA02**	Language – I	**6**	**3**	**3**	**25**	**75**	**100**	
II	**23UFEN02**	Language – II (English– II)	**4**	**3**	**3**	**25**	**75**	**100**	
II	**NMSDC**	Language Proficiency for Employability-Overview of English Communication	**2**	**-**	**2**	**-**	**-**	**-**	-
III	**23UPHCT02**	Core Course – II (Heat, Thermodynamics and Statistical Mechanics)	**5**	**3**	**4**	**25**	**75**	**100**	**21**
III	**23UPHCP02**	Core Course Practical – II*	**3**	**3**	**3**	**40**	**60**	**100**	**24**
III	**23UMAAT02**	Generic - II Allied Mathematics – II	**4**	**3**	**4**	**25**	**75**	**100**	
III	**23UMAAP01**	Allied Mathematics – Practical*	**2**	**3**	**2**	**25**	**75**	**100**	
IV		Skill Enhancement Course SEC 2 [NME]	**2**	**3**	**2**	**25**	**75**	**100**	
IV	**23UPHSE03**	Skill Enhancement Course SEC3 (Instrumentation)	**2**	**3**	**2**	**25**	**75**	**100**	**57**
***Examination will be held at the end of the semester.**									

Part	Paper Code	Subject Title	Hours/week	Exam Hrs.	Credits	University Examination			Page No.
						Internal	External	Total	
SEMESTER – III									
I	**23UFTA03**	Language – I	**6**	**3**	**3**	**25**	**75**	**100**	
II	**23UFEN03**	Language – II (English – III)	**6**	**3**	**3**	**25**	**75**	**100**	
III	**23UPHCT03**	Core Course – III (General Mechanics and Classical Mechanics)	**5**	**3**	**4**	**25**	**25**	**100**	**25**
III	**23UPHCP03**	Core Course Practical – III*	**3**	**3**	**3**	**40**	**60**	**100**	**28**
III	**23UCHAT01**	Generic - III Allied Chemistry– I	**4**	**3**	**4**	**25**	**75**	**100**	
III	**23UCHAP01**	Allied Chemistry –I (Practical*)	**2**	**3**	**2**	**25**	**75**	**100**	
IV	**23UPHSE04**	Skill Enhancement Course SEC 4 (Entrepreneurial Based)	**1**	**3**	**1**	**25**	**75**	**100**	**63, 65**
IV	**23UPHSE05**	Skill Enhancement Course SEC 5 (Computational methods and Programming in C)	**2**	**3**	**2**	**25**	**75**	**100**	**59**
IV	**23UES01**	Environmental studies (EVS)	**1**	**3**	**-**	**-**	**-**	**-**	
SEMESTER – IV									
I	**23UFTA04**	Language – I	**6**	**3**	**3**	**25**	**75**	**100**	
II	**23UFTA04**	Language – II (English – IV)	**6**	**3**	**3**	**25**	**75**	**100**	
III	**23UPHCT04**	Core Course – IV (Optics and Spectroscopy)	**4**	**3**	**4**	**25**	**75**	**100**	**29**
III	**23UPHCP04**	Core Course Practical – IV*	**3**	**3**	**3**	**40**	**60**	**100**	**32**
III	**23UCHAT02**	Generic - IV Allied Chemistry– II	**4**	**3**	**4**	**25**	**75**	**100**	
III	**23UCHAP02**	Allied Chemistry – II (Practical*)	**2**	**3**	**2**	**25**	**75**	**100**	
IV	**23UPHSE06**	Skill Enhancement Course SEC 6 (Electronic devices)	**2**	**3**	**2**	**25**	**75**	**100**	**60**
IV	**23UPHSE07**	Skill Enhancement Course SEC 7 (Communication systems)	**2**	**3**	**2**	**25**	**75**	**100**	**62**
IV	**23UES01**	Environmental studies (EVS)	**1**	**3**	**2**	**25**	**75**	**100**	

***Examination will be held at the end of the semester.**

Part	Paper Code	Subject Title	Hours/week	Exam Hrs.	Credits	University Examination			Page No.
						Internal	External	Total	
SEMESTER – V									
III	**23UPHCT05**	Core Course – V (Atomic Physics and Lasers)	**5**	**3**	**5**	**25**	**75**	**100**	**33**
III	**23UPHCT06**	Core Course – VI (Relativity and Quantum Mechanics)	**5**	**3**	**4**	**25**	**75**	**100**	**36**
III	**23UPHCT07**	Core Course – VII (Electricity and Magnetism)	**5**	**3**	**4**	**25**	**75**	**100**	**39**
III	**23UPHE01**	Elective – I (Energy Physics)	**5**	**3**	**3**	**25**	**75**	**100**	**51**
III	**23UPHE02**	Elective – II (Materials Science)	**5**	**3**	**3**	**25**	**75**	**100**	**53**
III	**23UPHCP05**	Core Course Practical – V*	**3**	**3**	**3**	**40**	**60**	**100**	**41**
IV	**23UEV01**	Value Education	**2**	**3**	**2**	**25**	**75**	**100**	
IV	**23UPHIO01**	Internship/Industrial visit/Field visit**	**-**	**-**	**2**	**-**	**-**	**-**	
SEMESTER VI									
III	**23UPHCT08**	Core Course –VIII (Nuclear and Particle Physics)	**5**	**3**	**3**	**25**	**75**	**100**	**42**
III	**23UPHCT09**	Core course – IX (Solid State Physics)	**5**	**3**	**3**	**25**	**75**	**100**	**45**
III	**23UPHCT10**	Core Course – X (Digital Electronics &Microprocessor 8085)	**5**	**3**	**3**	**25**	**75**	**100**	**49**
III	**23UPHE03**	Elective – III (Nanoscience & Nanotechnology)	**5**	**3**	**3**	**25**	**75**	**100**	**55**
III	**23UPHCP06**	Core Course Practical – VI*	**3**	**3**	**3**	**40**	**60**	**100**	**50**
III	**23UPHPR**	Project***	**5**	**3**	**3**	**-**	**-**	**100**	
IV	**23UEX01**	Extension Activity	**-**	**-**	**1**	**-**	**-**	**-**	
IV	**23UPHPC01**	Professional Competency Skills	**2**	**3**	**2**	**25**	**75**	**100**	**67**

***Examination will be held at the end of the semester.**

**** The students should undergo compulsory 2 weeks internship programs during the IV Semester vacation. The students should submit the report at the end of the V semester.**

*****Project Report should be submitted at the end of the VI semester.**

DISCIPLINE SPECIFIC ELECTIVES

1. Energy Physics
2. Materials Science
3. Nanoscience and Nanotechnology

ENTREPRENEURIAL BASED (ANY ONE) - SEC 4

1. Digital Photography
2. Home Electrical Installation

SKILL ENHANCEMENT COURSE (SEC) (DISCIPLINE/SUBJECT SPECIFIC)

1. Instrumentation- SEC 3
2. Computational Methods and Programming in C - SEC 5
3. Electronic devices-SEC 6
4. Communication systems- SEC 7

PROFESSIONAL COMPETENCY SKILLS

1. Quantitative Aptitude for competitive Examinations

SKILL ENHANCEMENT COURSE (Non Major)(NME)

1. Physics for Everyday life- SEC 1 (NME)
2. Astrophysics- SEC 2 (NME)

4. EXTENSION ACTIVITY/ FIELD VISIT IS MANDATORY

A visit to a factory, farm, or museum is **mandatory** for purposes of firsthand observation.

5. EXAMINATIONS

The theory examination shall be three hours duration to each paper at the end of each semester. The candidates failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination.

6. QUESTION PAPER PATTERN

(University Exam)

Duration: 3 Hours **Maximum Marks – 75**

Marks Part A: 15 X 1 = 15 Marks (Answer all questions)

Multiple Choice Questions – with four options (Three questions from each unit)

Part B: 2 X 5 = 10 Marks (Answer any two questions out of five questions)

One question from each unit - (**Out of five questions, two questions must be the problem**)

Part C: 5 X 10 = 50 Marks (Answer all Questions) One question from each unit - (Either or type)

7. PASSING

MINIMUM 1. Theory

Continuous Internal Assessment (CIA): 25 marks

University Examination (UE): 75 marks

Evaluation of CIA		**Passing minimum**	
Tests	- 15 marks		
Assignment/Seminar/Field Trip*	- 05 marks		
Attendance	- 05 marks		
Total (CIA)	= 25 marks	**No minimum marks**	
Evaluation of UE	= 75 marks	UE (40%)	= 30 marks
Total	**= 100 marks**	40 %	**= 40 marks**

2. Practical

Continuous Internal Assessment (CIA): 40 marks

University Examination (UE): 60 marks

Evaluation of CIA		**Passing minimum**	
Observation	- 15 marks		
Model Exam	- 20 marks		
Attendance	- 05 marks		
Total	= 40 marks	**No minimum marks**	
UE	= 60 marks	UE (40%)	= 24 marks
Total	**= 100 marks**	40 %	**= 40 marks**

University Examination: 60 Marks

Evaluation for university practical examinations

Record Marks**	- 10 Marks
Formula with expansion	- 5 Marks
Observations with data	- 20 Marks
Calculation	- 15 Marks
Result with units	- 05 Marks
Viva – voce	- 05 Marks

** Submission of record with due certification is a must for external practical examination.

** A student should complete all the required experiments to get 10 marks for the record.

8. PROJECT

Students should submit the Project Report at the end of the VI Semester.

Students should attend the Viva-voce Examination at the end of the VI Semester.

Project Report – 75 Mark Viva- voce Exam – 25 marks

9. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who obtain **75% and above** of the marks in the aggregate shall be deemed to have passed in **First Class with Distinction** provided they pass all the examinations prescribed for the course at first appearance. Candidates who secure not less than **60%** of the aggregate marks in the whole examination shall be declared to have passed in **First Class**. Candidates to secure not less than 50% shall be declared to have passed in **Second Class**. **All other successful candidates** shall be declared to have passed in **third class**.

Letter Grade	Cumulative Grade Points Average	Grade Description	Range of Marks
S	10	Outstanding	90-100
A	9	Excellent	80-89
B	8	Very Good	70-79
C	7	Good	60-69
D	6	Average	50-59
E	5	Satisfactory	40-49
RA	0	Re-Appear	0-39

$$GP = \frac{Marks\ obtained\ in\ Course\ X\ Credit}{100}$$

$$GPA = \frac{Total\ Grade\ point\ earned\ in\ a\ Semester}{Total\ Grade\ Register\ in\ a\ Semester}$$

$$CGPA = \frac{Sum\ of\ Grade\ Points\ earned}{Total\ Grade\ Register\ in\ a\ Semester}$$

CLASSIFICATION

CGPA	7.5 and above	I Class with Distinction
CGPA	Between 6 and 7.4	I Class
CGPA	Between 5 and 5.9	II Class
CGPA	Between 4 and 4.9	III Class

10. RANKING

Candidates who pass all the examinations prescribed for the course in the first attempt and within three academic years from the year of admission to the course alone are eligible for University Ranking.

11. MAXIMUM DURATION FOR THE COMPLETION OF THE UG PROGRAM

The maximum duration for the completion of the **UG Program shall not exceed twelve semesters.**

12. COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2023-2024 and thereafter.

13. TRANSITORY PROVISION

Candidates who were admitted to the UG course of study before 2023-2024 shall be permitted to appear for the examinations under those regulations for three years i.e., up to and inclusive of the examination of April/May 2027. Thereafter they will be permitted to appear only under regulations then in force.

COURSE	**FIRST SEMESTER - FOUNDATION COURSE**
COURSE TITLE	**INTRODUCTORY PHYSICS**
CREDITS	**2**
COURSE OBJECTIVES	To help students get an overview of Physics before learning their core courses. To serve as a bridge between the school curriculum and the degree programme.

UNITS	**COURSE DETAILS**
UNIT-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.
UNIT-II	Different Types of Forces–Gravitational, Electrostatic, Magnetic, Electromagnetic, Nuclear –Mechanical Forces like, Centripetal, Centrifugal, Friction, Tension, Cohesive, Adhesive Forces.
UNIT-III	Different forms of Energy– Conservation Laws of Momentum, Energy – Types of Collisions –Angular Momentum– Alternate Energy Sources– Real Life Examples.
UNIT-IV	Types of Motion– Linear, Projectile, Circular, Angular, Simple Harmonic Motions – Satellite Motion – Banking of a Curved Roads – Stream Line and Turbulent Motions – Wave Motion – Comparison of Light and Sound Waves – Free, Forced, Damped Oscillations.
UNIT-V	Surface Tension – Shape of Liquid Drop – Angle of Contact – Viscosity – Lubricants – Capillary Flow – Diffusion – Real Life Examples– Properties and Types of Materials in Daily use- Conductors, Insulators – Thermal and Electric.
TEXT BOOKS	1. D.S.Mathur, 2010, Elements of Properties of Matter, 2. S.Chand& Co 3. BrijLal& N. Subrahmanyam, 2003, Properties of Matter, 4. S.Chand& Co.
REFERENCE BOOKS	1. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, S.Chand& Co.
WEBLINKS	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/

COURSEOUTCOMES:

At the end of the course, the student will be able to:

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	Relate various properties of matter with their behaviour and connect them with different physical parameters involved.

MAPPINGWITHPROGRAMOUTCOMES

Map course outcomes **(CO)**for each course with program outcomes **(PO)**in the3-point scale of STRONG(**S**), MEDIUM(**M**) and LOW(**L**).

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

COURSE	**FIRST SEMESTER – CORE COURSE – I**
COURSE TITLE	**PROPERTIES OF MATTER AND SOUND**
CREDITS	**5**
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 insight and understanding of the subject.

UNITS	COURSE DETAILS
UNIT-I	**ELASTICITY:** Hooke‟s Law – Stress-Strain Diagram – Elastic Constants –Poisson‟s Ratio – Relation between Elastic Constants and Poisson‟s Ratio – Work done in Stretching and Twisting a wire – Twisting Couple on a Cylinder – Rigidity Modulus by Static Torsion– Torsional Pendulum (With and Without Masses).
UNIT-II	**BENDING OF BEAMS:** Cantilever– Expression for Bending Moment – Expression for Depression at the Loaded end of the Cantilever– Oscillations of a Cantilever – Expression for Time Period – Experiment to find Young‟s Modulus – Non-Uniform Bending– Experiment to Determine Young‟s Modulus by Koenig‟s Method – Uniform Bending – Expression for Elevation – Experiment to determine Young‟s Modulus using Microscope.
UNIT-III	**FLUID DYNAMICS:** Surface Tension: Definition – Molecular Forces– Excess Pressure over Curved Surface – Application to Spherical and Cylindrical drops and Bubbles – Determination of Surface Tension by Jaegar‟s Method– Variation of Surface Tension with Temperature. **Viscosity:** Definition – Streamline and Turbulent Flow – Rate of Flow of Liquid in a Capillary Tube – Poiseuille‟s Formula –Corrections – Terminal Velocity and Stoke‟s Formula– Variation of Viscosity with Temperature.
UNIT-IV	**WAVES AND OSCILLATIONS:** Simple Harmonic Motion (SHM) – Differential Equation of SHM – Graphical Representation of SHM – Composition of Two SHM in a Straight Line and at Right Angles – Lissajous's Figures- Free, Damped, Forced Vibrations –Resonance and Sharpness of Resonance. Laws of Transverse Vibration in Strings –Sonometer – Determination of AC Frequency using Sonometer –Determination of Frequency using Melde‟s String Apparatus

UNIT-V	**ACOUSTICS OF BUILDINGS AND ULTRASONICS:** Intensity of Sound – Decibel – Loudness of Sound –Reverberation – Sabine‟s Reverberation Formula – Acoustic Intensity – Factors Affecting the Acoustics of Buildings. **Ultrasonic Waves:** Production of Ultrasonic Waves – Piezoelectric Crystal Method – Magnetostriction Effect – Application of Ultrasonic Waves.
TEXT BOOKS	1. D.S.Mathur, 2010, Elements of Properties of Matter, 2. S.Chand& Co. 3. BrijLal& N. Subrahmanyam, 2003, Properties of Matter, S.Chand& Co 4. D.R.Khanna&R.S.Bedi, 1969, Textbook of Sound, 5. AtmaRam& sons 6. Brij Lal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition,Vikas Publishing House. 7. R. Murugesan,2012, Properties of Matter, S.Chand & Co.
REFERENCE BOOKS	1. C.J. Smith, 1960, General Properties of Matter, Orient Longman Publishers 2. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, R. Chand & Co. 3. A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.
WEBLINKS	1. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work 2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html 3. https://www.youtube.com/watch?v=gT8Nth9NWPM 4. https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s 5. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work 6. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/ 7. http://www.sound-physics.com/ 8. http://nptel.ac.in/courses/112104026/

COURSE OUTCOMES:

At the end of the course, the student will be able to:

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 ultrasonics in real life, especially in medical field and assimilate different methods of production of ultrasonic waves

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** inthe3- point scale of STRONG(**S**), MEDIUM(**M**) and LOW(**L**).

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

COURSE	**FIRST SEMESTER – CORE COURSE PRACTICALS – I**
COURSETITLE	**PROPERTIES OF MATTER EXPERIMENTS**
CREDITS	**3**
COURSE OBJECTIVES	Apply various physics concepts to understand Properties of Matter, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

(Any EIGHT Experiments)

1. Determination of rigidity modulus without mass using Torsional pendulum.
2. Determination of rigidity modulus with masses using Torsional pendulum.
3. Determination of moment of inertia of an irregular body.
4. Verification of parallel axes theorem on moment of inertia.
5. Verification of perpendicular axes theorem on moment of inertia.
6. Determination of moment of inertia and g using Bifilar pendulum.
7. Determination of Young‟s modulus by stretching of wire with known masses.
8. Verification of Hook‟s law by stretching of wire method.
9. Determination of Young‟s modulus by uniform bending – load depression graph.
10. Determination of Young‟s modulus by non-uniform bending – scale & telescope.
11. Determination of Young‟s modulus by cantilever – load depression graph.
12. Determination of Young‟s modulus by cantilever – oscillation method
13. Determination of Young‟s modulus by Koenig‟s method – (or unknown load)
14. Determination of rigidity modulus by static torsion.
15. Determination of Y, n and K by Searle‟s double bar method.
16. Determination of surface tension & interfacial surface tension by drop weight method.
17. Determination of co-efficient of viscosity by Stokes‟ method – terminal velocity.
18. Determination of critical pressure for streamline flow.
19. Determination of Poisson‟s ratio of rubber tube.
20. Determination of viscosity by Poiseullie‟s flow method.
21. Determination radius of capillary tube by mercury pellet method.
22. Determination of g using compound pendulum.

COURSE	**SECOND SEMESTER – CORE COURSE – II**
COURSETITLE	**HEAT, THERMODYNAMICSANDSTATISTICALPHYSICS**
CREDITS	4
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

UNITS	COURSEDETAILS
UNIT-I	**CALORIMETRY:** Specific Heat Capacity – Specific Heat Capacity of Gases CP& CV– Meyer‟s Relation – Joly‟s Method for Determination of CV – Regnault‟s Method for Determination of CP. **Low Temperature Physics:** Joule-Kelvin Effect – Porous Plug Experiment – Joule-Thomson Effect –Boyle temperature– Temperature of Inversion – Liquefaction of Gas by Linde‟s Process – Adiabatic Demagnetisation.
UNIT-II	**THERMODYNAMICS-I:** Zeroth Law and First Law of Thermodynamics – P-V Diagram – Heat Engine –Efficiency of Heat Engine – Carnot‟s Engine, Construction, Working and Efficiency of Petrol Engine and Diesel Engines – Comparison of Engines.
UNIT-III	**THERMODYNAMICS-II:** Second Law of Thermodynamics –Entropy of an Ideal Gas – Entropy Change in Reversible and Irreversible Processes – T-S Diagram – Thermodynamical scale of Temperature – Maxwell‟s Thermodynamical Relations –Clasius-Clapeyron‟s Equation (First Latent Heat Equation) – Third Law of Thermodynamics – Unattainability of Absolute Zero – Heat Death.
UNIT-IV	**HEATTRANSFER:** **Modes of Heat Transfer:** Conduction, Convection and Radiation. **Conduction:** Thermal Conductivity – Determination of Thermal Conductivity of a Good Conductor by Forbe‟s Method – Determination Of thermal Conductivity of a Bad Conductor by Lee‟s Disc Method. **Radiation:** Black Body Radiation (Ferry‟s Method) – Distribution of Energy in Black Body Radiation – Wien‟s Law and Rayleigh Jean‟s Law –Planck‟s Law of Radiation – Stefan‟s Law – Deduction of Newton‟s Law of Cooling from Stefan‟s Law.

UNIT-V	**STATISTICALMECHANICS:** Definition of Phase-Space – Micro and Macro States – Ensembles – Different types of Ensembles – Classical and Quantum Statistics – Maxwell-Boltzmann Statistics – Expression for Distribution Function – Bose-Einstein Statistics – Expression for Distribution Function – Fermi- Dirac Statistics –Expression for Distribution Function – Comparison of three statistics.
TEXT BOOKS	1. Brijlal&N. Subramaniam, 2000, Heat and Thermodynamics, S.Chand& Co. 2. Narayanamoorthy&KrishnaRao, 1969,Heat,Triveni Publishers, Chennai. 3. V.R.Khanna&R.S.Bedi, 1998 1st Edition, Text book of Sound, Kedharnaath Publish & Co, Meerut 4. Brijlal and N. Subramanyam, 2001, Waves and Oscillations,Vikas Publishing House, New Delhi. 5. Ghosh, 1996, Text Book of Sound, S.Chand&Co. 6. R.Murugeshan&KiruthigaSivaprasath, Thermal Physics, 7. S.Chand& Co.
REFERECE BOOKS	1. J.B.Rajam&C.L.Arora, 1976, Heat and Thermodynamics, 8th edition, S.Chand& Co. Ltd. 2. D.S.Mathur, Heat and Thermodynamics, Sultan Chand & Sons. 3. Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand & Co. 4. Resnick, Halliday&Walker,2010, Fundamentals of Physics, 6th Edition. 5. Sears, Zemansky, Hugh D. Young,Roger A. Freedman, 2021 University Physics with Modern Physics 15th Edition, Pearson.
WEBLINKS	1. https://youtu.be/M_5KYncYNyc 2. https://www.youtube.com/watch?v=4M72kQulGKk&vl=en

COURSE OUTCOMES:

At the end of the course, the student will be able to:

COURSE OUTCOMES	**CO1**	Acquires knowledge on how to distinguish between temperature and heat. Introduce him/her to the field of thermometry and explain practical measurements of high temperature as well as low temperature physics. Student identifies the relationship between heat capacity, specific heat capacity. The study of Low temperature Physics sets the basis for the students to understand cryogenics, superconductivity, superfluidity and Condensed Matter Physics
	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. Quantify different parameters related to heat, relate them with various physical parameters and analysethem
	CO5	Interpret classical statistics concepts such as phase space, ensemble, Maxwell-Boltzmann distribution law. Develop the statistical interpretation of Bose-Einstein and Fermi-Dirac . Apply to quantum particles such as photon and electron

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes**(CO)**for each course with program outcomes**(PO)**inthe3- point scale of STRONG(**S**),MEDIUM(**M**) and LOW(**L**).

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

COURSE	**SECOND SEMESTER – CORE COURSE PRATICALS – II**
COURSETITLE	**HEAT, OSCILLATIONS, WAVES & SOUNDEXPERIMENTS**
CREDITS	3
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 analyse, able to do error analysis and correlate results

(Any EIGHTExperiments)

1. Determination of specific heat by cooling – graphical method.
2. Determination of thermal conductivity of good conductor by Searle‟s method.
3. Determination of thermal conductivity of bad conductor by Lee‟s disc method.
4. Determination of thermal conductivity of bad conductor by Charlaton‟s method.
5. Determination of specific heat capacity of solid.
6. Determination of specific heat of liquid by Joule‟s electrical heating method (applying radiation correction by Barton‟s correction/graphical method),
7. Determination of Latent heat of a vaporization of a liquid.
8. Determination of Stefan‟s constant for Black body radiation.
9. Verification of Stefan‟s-Boltzmans law.
10. Determination of thermal conductivity of rubber tube.
11. Helmholtz resonator.
12. Velocity of sound through a wire using Sonometer.
13. Determination of velocity of sound using Kunds tube.
14. Determination of frequency of an electrically maintained tuning fork
15. To verify the laws of transverse vibration using sonometer.
16. To verify the laws of transverse vibration using Melde‟s apparatus.
17. To compare the mass per unit length of two strings using Melde‟s apparatus.
18. Frequency of AC by using sonometer.

COURSE	**THIRD SEMESTER – CORE COURSE – III**
COURSETITLE	**GENERAL MECHANICS AND CLASSICAL MECHANICS**
CREDITS	**4**
COURSE OBJECTIVES	This course allows the students: 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.

UNITS	COURSEDETAILS
UNIT-I	**LAWS OF MOTION:** Newton‟s Laws– Forces – Equations of Motion – Frictional Force – Motion of a particle in a Uniform Gravitational Field – Types of Everyday Forces in Physics. **Gravitation:** Classical Theory of Gravitation–Kepler‟s Laws, Newton‟s Law of Gravitation – Determination of G by Boy‟s Method – Earth-Moon System – Weightlessness – Earth Satellites – Parking Orbit – Earth Density – Mass of The Sun – Gravitational Potential – Velocity of Escape – Satellite Potential and Kinetic Energy –Einstein‟s Theory of Gravitation – Introduction –Principle of Equivalence – Experimental Tests of General Theory of Relativity – Gravitational Red Shift – Bending of Light – Perihelion of Mercury.
UNIT-II	**CONSERVATION LAWS OF LINEAR AND ANGULAR MOMENTUM:** Conservation 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 – Proton Scattering by Heavy Nucleus.
UNIT-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 and Electric Field – Examples –Non-Conservative Forces – General Law of Conservation of Energy.
UNIT-IV	**RIGID BODY 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 – Gyroscopic Precision – Gyrostatic Applications.

UNIT-V	**LAGRANGIAN MECHANICS:** Generalized Coordinates –Degrees of Freedom – Constraints - Principle of Virtual Work and D‟ Alembert‟s Principle –Lagrange‟s Equation from D‟ Alembert‟s Principle – Application –Simple Pendulum – Atwood‟s Machine.
TEXT BOOKS	1.J.C.Upadhyaya, 2019, Classical Mechanics, Himalaya Publishing house, Mumbai. 2. P.Durai Pandian, Laxmi Durai Pandian, MuthamizhJayapragasam,2005, Mechanics, 6threvised edition, S.Chand& Co. 3.D. S. Mathur & P. S. Hemne,2000, Mechanics, Revised Edition, S.Chand& Co. 4. Narayanamurthi, M.&Nagarathnam. N, 1998, Dynamics. The National Publishing,Chennai. 5. Narayanamurthi, M. and Nagarathnam, N, 1982, Statics, Hydrostatics and Hydrodynamics, The National Publishers, Chennai.
REFERENCE BOOKS	1. Goldstein Herbert, 1980, Classical Mechanics. U.S.A: Addison and Wesely. 2. Halliday, David & Robert, Resnick, 1995, Physics Vol.I. New Age, International, Chennai. 3. Halliday, David Robert Resnick and Walker Jearl, 2001, Fundamentals of Physics, John Wiley, New Delhi
WEBLINKS	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:

At the end of the course, the student will be able to:

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

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes**(CO)**for each course with program outcomes**(PO)** inthe3- point scale of STRONG(**S**), MEDIUM(**M**) and LOW(**L**).

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

COURSE	**THIRD SEMESTER – CORE COURSE PRACTICAL-III**
COURSETITLE	**ELECTRICITY EXPERIMENTS**
CREDITS	3
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

(Any EIGHT Experiments)

1. Calibration of low range and high range voltmeter using potentiometer
2. Calibration of ammeter using potentiometer.
3. Measurement of low resistances using potentiometer.
4. Determination of field along the axis of a current carrying circular coil.
5. Determination of earth‟s magnetic field using field along axis of current carrying coil.
6. Determination of specific resistance of the material of the wire using PO box.
7. Determination of resistance and specific resistance using Carey Foster‟s bridge.
8. Determination of internal resistance of a cell using potentiometer.
9. Determination of specific conductance of an electrolyte.
10. Determination of e.m.f of thermo couple using potentiometer
11. Determination of capacitance using Desauty‟s bridge and B.G./Spot galvanometer/head phone.
12. Determination of figure of merit of BG or spot galvanometer.
13. Comparison of EMF of two cells using BG.
14. Comparison of capacitance using BG.

COURSE	**FOURTH SEMESTER – CORE COURSE-IV**
COURSETITLE	**OPTICS AND SPECTROSCOPY**
CREDITS	**4**
COURSE OBJECTIVES	To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics; To explain the behaviour 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 solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations.

UNITS	COURSE DETAILS
UNIT-I	**LENS AND PRISMS:** Fermat‟s Principle Of Least Time – Postulates of Geometrical Optics – Thick and Thin Lenses – Focal Length, Critical Thickness, Power and Cardinal Points of a Thick Lens – Narrow Angled Prisms. **Lens:** Lens Makers Formula (No Derivation) – Aberrations: Spherical Aberration, Chromatic Aberrations, Coma, and Astigmatism– Curvature of the Field – Distortion – Chromatic Aberrations Methods. **Prism:** Dispersion, Deviation, Aberrations - Applications Rainbows and Halos, Constant Deviation Spectroscope. **Eyepieces:** Advantage of an Eyepiece over a Simple Lens – Huygen‟s and Ramsden‟s Eyepieces, Construction and Working –Merits and Demerits of the Eyepiece. **Resolving power:** Rayleigh‟s Criterion for Resolution – Limit of Resolution for the Eye – Resolving Power of, (I) Prism (Ii) Grating (Iii) Telescope
UNIT-II	**INTERFERENCE:** Division of Wave Front, Fresnel‟s Biprism – Fringes with White Light – Division of Amplitude: Interference in Thin Films due to, (i) Reflected Light, (ii) Transmitted Light – Colours of Thin Films Applications – Air Wedge – Newton‟s Rings. **Interferometers :** Michelson‟s Interferometer – Applications, (i) Determination of the Wavelength of a Monochromatic Source of Light, (ii) Determination of the Wavelength and Separation D1 And D2Lines of Sodium Light, (iii) Determination of a Thickness of a Mica Sheet.
UNIT-III	**DIFFRACTION:** Fresnel‟s assumptions – zone plate – action of zone plate for an incident spherical wave front – differences between a zone plate and a convex lens –Fresnel type of diffraction – diffraction pattern due to a straight edge – positions of maximum and minimum intensities – diffraction due to a narrow slit – Fraunhofer type of diffraction – Fraunhofer diffraction at a single slit – plane diffraction grating– experiment to determine

	wavelengths – width of principal maxima.
UNIT-IV	**POLARISATION:** Optical Activity – Optically Active Crystals –Polarizer and Analyser– Double Refraction – Optic Axis, Principal Plane – Huygens‟s Explanation of Double Refraction in Uniaxial Crystals – Polaroids and Applications – Circularly and Elliptically Polarized Light –Quarter Wave Plate – Half Wave Plate – Production and Detection of Circularly and Elliptically Polarized Lights – Fresnel‟s Explanation – Specific Rotation – Laurent Half Shade Polarimeter – Experiment to Determine Specific Rotatory Power.
UNIT-V	**SPECTROSCOPY:** Infra-Red Spectroscopy Near Infra-Red and Far Infra-Red – Properties – Origin of IR spectra – IR Spectrophotometer – Applications Interpretation of IR Spectra – CH, CO, CN Bending and Stretching Vibrational Modes Only – Scattering of Light – Raman Effect –Classical Theory –Quantum Theory –Mutual Exclusion Principle – Raman Spectrometer-Characteristics of Raman Lines –Applications – Ultraviolet and Visible Spectroscopy –Properties – Spectrophotometer.
TEXT BOOKS	1. Subramaniam. N&Brijlal, 2014,Optics, 25thedition,S.Chand&Co. 2. S.L.Gupta,V.Kumar& R.C.Sharma,1997,Elements of Spectroscopy, 13th Edition, Pragati Prakashan, Meerut. 3. G.Aruldhass,2000,Molecular Structure and Spectroscopy,IIedition.PHIPvt Ltd, New Delhi. 4. P.R.Sasikumar, 2012, Photonics, PHIPvt Ltd, New Delhi. 5. K.Rajagopal, 2008, Engineering Physics, PHIPvt Ltd, New Delhi. 6. V.Rajendran, 2012, Engineering Physics, Tata McGraw Hill.
REFERENCE BOOKS	1. Agarwal B.S, 2011,Optics, Kedernath Ramnath Publishers, Meerut. 2. Sathyaprakash, 1990,Optics,VII edition, Ratan Prakashan Mandhir, New Delhi. 3.C.N.Banewell, 2006, Introduction to Molecular Spectroscopy, IV edition,TMH Publishing Co,New Delhi. 4. AjoyGhatak, 2009,Optics, 4thedition, PHIPvt Ltd, New Delhi. 5. Singh &Agarwal,2002,Optics and Atomic Physics, 9thedition, PragatiPrakashan Meerut. 6.D.Halliday,R.Resnick and J. Walker, 2001, Fundamentals of Physics,6th edition, Willey, New York. 7. JenkinsA.Francis& White, 2011, Fundamentals of Optics, 4th edition, McGraw Hill Inc., NewDelhi.

WEBLINKS	1. https://science.nasa.gov/ems/ 2. https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCz wo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472 3. https://science.nasa.gov/ems/ 4. https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCz wo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472 5. https://imagine.gsfc.nasa.gov/educators/gammarabursts/imagine/ind ex.html 6. http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/ 7. http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/

COURSE OUTCOMES:

At the end of the course, the student will be able to:

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

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes**(CO)**for each course with program outcomes**(PO)** in the3- point scale of STRONG(**S**), MEDIUM(**M**) and LOW(**L**).

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

COURSE	**FOURTH SEMESTER – CORE COURSE PRACTICALS – IV**
COURSETITLE	**LIGHTEXPERIMENTS**
CREDITS	3
COURSE OBJECTIVES	Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.

(Any EIGHT Experiments)

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 resolving power of telescope
9. Comparison of intensities using Lummer Brodhum Photometer.
10. Determination of range of motion using Searles goniometer.
11. Verification of Newton‟s formula for a lens separated by a distance.
12. Determination of refractive index of a given liquid by forming liquid lens
13. Determination of refractive index using Laser.
14. Determination of wavelengths, particle size using Laser/Monochromatic source.
15. Determination of resolving power of Diffraction grating using Laser
16. Determination of wire using Laser.

COURSE	**FIFTH SEMESTER – CORE COURSE – V**
COURSETITLE	**ATOMIC PHYSICS AND LASERS**
CREDITS	**5**
COURSE OBJECTIVES	To study about electric charges, their properties through experiments; To gain knowledge on photoelectric effect; To solve problems based on Einstein‟s photoelectric equation; To make students understand the development of atom models, quantum numbers, coupling schemes and analysis of magnetic moments of an electrons; To gain knowledge on excitation and ionization potentials, splitting of spectral lines in magnetic and electric fields; To understand the principle, production and applications of lasers.

UNITS	COURSE DETAILS
UNIT-I	**THE ELECTRON AND POSITIVE RAYS:** e/m of electron by Dunnington's method –charge of electron by Millikan‟s oil drop method – properties of positive rays –e/m of positive rays by Thomson's parabola method (problems calculation of e/m ratio of positive rays)–mass spectrographs and uses– Bainbridge and Dempster‟s mass spectrographs
UNIT-II	**PHOTOELECTRIC EFFECT:** Photoelectric Emission – Leonard's Experiment – Richardson and Compton Experiment –Laws of Photoelectric Emission – Einstein's Photoelectric Equation (Problems using Einstein's Photoelectric Equation) –Experimental Verification by Millikan‟s Method – Photoelectric Cell– Photo Emissive Cell –Photovoltaic Cell – Photo Conducting Cell – Applications of Photoelectric Cells –Photomultiplier.
UNIT-III	**ATOMIC STRUCTURE:** Sommerfield‟s relativistic atom model –vector atom model –various quantum numbers – L-S and J-J coupling – Pauli's exclusion principle – magnetic dipole moment of an electron due to orbital and spin motion – Bohr magneton - Stern and Gerlach experiment – Lande „g‟ factor.
UNIT-IV	**SPLITTING OF SPECTRAL LINES:** Excitation, Ionisation and Critical Potentials – Davis and Goucher‟s Method – Optical Spectra – Spectral Notation and Selection Rules – Fine Structure of Sodium D-Line – Zeeman Effect – Experimental Arrangement and Classical Theory of Normal Zeeman Effect – Larmor's Theorem –Quantum Theory of Normal Zeeman Effect –Anomalous Zeeman Effect –Explanation of Splitting of D1 And D2lines of Sodium – Paschen Back Effect - Stark Effect (Qualitative Only).

UNIT-V	**LASERS:** General Principles of Lasers – Properties of Lasers Action – Spontaneous and Stimulated Emission – Population Inversion – Optical Pumping – He-Ne Laser (Principle and Working) – Semiconductor Laser –Laser Applications–Holography.
TEXT BOOKS	1. R. Murugesan, Modern Physics, S. Chand & Co. (All units) (Units I&II-Problems) 2. Brijlal& N. Subrahmanyam, Atomic & Nuclear Physics, S. Chand & Co. (All units) 3. J. B. Rajam, Modern Physics, S. Chand & Co. 4. Sehgal&Chopra, Modern Physics, Sultan Chand, New Delhi 5. Avadhahnulu, An Introduction to Lasers - Theory and Applications, M.N., S.Chand& Co., New Delhi, 2001.
REFERENCE BOOKS	1. Perspective of Modern Physics, Arthur Beiser, McGraw Hill. 2. Modern Physics, S. Ramamoorthy, National Publishing & Co. 3. Laser and Non-Linear Optics by B.B.Laud, Wiley Easter Ltd., New York,1985.
WEBLINKS	1. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html 2. https://makingphysicsfun.files.wordpress.com/2015/01/photoelect ric-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:

At the end of the course, the student will be able to:

COURSE OUTCOMES	**CO1**	**List** the properties of electrons and positive rays, **define** specific charge of positive rays, **know** different mass spectrographs.
	CO2	**Outline** photoelectric effect and the terms related to it, **State** laws of photoelectric emission, Explain experiments and applications of photo electric 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.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes**(CO)** for each course with program outcomes**(PO)** inthe3- point scale of STRONG(**S**), MEDIUM(**M**) and LOW(**L**).

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

COURSE	**FIFTH SEMESTER – CORE COURSE- VI**
COURSETITLE	**RELATIVITY AND QUANTUM MECHANICS**
CREDITS	**4**
COURSE OBJECTIVES	To understand the theory of relativity, its postulates and the consequences. To learn the importance of transformation equations and also to differentiate between special and general 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.

UNITS	COURSE DETAILS
UNIT-I	**SPECIAL THEORY OF RELATIVITY:** Michelson-Morley Experiment–Frames of Reference – Galilean Relativity – Postulates of Special Theory of Relativity – Lorentz Transformation – Consequences – Time Dilation–Concept of Simultaneity – Doppler Effect – Length Contraction–Variation Of Mass with Velocity – Einstein‟s Mass-Energy Relation– Relativistic Momentum – Energy Relation
UNIT-II	**TRANSFORMATION RELATIONS:** Transformation of velocity, mass, energy and momentum – four vector – invariance under transformation – Lorentz transformation and velocity addition equations in terms of hyperbolic functions. **GENERAL THEORY OF RELATIVITY:** Inertial and Gravitational mass – Principle of equivalence – Experimental evidences for General theory of Relativity
UNIT-III	**PHOTONS AND MATTER WAVES:** Difficulties of classical physics and origin of quantum theory –black body radiation – Planck‟s law – Einstein‟s photoelectric equation – Compton effect –pair production – De Broglie waves – phase velocity and group velocity– Davisson and Germer‟s experiment –uncertainty principle – consequences –illustration of Gamma ray microscope.
UNIT-IV	**OPERATORS AND SCHRÖDINGER EQUATION:** postulates of quantum mechanics – Wave function and its interpretation – Schrödinger„s equation – linear operators – Eigenvalue – Hermitian operator – properties of Hermitian operator– observable – operators for position, linear Momentum, angular momentum components – commutator algebra –commutator between these operators –expectation values of position and momentum – Ehrenfest theorem.

UNIT-V	**SOLVING SCHRÖDINGER EQUATION FOR SIMPLE PROBLEMS:** one-dimensional problems: (i) particle in a box, (ii) barrier penetration problem – quantum mechanical tunneling, (iii) linear harmonic oscillator. higher dimensional problems: (i) Rigid rotator (qualitative), (ii) Hydrogen atom (qualitative).
TEXT BOOKS	1. Special Theory of Relativity,S. P. Puri, Pearson Education, India, 2013. 2. Concepts of Modern Physics, A.Beiser, 6th Ed., McGraw-Hill, 2003. 3. Modern Physics, R. Murugeshan, Kiruthiga Sivaprasath, S. Chand & Co.,17th Revised Edition, 2014. 4. Quantum Mechanics, S.P.Singh, M.K.Bagde, S.Chand& Co., New Delhi, 2000. 5. Quantum Mechanics in Physics and Chemistry with Applications to Biology, Rabi Majumdar, PHI, 2011. 6. Modern Physics, R. Murugesan, S.Chand& Co., New Delhi. (Quantum Mechanics, Gupta, Kumar and Sharma. Jai Prakash Nath & Co Meerut 7. Quantum mechanics – Satyaprakash and Swati Saluja. KedarNath Ram Nath& Co.
REFERENCE BOOKS	1. Fundamentals of Modern Physics, Peter J. Nolan, 1stEdition, 2014, by Physics 2. Quantum Mechanics, V.Murugan, Pearson Education, India, 2014. 3. Quantum Mechanics, Alastair I. M. Rae and Jim Napolitano, 6th Edition, CRC Press:Taylor& Francis, 2010. 4. Quantum Physics:A Fundamental Approach to Modern Physics, John S. Townsend, University Science Books, Sausalito, California, 2010. 5. Quantum Mechanics: Theory and Applications, Ajoy Ghatak and S. Lokanathan, Springer ScienceB usiness Media, Dordrecht, Netherlands, 2004. 6. Physics ofthe Atom,Editor(s): M. R. Wehr, J. A. Richards, T. W. Adair, 4th Edition, Narosa, 2013. 7. Quantum Mechanics, V.Devanathan, Narosa Pub. House, Chennai, 2005. 8. Quantum Mechanics, V.K. Thangappan, New Age International, New Delhi. 9. AText Book of Quantum Mechanics, Mathews &Venkatesan, Tata McGraw Hill, New Delhi. 10. Quantum Mechanics, Ghatak&Loganathan, Macmillan Publications. 11. Introductionto Quantum Mechanics, Pauling &Wilson, McGraw Hill Co., NewYork. 12. Quantum Mechanics, Gupta, Kumar and Sharma. JaiPrakashNath&Co Meerut

WEBLINKS	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:

At the end of the course,the student will be able to:

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	Realise 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.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes**(CO)** for each course with program outcomes**(PO)** inthe3- point scale of STRONG(**S**),MEDIUM(**M**)andLOW(**L**).

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

COURSE	**FIFTH SEMESTER – CORE COURSE – VII**
COURSETITLE	**ELECTRICITY AND MAGNETISM**
CREDITS	**4**
COURSE OBJECTIVES	To acquire in-depth knowledge of measuring instruments involving electric and magnetic fields.To study various magnetic properties of materials and their applications. To give an idea of the fundamentals of electromagnetic induction and alternating currents.On the successful completion of the course, students will be able to recognize basic principles and applications of electrometers.Effectively formulate the electrical circuit problem into a mathematical problem using circuits, laws and theorems.

UNITS	COURSE DETAILS
UNIT-I	**CAPACITORS AND ELECTROMETERS:** Spherical Capacitors - Cylindrical capacitors– Parallel plate capacitor – Effect of dielectric - the force of attraction between plates of a charged parallel plate capacitor – Guard Ring capacitor – Mica capacitor – uses of capacitors - Quadrant electrometer – measurement of potential, ionization current and dielectric constant.
UNIT-II	**ELECTRICAL MEASUREMENTS AND THERMOELECTRICITY:** Carey–Foster Bridge – theory – temperature coefficient of resistance – potentiometer – calibration of ammeter and high range voltmeter – thermoelectricity – laws of thermos e.m.f.– measurement of thermos e.m.f. using potentiometer–Peltier effect and Peltier coefficient – Thomson effect and Thomson coefficient – relation between π and σ – thermoelectric diagrams and their uses.
UNIT-III	**MAGNETIC PROPERTIES OF MATERIALS:** Relation between three magnetic vectors B, H and M- Intensity of magnetization - Susceptibility – Permeability – Properties, Electron theory and Langevin‟s theory of dia, para and ferromagnetic materials - magnetic hysteresis – Experiment to draw B-H curve – Ballistic method – Energy loss - determination of susceptibility: Gouy‟s method.
UNIT-IV	**ELECTROMAGNETIC INDUCTION:** Magnetic induction due to a straight conductor carrying current – Moving coil ballistic galvanometer – damping correction –absolute capacity of a condenser using B.G – Ampere‟s circuital Law-Faradays Laws of electromagnetic induction – vector form - self – inductance by Anderson's Bridge method – Mutual inductance – Experimental determination - coefficient of coupling

UNIT-V	**ALTERNATING CURRENT:** Peak, average and RMS value of current and voltage– form factor – ac circuit containing resistance and inductance – ac circuit containing resistance and capacitance – series and parallel resonance circuits –Q factor – power in an ac circuit containing LCR – Wattless current – choke coil - Transformer – construction, theory and uses – energy loss – skin effect.
TEXT BOOKS	1. Brij Lal and Subrahmanyam, Electricity and Magnetism, S. Chand & Co, New Delhi (2016) 2. R. Murugesan, Electricity and Magnetism, S. Chand & Co, New Delhi(2016)
REFERENCE BOOKS	1. D. N. Vasudeva, Electricity and Magnetism, S. Chand & Co, New Delhi(2016) 2. K. K. Tewari, Electricity and Magnetism, S. Chand & Co, New Delhi (2016) 3. Fundamentals of Electricity and Magnetism – B.D.Duggal and C.L. Chhabra, Vishal Publishing Co(2004)
WEBLINKS	1. https://www.askiitians.com/revision-notes/physics/current-electricity.html 2. https://www.askiitians.com/revision-notes/physics/electromagnetic-induction-and-alternating- current/

COURSE OUTCOMES:

At the end of the course, the student will be able to:

COURSE OUTCOMES	**CO1**	Define And Derive The Laws Of Electricity And Magnetism
	CO2	Update The Knowledge Of Properties And Magnetism
	CO3	Expertise The Skills To Manufacture Devices
	CO4	Understand The Properties Of Electric And Magnetic Materials
	CO5	Acquire Experimental Skills To Construct Technically Useful Devices.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes**(CO)**for each course with program outcomes**(PO)** inthe3- point scale of STRONG(**S**),MEDIUM(**M**) andLOW(**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	M	S	S	M	M	S
CO2	S	M	M	M	S	M	M	S	S	M
CO3	S	S	S	S	S	S	S	S	S	S

COURSE	**FIFTH SEMESTER – CORE COURSE PRACTICALS –V**
COURSETITLE	**GENERAL EXPERIMENTS**
CREDITS	**3**
COURSE OBJECTIVES	Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.

(**Any TEN Experiments)**

1. Diffraction at a wire and straight edge
2. Specific rotation of a sugar solution
3. Brewster‟s law- p0larization
4. Biprism – determination of refractive index
5. Dispersive power of plane diffraction grating.
6. Y- by Corlus Method
7. e/m Thomson Method.
8. Kundt‟s tube – Velocity of sound, Adiabatic Young‟s modulus of the material of the rod.
9. Forbe‟s method – Thermal conductivity of a metal rod.
10. Spectrometer– Grating - Normal incidence - Wave length of Mercury spectral lines.
11. Spectrometer – Grating - Minimum deviation - Wave length of Mercury spectral lines.
12. Spectrometer – (i-d) curve.
13. Spectrometer – (i-i′) curve.
14. Spectrometer – Narrow angled prism.
15. Rydberg‟s constant
16. Spectral response of photo conductor (LDR).
17. Potentiometer –Resistance and Specific resistance of the coil.
18. Potentiometer – E.M.F of a thermocouple.
19. Carey Foster‟s bridge - Temperature coefficient of resistance of the coil.
20. Deflection Magnetometer – Determination of Magnetic moment of a bar magnet and BHusing circular coil carrying current.
21. Vibration magnetometer - Determination of BH using circular coil carrying current– Tan B position.
22. B.G – Figure of Merit – Charge Sensitivity

COURSE	**SIXTH SEMESTER – CORE COURSE-VIII**
COURSETITLE	**NUCLEAR AND PARTICLE PHYSICS**
CREDITS	**3**
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 the reason for cosmic rays and their effect on the surface of earth and also understand the classification of elementary particles.

UNITS	COURSE DETAILS
UNIT-I	**PROPERTIES OF NUCLEUS:** constituents of nucleus – isotopes, isobars, isotones – nuclear size, mass, density, charge, spin, angular momentum, magnetic dipole moment, electric quadrupole moment (qualitative) – binding energy – mass defect – packing fraction – nuclear stability – binding energy per nucleon graph – properties of nuclear force – meson theory of nuclear forces – Yukawa potential. **Nuclear Models:** liquid drop model –Weizacker‟s semi-empirical mass formula – shell model – magic numbers.
UNIT-II	**RADIO ACTIVITY:** radio activity – laws of radioactivity – radioactive disintegration, decay constant, half-life, mean-life (only final formulae) **–** units of radioactivity**–**successive disintegration – transient and secular equilibrium– properties of alpha, beta and gamma rays – Geiger-Nuttal law – α-ray spectra –Gammow's theory of α-decay (qualitative) –β-ray spectrum – neutrino theory of β-decay – nuclear isomerism – K-shell capture – internal conversion – non-conservation of parity in weak interactions.
UNIT-III	**PARTICLE DETECTORS AND ACCELERATORS** **DETECTORS:** Gas Detectors –Ionization Chamber – G-M Counter – Scintillation Counter – Photo Multiplier Tube (Pmt) – Semiconductor Detectors – Neutron Detector. **Accelerators:**Linear Accelerators – Cyclotron – Synchrotron – Betatron– Electron Synchrotron – Protonsynchrotron (Bevatron)
UNIT-IV	**NUCLEAR REACTIONS:** Types Of Nuclear Reactions –Conservation Laws in Nuclear Reaction – Q-Value– Threshold Energy – Nuclear Fission – Energy Released In Fission – Chain Reaction – Critical Mass – Nuclear Reactor – Nuclear Fusion – Sources Of Stellar Energy – Proton-Proton Cycle – Carbon-Nitrogen Cycle – Thermonuclear Reactions – Controlled Thermonuclear Reactions.

UNIT-V	**COSMIC RAYS AND ELEMENTARY PARTICLES** **COSMIC RAYS:** Discovery Of Cosmic Rays – Primary And Secondary Cosmic Rays – Cascade Theory Of Cosmic Ray Showers – Altitude And Latitude Effects –Discovery Of Positron – Pair Production – Annihilation Of Matter – Van-Allen Radiation Belts – Big-Bang Theory – Future Of The Universe (Elementary Ideas Only). **Elementary Particles:**particles and antiparticles – classification of elementary particles – types of fundamental interactions – quantum numbers of elementary particles – conservation laws and symmetry – quarks and types – quark model (elementary ideas only).
TEXT BOOKS	1. R Murugeshan&KiruthigaSivaprasath, Modern Physics, S. Chand & Co. (2013) 2. Brijlal& N. Subramaniyan, Atomic and Nuclear Physics S.Chand& Co 3. J.B. Rajam, Modern Physics, S Chand &Co.Publishing Co. 4. D.C. Tayal, Nuclear Physics, Himalayan Publishing House 5. Atomic and Nuclear Physics, Brijlal& N. Subramaniyan, S.Chand& Co
REFERENCE BOOKS	1. Basic ideas and concepts in Nuclear Physics, K.Heyde, 3rd Edn., Institute of Physics Pub. 2. Introductory nuclear Physics by Kenneth S. Krane (Wiley India Pvt. Ltd., 2008) 3. Concepts of nuclear physics by Bernard L. Cohen. (Tata Mcgraw Hill, 1998). 4. Introduction to the physics of nuclei & particles, R.A. Dunlap. (Thomson Asia, 2004). 5. Introduction to High Energy Physics, D.H. Perkins, Cambridge Univ. Press 6. Introduction to Elementary Particles, D. Griffith, John Wiley & Son 7. Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi 8. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000). 9. Theoretical Nuclear Physics, J.M. Blatt &V.F.Weisskopf (Dover Pub.Inc., 1991) 10. Physics and Engineering of Radiation Detection, Syed Naeem Ahmed (AcademicPress, Elsevier, 2007). 11. Nuclear Physics, S. N. Ghoshal, S Chand & Co. Edition 2003 12. 15. Elements of Nuclear Physics, M. L.Pandya& R. P. S.Yadav, KedarNath& Ram Nath

WEBLINKS	1. http://hyperphysics.phy-astr.gsu.edu/hbase/nuccon.html 2. https://www.kent.edu/physics/nuclear-physics-links 3. https://www2.lbl.gov/abc/links.html

COURSE OUTCOMES:

At the end of the course, the student will be able to:

COURSE OUTCOMES	**CO1**	Describe various models that explain about the nuclear structures
	CO2	Give reason for various kinds of radioactivity and also know laws governing them
	CO3	Know the principles and applications of various particle detectors and accelerators.
	CO4	Discuss the concepts used in nuclear reaction.
	CO5	Classify various elementary particles and study the effect of cosmic rays.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes**(CO)** for each course with program outcomes**(PO)** inthe3-pointscale of STRONG(**S**),MEDIUM(**M**) andLOW(**L**).

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

COURSE	**SIXTH SEMESTER – CORE COURSE-IX**
COURSETITLE	**SOLID STATE PHYSICS**
CREDITS	**3**
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 the reason for cosmic rays and their effect on the surface of earth and also understand the classification of elementary particles.

UNITS	COURSE DETAILS
UNIT-I	**BONDING IN SOLIDS, CRYSTAL STRUCTURE:** Types of Bonding –Ionic Bonding – Bond Energy of Nacl Molecule – Covalent Bonding – Metallic Bonding – Hydrogen Bonding – Van-Der-Waals Bonding – Crystal Lattice – Lattice Translational Vectors – Lattice with Basis – Unit Cell – Bravais‟ Lattices – Miller Indices – Procedure for finding them –Packing of BCC and FCC Structures – Structures of Nacl and Diamond Crystals –Reciprocal Lattice – Reciprocal Lattice Vectors – Properties – Reciprocal Lattices to SC, BCC and FCC Structures – Brillouin Zones – X-Rays – Bragg's Law(Simple Problems) – Experimental Methods: Laue Method, Powder Method And Rotating Crystal Method
UNIT-II	**ELEMENTARY LATTICE DYNAMICS:** Lattice Vibrations and Phonons: Linear Monoatomicand Diatomic Chains. Acoustical and Optical Phonons –Qualitative description of the Phonon Spectrum in Solids – Dulong and Petit‟s Law – Einstein and Debye Theories of specific Heat of Solids – T3 Law (Qualitative Only)–Properties of Metals – Classical Free Electron Theory of Metals(Drude-Lorentz) – Ohm‟s Law – Electrical and Thermal Conductivities – Weidemann-Franz‟ Law – Sommerfeld‟s Quantum Free Electron Theory (Qualitative Only) – Einstein‟s Theory of Specific Heat Capacity.
UNIT-III	**MAGNETIC PROPERTIES OF SOLIDS:** Permeability, Susceptibility, Relation Between them – Classification of Magnetic Materials – Properties ofDia, Para, Ferro, Ferri and Antiferromagnetism – Langevin‟s theory of Diamagnetism – Langevin‟s Theory of Paramagnetism – Curie-Weiss Law – Weiss Theory of Ferromagnetism(Qualitative Only) – Heisenberg‟s Quantum Theory of Ferromagnetism – Domains – Discussion of B-H Curve –Hysteresis and Energy Loss – Soft and Hard Magnets – Magnetic Alloys.

UNIT-IV	**DIELECTRIC PROPERTIES OF MATERIALS:** 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 – Dielectric Breakdown and its types – Classical Theory of Electric Polarisability –Normal and Anomalous Dispersion – Cauchy and Sellmeir Relations – Langevin-Debye Equation – Complex Dielectric Constant -Optical Phenomena Application – Plasma Oscillations – Plasma Frequency –Plasmons.
UNIT-V	**FERROELECTRIC & SUPERCONDUCTING PROPERTIES OF MATERIALS:** **Ferroelectric Effect:** Curie-Weiss Law – Ferroelectric Domains, P-E Hysteresis Loop – Elementary Band Theory:Kronig-Penny Model – Band Gap(No Derivation) – Conductor, Semiconductor (P And N Type) and Insulator –Conductivity of Semiconductor – Mobility – Hall Effect – Measurement of Conductivity (Four Probe Method) - Hall Coefficient. Super conductivity: experimental results –critical temperature –critical magnetic field – Meissner effect –type-I and type-II superconductors – London‟s equation and penetration depth – isotope effect – idea of BCS theory (no derivation)
TEXT BOOKS	1. Introduction to Solid State Physics,Kittel, Willey Eastern Ltd (2003). 2. Solid state Physics, Rita John,1st edition, TataMcGraw 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, 2nd Edition, 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, 1976, Cengage Learning 7. Solid-state Physics, H. Ibach and H. 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, McMillan India Ltd. 7. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India

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

COURSE OUTCOMES:

At the end of the course, the student will be able to:

COURSE OUTCOMES	**CO1**	Classify the bonding &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 super conducting properties of materials.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)**for each course with program outcomes **(PO)**in the 3-point scale of STRONG(**S**), MEDIUM(**M**) and LOW(**L**).

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

COURSE	**SIXTH SEMESTER – CORE COURSE – X**
COURSETITLE	**DIGITAL ELECTRONICS AND MICROPROCESSOR 8085**
CREDITS	**3**
COURSE OBJECTIVES	To learn all types of number systems, Boolean algebra and identities, digital circuits for addition and subtraction, flip-flops, registers, counters. To get the knowledge on fundamentals of 8085 architecture, instruction sets and simple programs.

UNITS	COURSE DETAILS
UNIT-I	Decimal, Binary, Octal, Hexadecimal Numbers Systems and their Conversions – Codes: BCD, Gray and Excess-3 Codes – Code Conversions –Complements (1‟s, 2‟s, 9‟s And 10‟s) – Binary Addition, Binary Subtraction using 1‟s & 2‟s Complement Methods – Boolean Laws – De-Morgan‟s Theorem –Basic Logic Gates -Universal Logic Gates (NAND & NOR) – Standard Representation of Logic Functions (SOP & POS) – Minimization Techniques (Karnaugh Map: 2, 3, 4 Variables).
UNIT-II	Adders,Half&Full Adder –Subtractors,Half&Full Subtractor – Parallel Binary Adder – Magnitude Comparator – Multiplexers (4:1) &Demultiplexers (1:4), Encoder (8-Line-To-3- Line) And Decoder (3-Line-To-8-Line), BCD to Seven Segment Decoder.
UNIT-III	**Flip-Flops:** S-R Flip-Flop , J-K Flip-Flop, T and D Type Flip-Flops, Master-Slave Flip-Flop, Truth Tables, Registers:- Serial in Serial Out And Parallel in And Parallel Out – Counters Asynchronous:-Mod-8, Mod-10, Synchronous - 4-Bit &Ring Counter – General Memory Operations, ROM, RAM (Static And Dynamic), PROM, EPROM, EEPROM, EAROM. IC – Logic Families: RTL, DTL, TTL Logic, CMOS NAND & NOR Gates, CMOS Inverter, Programmable Logic Devices – Programmable Logic Array (PLA), Programmable Array Logic (PAL).
UNIT-IV	**8085 Microprocessor:** Introduction To Microprocessor – INTEL 8085 Architecture – Register Organization –Pin Configuration Of 8085, Interrupts And Its Priority – Program Status Word (PSW) – Instruction Set Of 8085 –Addressing Modes Of 8085 –Assembly Language Programming Using 8085 –Programmes For Addition (8-Bit & 16-Bit), Subtraction (8-Bit & 16-Bit), Multiplication (8-Bit), Division (8- Bit) – Largest And Smallest Number In An Array – BCD To ASCII And ASCII To BCD.
UNIT-V	**I/O Interfaces:** Serial Communication Interface (8251-USART) – Programmable Peripheral Interface (8255-PPI) –Programmable Interval Timers (8253) – Keyboard And Display (8279), DMA Controller (8237).

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. Microcomputer Systems the 8086/8088 family – YU-Cheng Liu and GlenSA
REFERENCE BOOKS	1. Herbert Taub and Donald Schilling. "Digital Integrated Electronics" . McGraw 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". TMG HillEdition 5. Microprocessors and Interfacing – Douglas V.Hall 6. Microprocessor and Digital Systems – Douglas V.Hall
WEBLINKS	1. https://youtu.be/-paFaxtTCkI 2. https://youtu.be/s1DSZEaCX_g

COURSE	**SIXTH SEMESTER – CORE COURSE PRACTICALS – VI**
COURSETITLE	**ELECTRONICS EXPERIMENTS**
CREDITS	**3**
COURSE OBJECTIVES	To perform basic experiments on characteristics of electronic devices and then get into the applications such as amplifiers, oscillators, counters, multivibrators. Perform fundamental experiments on microprocessor 8085 and learn to write programs by themselves.

(Any TEN Experiments)

1. Zener diode – voltage regulations
2. Bride rectifier using diodes
3. Clipping and clamping circuits using diodes.
4. Characteristics of a transistor –(CE mode)
5. RC coupled CE transistor amplifier - single stage.
6. Transistor Emitter follower.
7. Colpitt‟s oscillator -transistor.
8. Hartley oscillator - transistor.
9. Astable multivibrator - transistor
10. FET - characteristics.
11. UJT -characteristics
12. AC circuits with L,C,R -Series resonance.
13. Operational amplifier - inverting amplifier and summing
14. Operational amplifier - differentiator & integrator.
15. 5V,IC Regulated power supply
16. Study of gate ICs – NOT,OR,AND, NOR,NAND, XOR, XNOR
17. Verification of De Morgan's theorem using ICs –NOT, OR,AND
18. NAND and NOR as universal building block.
19. Half adder andHalf subtractor using basic logic gate ICs
20. Microprocessor 8085 – addition and subtraction (8 bit only)
21. Microprocessor 8085 – largest and smallest of numbers (8 bit only

DISCIPLINE SPECIFIC CORE ELECTIVES

COURSE	**FIFTH SEMESTER –ELECTIVE – I**
COURSETITLE	**ENERGY PHYSICS**
CREDITS	3
COURSE OBJECTIVES	To get the understanding of the conventional and non-conventional energy sources, their conservation and storage systems.

UNITS	**COURSE DETAILS**
UNIT-I	**INTRODUCTION TO ENERGY SOURCES:** Energy Consumption as a Measure of Prosperity – World Energy Future – Energy Sources and their Availability – Conventional Energy Sources – Non-Conventional and Renewable Energy Sources – Comparison – Merits and Demerits.
UNIT-II	**SOLAR ENERGY:** Solar Energy Introduction – Solar Constant – Solar Radiation at the Earth‟s Surface – Solar Radiation Geometry – Solar Radiation Measurements – Solar Radiation Data –Solar Energy Storage And Storage Systems – Solar Pond – Solar Cooker – Solar Water Heater – Solar Greenhouse – Types Of Greenhouses – Solar Cells.
UNIT-III	**WIND ENERGY:** Introduction –Nature of the Wind – Basic Principle of Wind Energy Conversion – Wind Energy Data and Energy Estimation – Basic Components of Wind Energy Conversion Systems (WECS) – Advantages and Disadvantages of WECS – Applications – Tidal Energy
UNIT-IV	**BIOMASS ENERGY:** Introduction – Classification – Biomass Conversion Technologies – Photosynthesis – Fermentation - Biogas Generation –Classification of Biogas Plants – Anaerobic Digestion for Biogas – Wood Gasification – Advantages & Disadvantages.
UNIT-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 - Hydrogen Storage.
TEXT BOOKS	1. G.D.Rai, Non-ConventionalSourcesof Energy, Khanna Publishers, 2009, 4th Edn. 2. S P Sukhstme, JKNayak, Solar Energy, Principles of Thermal Collection and Storage, McGraw Hill, 2008, 3rd Edn. 3. D P Kothari, KPSingal, RakeshRajan, PHI Learning Pvt Ltd, 2011, 2nd Edn.

REFERENCE BOOKS	1. John Twidell& Tony Weir, Renewable EnergyResources, Taylor & Francis, 2005, 2nd Edn. 2. S.A. Abbasi and NasemaAbbasi, Renewable Energysources and their environmental impact, PHI Learning Pvt. Ltd, 2008. 3. M. P. Agarwal, Solar Energy, S. Chand & Co. Ltd., New Delhi,1982 4. H. C. Jain, Non-ConventionalSourcesof Energy, Sterling Publishers,1986.

COURSE	**FIFTH SEMESTER –ELECTIVE – II**
COURSETITLE	**MATERIALS SCIENCE**
CREDITS	**3**
COURSE OBJECTIVES	To learn imperfections in crystals, deformation of materials and testing of materials. To get knowledge on behavior ofa material, under the actionof light and their applications. To know the applications of crystaldefects.

UNITS	**COURSE DETAILS**
UNIT-I	**CRYSTAL IMPERFECTIONS:** Introduction – Point Defects: Vacancies**(**Problems**)**, Interstitials, Impurities, Electronic Defects – Equilibrium Concentration of Point Imperfections **(**Problems**)**–Application of Point Defects –Line Defects: Edge Dislocation**(**Problems**)**, Screw Dislocation – Surface Defects: Extrinsic Defects – Intrinsic Defects: Grain Boundaries, Tilt &Twist Boundaries,Twin Boundaries, Stacking Faults – Volume Defects – Effect of Imperfections.
UNIT-II	**MATERIAL DEFORMATION:** Introduction – Elastic Behavior of Materials – Atomic Model of Elastic Behavior –Modulus as a Parameter in Design – Rubber Like Elasticity – Inelastic Behavior of Materials – Relaxation Process – Viscoelastic Behavior of Materials – Spring- Dash Pot Models of Viscoelastic Behavior of Materials.
UNIT-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 – Precipitation Strengthening.
UNIT-IV	**OPTICAL MATERIALS:** Introduction – Optical Absorption in Metals, Semiconductors and Insulators – NLO Materials and their Applications – Display Devices and Display Materials: Fluorescence And Phosphorescence – Light Emitting Diodes –Liquid Crystal Displays.
UNIT-V	**MECHANICAL TESTING:** Destructive Testing: Tensile Test,Compression Test, Hardness Test – Nondestructive Testing (NDT): Radiographic Methods, Ultrasonic Methods – Thermal Methods of NDT: Thermography – Equipment Used for NDT: Metallurgical Microscope
TEXT BOOKS	1. Materialscience and Engineering, Raghavan V, Prentice Hall of India, Sixth Edition, 2015 2. Materials science, V. Rajendran, McGraw Hillpublications2011.

REFERENCE BOOKS	1. WilliamD. Callister, Jr., MaterialScience & Engineering – An Introduction, 8th Edition, John Wiley & Sons, Inc., 2007 2. W. Bolton, "Engine ring materials technology", 3rd Edition, Butterworth & Heinemann, 2001. 3. Donald R. Askeland, Prade p P. Phule, "The Science and Engine ring of Materials", 5thEdition, Thomson Learning, First Indian Reprint, 2007. 4. William F. Smith, "Structure and Properties of Engine ring Aloys", Mc-Graw-Hill Inc., U.S.A, 2nd edition, 1993.

COURSE	**SIXTH SEMESTER –ELECTIVE – III**
COURSETITLE	**NANOSCIENCE AND NANO TECHNOLOGY**
CREDITS	**3**
COURSE OBJECTIVES	This course aims to provide an overallunderstanding of Nanoscience and Nanotechnologyand introduces different types of nanomaterials, their properties, fabrication methods, characterizationtechniques and a range of applications.

UNITS	**COURSE DETAILS**
UNIT-I	**NANOSCIENCE AND NANOTECHNOLOGY:** Nanoscale– Nature and Nanostructures – Nanostructures: 0D,1D,2D– Surface To Volume Ratio– Size Effect – Excitons – Quantum Confinement– Metal Based Nanoparticles (Metal And Metal Oxide) – Nanocomposites (Non-Polymer Based) – Carbon Nanostructures – Fullerene –SWCNT And MWCNT.
UNIT-II	**PROPERTIES OF NANOMATERIALS:** Introduction –Mechanical Behavior –Elastic Properties – Hardness And Strength – Ductility And Toughness –Superplastic Behavior – Optical Properties – Surface Plasmon Resonance – Electrical Properties – Dielectric Materials And Properties – Magnetic Properties – Super Paramagnetism – Electrochemical Properties – Properties of Cnts.
UNIT-III	**FABRICATION METHODS AND VACUUM TECHNIQUES:** Top-Down and Bottom-Up Approaches – Electrochemical Method – Chemical & Physical Vapour Depositions (CVD & PVD) – Plasma Arc Discharge – Sputtering – Thermal Evaporation – Pulsed Laser Deposition – Ball Milling – Lithography: Photolithography – E-Beam Lithography – Sol- Gel Methods – Synthesis Of CNT.
UNIT-IV	**CHARACTERIZATION TECHNIQUES:** Scanning Probe Microscopy – Scanning Tunneling Microscopy – Atomic Force Microscopy – Scanning Electron Microscopy – Transmission Electron Microscopy –Powder XRD Method: Determination of Structure And Grain Size Analysis – UV-Visible and Photoluminescence Spectroscopy.
UNIT-V	**APPLICATIONS OF NANOMATERIALS:** Medicine: Drug Delivery – Photodynamic Therapy – Molecular Motors – Energy: Fuel Cells –Rechargeable Batteries – Supercapacitors– Photovoltaics. Sensors: Nanosensors Based On Optical And Physical Properties – Electrochemical Sensors – Nanobiosensors. Nanoelectronics: CNTFET – Display Screens – GMR Read/Write Heads – Nanorobots – Applications of CNTs
TEXT BOOKS	1. K.K.Chattopadhyayand A.N.Banerjee, (2012), Introductionto Nanoscience and Nanotechnology, PHI Learning Pvt. Ltd., 2. M.A. Shah, Tokeer Ahmad (2010), PrinciplesofNanoscience and Nanotechnology, Narosa Publishing House Pvt Ltd. 3. Mick Wilson, et al(2005) Nanotechnology, Overseas Press.

REFERENCE BOOKS	1. RichardBookerandEarlBoysen, (2005) Nanotechnology, WileyPublishingInc. USA 2. J.H.Fendler (2007) Nanoparticlesand nano structuredfilms;Preparation, Characterizationand Applications, JohnWiley&Sons 3. B.S.Murty, et al(2012) TextbookofNanoscienceandNanotechnology, UniversitiesPr

SKILL ENHANCEMENT COURSES

COURSE	SKILL ENHANCEMENT COURSE-3
COURSETITLE	INSTRUMENTATION
CREDITS	2
COURSE OBJECTIVES	To studythe instrument with its principle and observe the methodof their functioning. To provide a good foundation in measurements. To inspire interest in the knowledge of concepts regarding measurements.

UNITS	COURSE DETAILS
UNIT-I	**PERFORMANCE CHARACTERISTICS OF AN INSTRUMENTATION SYSTEM** Introduction – System configuration – Problem Analysis – Basic Characteristics of measuring devices – Calibration - Generalized measurement – Zero – ordersystem – Second order system–Dead time element – Specification and testing of dynamic response.
UNIT-II	**SENSORS AND TRANSDUCERS** Basic principles of sensors – pressure sensor (Strain Gauge) – IR sensor - Characteristics of transducers – variable resistance transducer –variable capacitance transducer – Voltage and current transducer.
UNIT-III	**DIGITAL INSTRUMENTS** Introduction – Digital Multimeter – Digital panel meter – Digital frequency meter – Digital measurement of time – Universal counter – Digital tachometer – Digital PH meter.
UNIT-IV	**MEDICAL INSTRUMENTATION** ECG - EEG – Lead systems and recording methods –typical waveforms – X-ray machine – Digital Stethoscope – Computer tomography – MRI – Ultrasonography – Thermography – Pacemakers –Ventilators – Dialyzers.
UNIT-V	**GAS ANALYSERS AND POLLUTION MONITORING INSTRUMENTS** Types of gas analysers– Oxygen, NO2 and H2S types – IR analyser– Air pollution standards – Air pollution detector – Dust and smoke detector – Radiation monitoring instruments –Area radiation dosimeter – personal radiation dosimeter – radiation warning alarm.
TEXT BOOKS	1.E.A.Doebelin, Measurement Systems-Applications and Design, Tata McGraw Hill,(1990) 2.CS Rangan, GRSharma, V.S.V. Mani, Instrumentation Devices and Systems, Second Edition, Tata McGraw Hill, (2011) 3.R.S.Khandpur, Handbookof AnalyticalInstruments, Tata McGraw Hill(2003).
REFERENCE BOOKS	1.D.Patranabis, Sensors and Transducers, Prentice Hallof India, (1999) 2.M. Arumugam, Bio-medicalInstrumentation, Anuradha Agencies, (2002) 3. John G. Webster, MedicalInstrumentation: Application and Design, John Wiley &Sons Inc (2009) 4. John P. BentleyPrinciples of Measurement Systems, Third Edition, Pearson Education, (2000)

WEBLINKS	1. https://www.electronicshub.org/ir-sensor/ 2. https://www.electronicsforu.com/technology-trends/learn- electronics/ir-led-infrared-sensor-basics

COURSE	**SKILL ENHANCEMENT COURSE-5**
COURSETITLE	**COMPUTATIONALMETHODSANDPROGRAMMINGIN–C**
CREDITS	2
COURSE OBJECTIVES	This course will provide the necessary basic concepts of errors in computing and a few numerical methods for finding zeros of non-linear functions. Further, will provide the basics of the C programming language.

UNITS	COURSE DETAILS
UNIT-I	**ERRORS IN COMPUTING:** Significant digits – Inherent Errors – Numerical Errors – Modelling Errors – Absolute and Relative Errors – Error Propagation – Conditioning and stability – Convergence of iterative process.
UNIT-II	**ROOTS OF EQUATIONS:** Algebraic, Polynomial, Transcendental equations – Methods of the solution – Iterative methods – Starting and stopping iterative process – Evaluation of polynomials – Bisection method – False Position method- Related problems.
UNIT-III	**C-FUNDAMENTALS:** Character set – Keywords - data types – variable types - constants – identifiers – keywords – operators and expressions – Input and Output functions.
UNIT-IV	**CONTROL STATEMENTS** (Syntax and examples for each) If – else, Nested if-else, Switch – Case, Break, While Loop, for loop, Do-While statement, go to.
UNIT-V	**FUNCTIONS AND ARRAYS** Declaration and definition of a function– accessing a function – passing parameters to a function Defining an array – processing an array – single dimensional array – multidimensional array - simple programs (Addition, Subtraction, Multiplication of two matrices - Ascending and Descending order).
TEXT BOOKS	1.E.Balagurusamy,NumericalMethods,McGrawHillPublishers,2017. 2. S.S.Sastry,IntroductoryMethodsofNumericalAnalysis,PrenticeHallofIndia,2012
REFERENCE BOOKS	1. E.Balagurusamy,Programmingin ANSIC,McGrawHillPublishers,2019,8th Edn. 2. B.Gottfried,Schaum's OutlineofProgrammingwithC,McGrawHillPublishers, 1996
WEBLINKS	1. https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with- examples/ 2.https://onlinecourses.swayam2.ac.in/cec20_cs02/preview

COURSE	**SKILL ENHANCEMENT COURSE-6**
COURSETITLE	**ELECTRONIC DEVICES**
CREDITS	2
COURSE OBJECTIVES	Providing an overview of the principles, operation and applications of special diodes. Introducing transistor and transistor biasing. Providing an overview of the principles, operation and applications of special devices. Providing an overview of amplifiers, oscillators and their applications in different electronic fields. To make students acquire knowledge about Boolean algebra, logic circuits, designing counters and the basic concepts of memory and programmable logic device.

UNITS	**COURSE DETAILS**
UNIT-I	**SPECIAL DIODES:** Spectral response of human eye - Light Emitting Diode (LED)– advantages and its applications – photo transistor -- characteristics and applications – Tunnel diode and its characteristics – Tunnel diode as an Oscillator.
UNIT-II	**SPECIAL TRANSISTORS**: JFET construction - JFET characteristics – parameters - Common source JFET amplifier UJT: construction - working – equivalent circuit - characteristics – Relaxation oscillator – SCR: Construction – working – equivalent circuit - V-I characteristics and their application.
UNIT-III	**OPERATIONAL AMPLIFIERS:** Op-amp - characteristics – Inverting and non-inverting amplifier - CMRR –Frequency response-Slew rate-Differential Amplifier-Applications: Sign changer and scale changer – adder – subtractor – integrator – differentiator.
UNIT-IV	**AMPLIFIERS:** Principle of Amplifier- Performance analysis of single-stage transistor amplifer-class A power amplifier- class B push pull power amplifier-characteristics of Amplifier-Appliciaton.
UNIT-V	**OSCILLATORS:** Principles of Oscillators- Types of Oscillators-Colpitt's oscillator - Hartley oscillator. Principle of multivibrator - Astable – monostable – bistable multivibrator using transistors – Applications.
TEXT BOOKS	1. Metha V. K. Principles of Electronics, New Delhi, S. Chand & Co. Ltd., 2003. 2. Atul P. Godse, Deepali A. Godse, Electronic Circuits, Pune, Technical Publications, 2009. 3. B. L. Theraja, Basic electronics, S. Chand, New Delhi, 2010. 4. D Leach, Albert Malvino, Digital Principles and Applications, CMc-grawHill Inc., US (1994).

REFERENCE BOOKS	1. Millman J. and Halkias C., Integrated Electronics, New Delhi, Tata McGraw Hill, 2001. 2. Thomas L. Floyd, Electronic Devices, New Delhi, Kindersley (India) Pvt. Ltd., 2003 3. Charles A. Schuler, Roger L. Tokheim, Electronic Principles and Applications, New Delhi, Tata McGraw Hill Publishing Company Limited, 2008. 4. Arul Thalapathy M., Basic and Applied Electronics, Chennai, Comtek publisher, 2005. 5. 5. Palanisamy P. K., Ramesh Babu P., Ganesh Babu T. R., Electronic Devices and Circuits, Chennai, Scitech Publications (India) Pvt. Ltd., 2005. 6. Allen Mottershead, Electronic Devices and Circuits, New Delhi, Prentice-Hall of India, 1996. 7. Arun P., Electronics, New Delhi, Narosa Publishing House, 2008. 8. Basavaraj B., A Text Book of Basic Electronics, Mumbai, Himalaya Publishing House, 2007. 9. Chatterji B.N, Digital Computer technology, Khanna Publishers, Delhi, 2nd edition 1986. 10. Puri V.K, Digital Electronics circuits and systems, Tata McGraw Hill Publishing Company Limited New Delhi, 1st edition 1997. 11. S. Salivahanan, S. Arivazhagan, Digital Circuits and Design, Vikas Publishing House Private Limited, 3rd edition 2007
WEBLINKS	1. www.elprocus.com/working-theory-of-an-rc-coupled- amplifier/ 2. www.circuitstoday.com/transistor-amplifier 3. www.visionics.a.se/html/.../RC%20Coupled%20Amplifier 1.html 4. www.circuitstoday.com/ujt-uni-junction-transistors 5. http://www.electronics-tutorials.ws/power/unijunction- transistor.html 6. http://www.allaboutcircuits.com/textbook/semiconductors/c hpt-5/junction-field-effect-transistors-jfet/ 7. http://www.futureelectronics.com/en/transistors/jfet- transistor.aspx 8. http://www.electronics-tutorials.ws/transistor/tran_6.html 9. www.learnabout-electronics.org/Oscillators/osc10.php 10. https://www.youtube.com/watch?v=A-gWV5liKxM 11. https://www.youtu.be/gl-qXk7XojA 12. https://www.youtu.be/qXv08d8caYc 13.E-module: https://www.youtu.be/fKVZpuptPo

COURSE	**SKILL ENHANCEMENT COURSE-7**
COURSETITLE	**COMMUNICATION SYSTEM**
CREDITS	2
COURSE OBJECTIVES	To enable the students to understand the different types of communications and make them appreciate the flavour of physics in communication.

UNITS	**COURSE DETAILS**
UNIT-I	**RADIO TRANSMISSION AND RECEPTION:** Introduction-types of modulation –comparison of FM and AM – demodulation – receivers: AM radio receivers – types of AM radio receivers – stages of superheterodyne radio receiver, advantages – disadvantages.
UNIT-II	**FIBER OPTIC COMMUNICATION:** Introduction – Basic Principle of Fiber Optics – Advantages – Construction of Optical Fiber – Classification Based on The Refractive Index Profile – Classification Based On The Number of Modes of Propagation – Losses in Optical Fibers – Attenuation–Advantages of Fiberoptic Communication
UNIT-III	**RADAR COMMUNICATION:** Introduction - Basic Radar System –Radar Range – Antenna Scanning – Pulsed Radar System – Search Radar –Tracking Radar – Moving Target Indicator Doppler Effect-MTI Principle – CW Doppler Radar
UNIT-IV	**SATELLITE COMMUNICATION:** Introduction –History of Satellites – Satellite Communication System – Satellite Orbits – Basic Components of Satellite Communication System – Commonly used Frequency In Satellite – Communication – Multiple Access Communication – Satellite Communication in India
UNIT-V	**MOBILE COMMUNICATION:** Introduction – Concept of Cell –Basic Cellular Mobile Radio System – Cellphone – Facsimile – Important Features of Fax Machine – Application of Facsimile – VSAT (Very Small Aperture Terminals) Modem IPTV (Internet Protocol Television) -Wi-Fi-4G- 5G (Basic Ideas)
TEXT BOOKS	1. V.K.Metha, Principles of Electronics, S. Chand &CoLtd., 2013 2. Anokh Singh and Chopra A.K., Principles of communication Engineering, S.Chand& Co, 2013
REFERENCE BOOKS	1. J.S. Chitode, Digital Communications, 2020, Unicorn publications 2. Senior John. M, Optical Fiber Communications: Principles and Practice, 2009, Pearson Education.

COURSE	**SKILL ENHANCEMENT COURSE - ENTREPRENEURIAL BASED**
COURSETITLE	**DIGITAL PHOTOGRAPHY**
CREDITS	2
COURSE OBJECTIVES	To understand the principles ofphotographyand image formation and the science and arts behind it. To understand the essentialcomponents of conventionaland digital cameras and also the different image processing techniques.

UNITS	COURSE DETAILS
UNIT-I	**PHOTOGRAPHY AND BASIC PRINCIPLE OF IMAGE FORMATION:** Principle –Chemical Route and Digital Route –Light, Wavelengths, Colours – Shadows – Light Intensity and Distance – Making Light form Images –Pin – Hole Images – Practical Limitations to Pin-Hole Images – Lens Instead of Pin – Hole – Focal Length And Image Size – Imaging of Closer Subjects.
UNIT-II	**LENSES – CONTROLLING THE IMAGES:** Photographic Lens – Focal Length and Angle of View **(**Problems**)**– Focusing Movement – Aperture and F – Numbers **(**Problems**)** – Depth of Field– Depth of Focus – Image Stabilization – Lenses for Digital Cameras – Lens and Camera Care.
UNIT-III	**CAMERA USING FILMS AND ITS TYPES:** Camera and its Essential Components– Shutter – Aperture – Light Measurement – Film Housing – Camera types: View Camera– View Finder Camera – Reflex Camera– Single Lens Reflex (SLR) Camera
UNIT-IV	**DIGITAL CAMERAS PRINCIPLE AND TYPES:** Principle of Digital Image Capturing –Comparison of Digital And Analog Picture Information – Megapixel – Grain, Noise and Pixel Density – Optical and Digital Zooming – Image Stabilizer – Bit Depth – White Balance – Colour Modes – File Formats (TIFF, RAW &JPEG) – Storage Cards and Types – Digital Cameras: Camera Phones – Compact Camera – Hybrid Camera – Digital SLR.
UNIT-V	**THE DIGITAL IMAGE – POSTPRODUCTION:** Hardware: Computer and its Peripherals – Software: Saving Digital File – Basic Editing: Navigating the Image – Undo/Redo/History – Crop – Rotate – Brightness &Contrast – Colour Balance – Hue/Saturation – Dodge/Burn – Cloning &Retouching – Removing An Element In An Image – Advanced Editing: Histogram/Levels – Curves – Selection Tools: Magic Wand – Printing Digital Images: Inkjet Printer – Laser Printer – Dye Sub Printer – Lambda/Light Jet Printers.
TEXT BOOKS	1. MichelJ.Langford , Anna Fox & Richard SawdonSmith, Basic photography, 9th Edition, , 2010-NL, Focalpress, London 2. HenryCarroll, Read this if you want to take great photographs ofpeople, Laurence King Publishing

REFERENCE BOOKS	3. Mark Galer, DigitalPhotography in Available Light essentialskills, 2006, Focal press, London 4. PaulHarcourt Davies, The Photographer‟s practicalhandbook, 2005, UKPRESS

COURSE	**SKILL ENHANCEMENT COURSE-ENTREPRENEURIAL BASED**
COURSE TITLE	**HOME ELECTRICAL INSTALLATION**
CREDITS	2
COURSE OBJECTIVES	The students will get knowledge on electrical instruments, installations and domestic wiring techniques with safety precautions and servicing.

UNITS	**COURSE DETAILS**
UNIT-I	**SIMPLE ELECTRICAL CIRCUITS:** Charge, Current, Potential Difference, Resistance – Simple Electrical Circuits – DC Ammeter, Voltmeter, Ohmmeter – Ohm‟s Law – Difference between DC And AC – Advantages of AC Over DC – Electromagnetic Induction - Transformers – Inductors/Chokes – Capacitors/Condensers – Impedance – AC Ammeter, Voltmeter – Symbols and Nomenclature
UNIT-II	**TRANSMISSION OF ELECTRICITY:** Production and Transmission of Electricity – Concept of Power Grid – Series and Parallel Connections – Technicalities of Junctions and Loops in Circuits –Transmission Losses (Qualitative) – Roles of Step-Up and Step- Down Transformers – Quality of Connecting Wires – Characteristics of Single and Multicore Wires.
UNIT-III	**ELECTRICAL WIRING:** Different Types of Switches – Installation of Two Way Switch – Role of Sockets, Plugs, Sockets - Installation of Meters – Basic Switch Board – Electrical Bell – Indicator – Fixing of Tube Lights and Fans – Heavy Equipment Like AC, Fridge, Washing Machine, Oven, Geyser, Jet Pumps – Provisions for Inverter – Gauge Specifications of Wires for Various Needs
UNIT-IV	**POWER RATING AND POWER DELIVERED:** Conversion of Electrical Energy in to Different Forms – Work Done by Electrical Energy – Power Rating of Electrical Appliances – Energy Consumption – Electrical Energy Unit in KWH – Calculation of EB Bill – Joule‟s Heating – Useful Energy and Energy Loss – Single and Three Phase Connections – Measures to Save Electrical Energy – Energy Audit.
UNIT-V	**SAFETY MEASURES:** Insulation for Wires – Colour Specification for Mains, Return and Earth – Understanding of Fuse and Circuit Breakers – Types of Fuse: Kit-Kat, HRC, Cartridge, MCB, ELCB – Purpose of Earth Line – Lighting Arrestors – Short Circuiting and Over Loading – Electrical Safety – Tips to avoid Electrical Shock – First Aid for Electrical Shock – Fire Safety for Electric Current

TEXT BOOKS	1. Wiring a House: 5th Edition by Rex Cauldwell, (2014). 2. Black & Decker Advanced Home Wiring, 5th Edition: Backup Power - Panel Upgrades - AFCI Protection - "Smart" Thermostats, by Editors of Cool Springs Press, (2018). 3. Complete Beginners Guide to Rough in Electrical Wiring: by Kevin Ryan (2022).

COURSE	**SIXTH SEMESTR – PROFESSIONAL COMPETENCY SKILLS**
COURSETITLE	**QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS**
CREDITS	2
COURSE OBJECTIVES	To motivate undergraduate students of physics to develop their aptitude and reasoning skill for competitive examinations.

UNITS	**COURSE DETAILS**
UNIT-I	Operations on numbers – H.C.F & L.C.M of numbers – Decimal fractions – Simplifications - Square roots and Cube roots – Averages.
UNIT-II	Problems of ages - Surds & Indices – Percentage – Profit & Loss – Ratio & Proportions – Time & Work – Pipes & Cisterns.
UNIT-III	Time & Distance - Problems on Trains -Boats & Streams – Allegation & Mixtures – Logarithms – Simple interest & Compound interest.
UNIT-IV	Area, Volumes and Surface areas – Calendar – Clocks – permutations & combinations – probability – Heights & Distances.
UNIT-V	Logical Reasoning – Puzzles – Dice – Visual Reasoning – Alphanumeric Reasoning – Number series.
TEXT BOOKS	1. Quantitative aptitude for competitive exams, R.S. Aggarwal, S. Chand publications, edition 2018 New Delhi.
REFERENCE BOOKS	1. Fast Track Objective Arithmetic Paperback, edition 2018, Rajesh Varma, Arihant publications 2. Abhijith Guha, Quantitative Aptitude for Competitive Examination, Tata McGraw Hill. 5th edition, New Delhi.
WEBLINKS	1. https://tnpsc.news/tnpsc-study-materials 2. https://byjus.com/free-ias-prep/tnpsc-study-material/ 3. https://www.winmeen.com/tnpsc-study-materials/ 4. http://www.kalvisolai.com/p/kalvisolai-tnpsc-study-materials.html

COURSE	**SKILL ENHANCEMENT COURSE-NON-MAJOR ELECTIVES (NME)**
COURSETITLE	**PHYSICS FOR EVERYDAY LIFE**
CREDITS	2
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.

UNITS	**COURSE DETAILS**
UNIT-I	**MECHANICAL OBJECTS:** **S**pring Scales – Bouncing Balls –Roller Coasters – Bicycles –Rockets and Space Travel.
UNIT-II	**OPTICAL INSTRUMENTS AND LASER:** Vision Corrective Lenses – Polaroid Glasses – UV Protective Glass – Polaroid Camera – Colour Photography – Holography and Laser.
UNIT-III	**PHYSICS OF HOME APPLIANCES:** Bulb – Fan – Hair Drier – Television – Air Conditioners – Microwave Ovens – Vacuum Cleaners
UNIT-IV	**SOLAR ENERGY:** Solar Constant – General Applications Of Solar Energy – Solar Water Heaters – Solar Photo – Voltaic Cells – General Applications of Solar Cells.
UNIT-V	**INDIAN PHYSICIST AND THEIR CONTRIBUTIONS:**C.V.Raman, HomiJehangirBhabha, Vikram Sarabhai, Subrahmanyan Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology.
TEXT BOOKS	1. The Physics in our Daily Lives, UmmeAmmara, Gugucool Publishing, Hyderabad, 2019. 2. For the love of physics, Walter Lawin, Free Press, New York, 2011.

COURSE	**SKILL ENHANCEMENT COURSE-NON-MAJOR ELECTIVES (NME)**
COURSE TITLE	**ASTROPHYSICS**
CREDITS	2
COURSE OBJECTIVES	This course intends tointroduce 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 celestialbodies along with the instrumentation and techniques used in astronomical research

UNITS	**COURSE DETAILS**
UNIT-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.
UNIT-II	**SOLAR SYSTEM:** Bode‟s law of planetary distances – meteors, meteorites, comets, asteroids – Kuiper belt – Oort cloud – detection of gravitational waves – recent advances in astrophysics.
UNIT-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.
UNIT-IV	**STELLAR EVOLUTION:** H-R diagram – birth & death of low mass, intermediate mass and massive stars – Chandrasekar limit – white dwarfs – neutron stars – pulsars – black holes – supernovae. **Galaxies:** classification of galaxies – galaxy clusters –interactions of galaxies, dark matter and super clusters – evolving universe.
UNIT-V	**ACTIVITIES IN ASTROPHYSICS:** (i) Basic construction of telescope (ii) Develop models to demonstrate eclipses/planetary motion (iii) Night sky observation (iv) Conduct case study pertaining to any topic in this paper (v) Visit to any one of the National Observatories Any three activities to be done compulsorily.
TEXT BOOKS	1. BaidyanathBasu, (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. &Madhusudan, H.R.,(1999), Eclipse: A Celestial Shadow Play, Orient BlackSwan,

COURSE	**ALLIED PAPER**
COURSETITLE	**ALLIED PHYSICS – I**
CREDITS	4
COURSE OBJECTIVES	To impart basicprinciplesof Physics that which would be helpful for students who have taken programmes other than Physics.

UNITS	**COURSE DETAILS**
UNIT-I	**WAVES, OSCILLATIONS AND ULTRASONICS:** Simple Harmonic Motion (SHM) – Composition of two SHMs at Right Angles (Periods in the Ratio 1:1) – Lissajous Figures – Uses – Laws of Transverse Vibrations of Strings – Determination of AC Frequency using Sonometer (Steel and Brass Wires) – Ultrasound – Production – Piezoelectric Method – Application of Ultrasonics: Medical Field – Lithotripsy, Ultrasonography – Ultrasonoimaging- Ultrasonics in Dentistry – Physiotheraphy, Opthalmology – Advantages of Noninvasive Surgery – Ultrasonics in Green Chemistry.
UNIT-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 – Comparison of Viscosities – Burette Method, **Surface Tension:** Definition – Molecular Theory – Droplets Formation–Shape, Size and Lifetime – Covid Transmission Through Droplets, Saliva – Drop Weight Method – Interfacial Surface Tension.
UNIT-III	**HEAT AND THERMODYNAMICS:** Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde‟s process of liquefaction of air– liquid Oxygen for medical purpose– importance of cryocoolers – thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot‟s cycle – efficiency – entropy – change of entropy in reversible and irreversible process.

UNIT-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 – Types Of Switches In Household And Factories– Smart Wifi Switches- Fuses And Circuit Breakers In Houses.
UNIT-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: Software Technological Parks Under Meity, NIELIT-Semiconductor Laboratories Under Dept. Of Space – An Introduction ToDigital India.
TEXT BOOKS	1. R.Murugesan (2001), AlliedPhysics,S. Chand&Co,NewDelhi. 2. BrijlalandN.Subramanyam(1994), WavesandOscillations,VikasPublishing House,NewDelhi. 3. BrijlalandN.Subramaniam (1994), PropertiesofMatter,S.Chand&Co.,NewDelhi . 4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8th edition), S.Chand&Co.,New Delhi. 5. R.Murugesan(2005), OpticsandSpectroscopy,S.Chand&Co,NewDelhi . 6. A.Subramaniyam, AppliedElectronics2ndEdn.,NationalPublishingCo.,Chennai.
REFERENCE BOOKS	1. ResnickHallidayandWalker(2018).Fundamentalsoft Physics (11thedition),JohnWilleyand Sons, Asia Pvt.Ltd., Singapore. 2. V.R.KhannaandR.S.Bedi (1998), TextbookofSound1stEdn. KedharnaathPublish&Co, Meerut. 3. N.S.KhareandS.S.Srivastava(1983),ElectricityandMagnetism 10thEdn.,AtmaRam&Sons, New Delhi. 4. D.R.KhannaandH.R. Gulati(1979). Optics,S. Chand &Co. Ltd.,New Delhi. 5. V.K.Metha(2004).Principlesofelectronics6thEdn. S.Chand and company.

WEBLINKS	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/wat

	ch?v=gT8Nth9NWPMhttps://www.youtube.com/watch?v=9mXOMzUruMQ&t=1shttps://www.youtube.com/watch?v=m4u-SuaSu1s&t=3shttps://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

COURSE OUTCOMES:

At the end of the course, the student will be able to:

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 background of growth of this technology.
	CO4	Articulate the knowledge about electric current resistance, capacitance in terms of potential electric field and electric correlatetheconnectionbetweenelectricfieldandmagneticfieldandanalyzethemmathematicallyverifycircuitsandapplytheconcepts to construct circuits and study them.
	CO5	Interpret the real life solutions using AND, OR, NOT basic logic gates and in tend their ideas to universal building blocks. InferoperationsusingBooleanalgebraandacquireelementaryideasofICcircuits.Acquire information about various Govt. programs/ institutions in this field.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes**(CO)**for each course with program outcomes**(PO)**inthe3-pointscale of STRONG(**S**),MEDIUM(**M**)andLOW(**L**).

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

COURSE	**ODD SEMESTER – CORE**
COURSETITLE	**ALLIED PRACTICALS – I**
CREDITS	2
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

ANY Seven only

1. Young‟s modulus by non-uniform bending using pin and microscope
2. Young‟s modulus by non-uniform bending using optic lever,scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations without mass
2. Surface tension and interfacial Surface tension – drop weight method
3. Comparison of viscosities of two liquids – burette method
4. Specific heat capacity of a liquid – half time correction
5. Verification of laws of transverse vibrations using sonometer
6. Calibration of low range voltmeter using potentiometer
7. Determination of thermo emf using potentiometer
8. Verification of truth tables of basic logic gates using ICs
9. Verification of De Morgan‟s theorems using logic gate ICs.
10. Use of NAND as universal building block.

Note : Use of digital balance permitted

COURSE	**ALLIED PAPER**
COURSETITLE	**ALLIED PHYSICS –II**
CREDITS	4
COURSE OBJECTIVES	To understand the basic concepts of optics, modern Physics, concepts of Relativity and Quantum Physics, semiconductor Physics, and Electronics.

UNITS	**COURSE DETAILS**
UNIT-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 – Diffraction of Light Vs Sound – 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
UNIT-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 – Periodic Classification Of Elements – Bohr Magneton – Stark Effect –Zeeman Effect (Elementary Ideas Only) – Photo Electric Effect – Einstein‟s Photoelectric Equation – Applications of Photoelectric Effect: Solar Cells, Solar Panels, Optoelectric Devices
UNIT-III	**NUCLEAR PHYSICS:** Nuclear Models – Liquid Drop Model – Magic Numbers – Shell Model – Nuclear Energy – Mass Defect – Binding Energy – Radioactivity – Uses – Half Life – Mean Life - Radio Isotopes and uses –Controlled and Uncontrolled Chain Reaction – Nuclear Fission – Energy Released In Fission – Chain Reaction – Critical Reaction – Critical Size – Atom Bomb – Nuclear Reactor – Breeder Reactor – Importance of Commissioning PFBR in Our Country – Heavy Water Disposal, Safety of Reactors: Seismic and Floods –Introduction to DAE, IAEA – Nuclear Fusion – Thermonuclear Reactions – Differences between Fission and Fusion.
UNIT-IV	**INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES**: Frame of Reference – Postulates of Special Theory of Relativity – Galilean Transformation Equations – Lorentz Transformation Equations – Derivation – Length Contraction – Time Dilation – Twin Paradox – Mass–Energy Equivalence –Introduction on Gravitational Waves, LIGO, ICTS Opportunities at International Centre for Theoretical Sciences
UNIT-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 – Introduction to E- Vehicles and EV Charging Stations
TEXT BOOKS	1. R.Murugesan (2005), AlliedPhysics,S.Chand&Co,NewDelhi. 2. K.ThangarajandD.Jayaraman(2004), AlliedPhysics,PopularBookDepot,Chenna i. 3. BrijlalandN.Subramanyam(2002), TextbookofOptics,S.Chand&Co,NewDelh i. 4. R.Murugesan (2005), ModernPhysics,S.Chand&Co,NewDelhi. 5. A.SubramaniyamAppliedElectronics, 2nd Edn.,NationalPublishingCo.,Chenna i.
REFERENCE BOOKS	1. ResnickHallidayandWalker (2018), FundamentalsofPhysics, 11th Edn., JohnWilleyandSons, Asia Pvt.Ltd.,Singapore. 2. D.R.KhannaandH.R. Gulati (1979).Optics, S.Chand&Co.Ltd.,New Delhi. 3. A.Beiser(1997),ConceptsofModernPhysics,TataMcGrawHill Publicati on,NewDelhi. 4. Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, NewDelhi. 5. V.K.Metha(2004), Principlesofelectronics, 6th Edn. ,S.Chandand Company, New Delhi.
WEBLINKS	1. https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318&v=D38Bj gUdL5U&feature=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:

At the end of the course, the student will be able to:

COURSE OUTCOMES	**CO1**	Explaintheconceptsof interferencediffractionusingprinciplesof 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 ofinterpretingimprovingtheoreticalmodelsbasedonobservation .Appreciateinterdisciplinarynatureofscience and in solar energy related applications.

	CO3	Summarizethepropertiesofnuclei, nuclearforcesstructureofatomicnucleusandnuclear models. Solveproblems on delayratehalf-lifeand mean-life.Interpret nuclear processes likefission 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	Todescribethebasicconceptsofrelativitylikeequivalenceprincip le, inertialframes and Lorentz transformation. Extend their knowledge on concepts ofrelativityandviceversa. Relate this with current research in this field and get an overview of research projects of National and International importance, like LIGO, ICTS, and opportunities available.
	CO5	Summarize the working of semiconductor devices like junction diode, Zenerdiode, transistors and practical devices we daily use like USB chargers and EV charging stations.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes**(CO)**for each course with program outcomes**(PO)**inthe3- point scale ofSTRONG(**S**),MEDIUM(**M**)andLOW(**L**).

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

COURSE	**EVEN SEMESTER – CORE**
COURSETITLE	**ALLIED PRACTICALS – II**
CREDITS	2
COURSE OBJECTIVES	Apply various Physics concepts to understand concepts of Light, electricity and magnetism and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

Any EIGHT Experiments

1. Radius of curvature of lens by forming Newton‟s rings
2. Thickness of a wire using air wedge
3. Wavelength of mercury lines using spectrometer and grating
4. Refractive index of material of the lens by minimum deviation
5. Refractive index of liquid using liquid prism
6. Determination of AC frequency using sonometer
7. Specific resistance of a wire using PO box
8. Thermal conductivity of poor conductor using Lee‟s disc
9. Determination of figure of merit table galvanometer
10. Determination of Earth‟s magnetic field using field along the axis of a coil
11. Characterisation of Zener diode
12. Construction of Zerner/IC regulated power supply
13. Construction of AND, OR, NOT gates using diodes and transistor
14. NOR gate as a universal building block