B.SC.,
PHYSICS

SYLLABUS

FROM THE ACADEMIC YEAR
2023-2024

TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION, CHENNAI – 600 005

B.Sc., PHYSICS SYLLABUS

Preamble

Physics is one of the basic and fundamental sciences. The curriculum for the undergraduate programme in Physics is revised as per the UGC guidelines on Learning Outcome based Course Framework. The learner-centric courses let the student progressively develop a deeper understanding of various aspects of physics.

The new curriculum offer courses in the core areas of mechanics, acoustics, optics and spectroscopy, electricity and magnetism, atomic and nuclear physics, solid state, electronics and other fields. The courses will train students with sound theoretical and experimental knowledge that suits the need of academics and industry. In addition to the theoretical course work, the students also learn physics laboratory methods for different branches of physics, specialized measurement techniques, analysis of observational data, including error estimation and etc. The students will have deeper understanding of laws of nature through the subjects like classical mechanics, quantum mechanics, statistical physics etc. The problem solving ability of students will be enhanced. The students can apply principles in physics to real life problems. The courses like integrated electronics and microprocessors will enhance the logical skills as well as employability skills. The numerical methods and mathematical physics provide analytical thinking and provides a better platform for higher level physics for research.

The restructured courses with well-defined objectives and learning outcomes, provide guidance to prospective students in choosing the elective courses to broaden their skills not only in the field of physics but also in interdisciplinary areas. The elective modules of the framework offer students choice to gain knowledge and expertise in specialized domains of physics like astrophysics, medical physics, etc.

TANSCHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE EDUCATION	
Programme	**B.Sc., Physics**
Programme Code	
Duration	**3 years [UG]**
Programme Outcomes: (These are mereguidelines. Faculty can create POs based on their curriculum or adopt from UGC or the University for their Programme)	**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 the analytic thought to a body of knowledge; analyse and evaluate the proofs, arguments, claims, beliefs on the basis of empirical evidences; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach. **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 toembrace 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 demonstratingthe 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. **PO 15: 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 research 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

Credit Distribution for UG Programmes

Sem I	Credit	H	Sem II	Credit	H	Sem III	Credit	H	Sem IV	Credit	H	Sem V	Credit	H	Sem VI	Credit	H
Part 1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	5.1 Core Course – \CC IX	4	5	6.1 Core Course – CC XIII	4	6
Part.2 English	3	6	Part..2 English	3	6	Part..2 English	3	6	Part..2 English	3	6	5.2 Core Course – CC X	4	5	6.2 Core Course – CC XIV	4	6
1.3 Core Course – CC I	5	5	2..3 Core Course – CC III	5	5	3.3 Core Course – CC V	5	5	4.3 Core Course – CC VII Core Industry Module	5	5	5. 3.Core Course CC -XI	4	5	6.3 Core Course – CC XV	4	6
1.4 Core Course – CC II	5	5	2.4 Core Course – CC IV	5	5	3.4 Core Course – CC VI	5	5	4.4 Core Course – CC VIII	5	5	5. 4.Core Course –/ Project with viva-voce CC -XII	4	5	6.4 Elective -VII Generic/ Discipline Specific	3	5
1.5 Elective I Generic/ Discipline Specific	3	4	2.5 Elective II Generic/ Discipline Specific	3	4	3.5 Elective III Generic/ Discipline Specific	3	4	4.5 Elective IV Generic/ Discipline Specific	3	3	5.5 Elective V Generic/ Discipline Specific	3	4	6.5 Elective VIII Generic/ Discipline Specific	3	5
1.6 Skill Enhancement Course SEC-1	2	2	2.6 Skill Enhancement Course SEC-2	2	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	1	4.6 Skill Enhancement Course SEC-6	2	2	5.6 Elective VI Generic/ Discipline Specific	3	4	6.6 Extension Activity	1	-
1.7 Skill Enhancement -(Foundation Course)	2	2	2.7 Skill Enhancement Course – SEC-3	2	2	3.7 Skill Enhancement Course SEC-5	2	2	4.7 Skill Enhancement Course SEC-7	2	2	5.7 Value Education	2	2	6.7 Professional Competency Skill	2	2
						3.8 E.V.S.	-	1	4.8 E.V.S	2	1	5.8 Summer Internship /Industrial Training	2				
	23	**30**		**23**	**30**		**22**	**30**		**25**	**30**		**26**	**30**		**21**	**30**
Total – 140 Credits																	

3 –Year UG Programme B.Sc., Physics Credit Distribution				
Part	**Details**	**No. of Papers**	**Total Credits**	**Part Credits**
Part-I	Language (3 Credits)	4	12	12
Part-II	English (3 Credits)	4	12	12
Part-III	Core Theory (4 Credits)	8	32	76
	Core Theory (3 Credits)	2	6	
	Allied Theory (4 Credits)	2	8	
	Allied Theory (3 Credits)	2	6	
	Core Practical (3 Credits)	6	18	
	Allied Practical (3 Credits)	2	6	
Part-IV	Foundation Course (2 Credits)	1	2	39
	Skills Enhancement Course (SEC) NME (2 Credits)	8	16	
	Ability Enhancement Compulsory Course (AECCC) Soft Skills (2 Credits)	4	8	
	Elective Core (2 Credits)	4	8	
	Summer Internship (1 Credits)	1	1	
	EVS (2 Credit)	1	2	
	Value Education (2 Credits)	1	2	
Part-V	Extension Activity (NSS/NCC/YRC/Physical Education) (1 Credit)	1	1	1
		51	**140**	**140**

Consolidated Semester wise and Component wise Credit Distribution

Parts	Sem-I	Sem-II	Sem-III	Sem-IV	Sem-V	Sem-VI	Total Credits
Part-I	3	3	3	3	-	-	12
Part-II	3	3	3	3	-	-	12
Part-III	11	11	13	13	18	18	84
Part-IV	6	6	6	8	1	4	31
Part-V	-	-	-	-	-	1	1
Total	**23**	**23**	**25**	**27**	**19**	**23**	**140**

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

Semester-I

Part	List of Courses	Credit	No. of Hours
Part-I	Language	3	6
Part-II	English	3	6
Part-III	Core Theory 1 – Properties of Matter and Acoustics	5	5

	Core Practical 1 – Physics Practical 1		3
	Allied Theory 1 – Allied Mathematics 1	5	6
Part-IV	Skill Enhancement Course SEC-1 (NME) /Physics of everyday life	2	2
	Foundation Course	2	2
		20	**30**

Semester-II

Part	List of Courses	Credit	No. of Hours
Part-I	Language and	3	6
Part-II	English	3	6
Part-III	Core Theory 2 – Heat, Thermodynamics and Statistical Physics	5	5
	Core Practical 1– Physics Practical 1	3	3
	Allied Theory 2 – Allied Mathematics 2	5	6
Part-IV	Skill Enhancement Course -SEC-2 (NME) Space Physics	2	2
	Skill Enhancement Course -SEC-3 (Discipline/Subject Specific) C-Programming	2	2
		23	**30**

Second Year - Semester-III

Part	List of Courses	Credit	No. of Hours
Part-I	Language	3	6
Part-II	English	3	6
Part-III	Core Theory 3 –Mechanics	5	5
	Core Practical 2 – Physics Practical 2	-	3
	Allied Theory 1 – Allied Chemistry 1/ Applied Electronics theory-I	4	4
	Allied Practical 1 – Allied Chemistry Practical 1/ Applied Electronics Practical-I	-	2
Part-IV	Skill Enhancement Course -SEC-4 (Entrepreneurial Based) – Biomedical Instrumentation	2	2
	Skill Enhancement Course -SEC-5 (Discipline/Subject Specific) Electrical Wiring	2	2
		19	**30**

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part-I	Language	3	6
Part-II	English	3	6
Part-III	Core Theory 4 – Optics and Laser Physics	5	5
	Core Practical 2 – Physics Practical 2	3	3

	Allied Theory 2 – Allied Chemistry 2/Applied Electronics theory- II	4	4
	Allied Practical 1 – Allied Chemistry Practical 2/Applied Electronics Practical-I	3	3
Part-IV	Skill Enhancement Course -SEC-6 (Discipline/Subject Specific) Energy Physics	2	2
	Skill Enhancement Course -SEC-7 (Discipline/Subject Specific) Material Science/ Naan Muthualvan Course	2	2
		24	**30**

Third Year

Semester-V

Part	List of Courses	Credit	No. of Hours
Part-III	Core Theory 5 – Electricity, Magnetism and Electromagnetism	5	5
	Core Theory 6 – Atomic and Nuclear Physics	5	5
	Core Theory 7 – Analog and Communication Electronics	5	5
	Core Practical 3 – General Practical	-	3
	Core Practical 4 – Analog Electronics Practical		2
	Core Practical 5 – Digital Electronics Practical		2
	Elective Course-1 Mathematical Physics	4	4
Part-IV	Internship / Industrial Training (Carried out in II Year Summer Vocation) (30 Hours)	1	-
	EVS	2	2
	Ability Enhancement Compulsory Course (AECC)-3 / Employability Skill/ Naan Muthalvan Course	2	2
		24	**30**

Semester – VI

Part	List of Courses	Credit	No. of Hours
Part-III	Core Theory 8 – Quantum Mechanics and	5	5
	Core Theory 9 – Solid State Physics	4	5
	Core Theory 10 – Digital Electronics and Microprocessor 8085	4	5
	Core Practical 6 –General Practical	3	3
	Core Practical 4 – Analog Electronics Practical	3	2
	Core Practical 5 – Digital Electronics Practical	3	2
	Elective Course -2 Nanoscience and Nano Technology/Project	2	4
Part-IV	Skill Enhancement Course -SEC-8 (Discipline/Subject Specific) Communication Physics	2	2
	Value Education	2	2
Part-V	Extension Activity, NSS/NCC/YRC/Physical Education (Outside College Hours)	1	-
		30	**30**

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.

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.

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** inthe3-point scale of STRONG (**3**), MEDIUM (**2**) and LOW(**1**).

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

COURSE	**FIRST SEMESTER –CORE THEORY 1**
COURSETITLE	**PROPERTIES OF MATTER AND ACOUSTICS**
CREDITS	4
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.

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)** in the3-point scale of STRONG (**3**), MEDIUM (**2**) and LOW(**1**).

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

COURSE	**SECOND SEMESTER–CORE PRACTICAL 1**
COURSETITLE	**PRACTICAL 1**
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

Properties of Matter

Minimum of Eight Experiments from the list:

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 and 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 and 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 Poiseuille's flow method.
21. Determination radius of capillary tube by mercury pellet method.
22. Determination of g using compound pendulum.

COURSE OUTCOMES	**CO1**	Apply the theoretical concepts in Properties of matter, Heat & Thermodynamics,electricity and Electromagnetism related experiments
	CO2	Draw the circuit diagram /experimental set up with tabular column/model graph andwrite the formula to calculate the required physical parameters.
	CO3	Execute the technical skills in handling the equipment and observe the requiredmeasurements related to the experiment.
	CO4	Calculate the necessary parameters using the formula/graph and complete the recordWork
	CO5	Analyze the accuracy of the results obtained and compare it with the theoretical value.

MAPPING WITH PROGRAM OUT COMES:

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

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

COURSE	**SECOND SEMESTER – CORE THEORY 2**
COURSETITLE	**HEAT**, **THERMODYNAMICS and** S**TATISTICAL PHYSICS**
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

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 analyse them
	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)** in the3-point scale of STRONG (**3**), MEDIUM (**2**) and LOW (**1**).

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

COURSE	**THIRD SEMESTER – CORE**
COURSETITLE	**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.

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)** in the3-point scale of STRONG (**3**), MEDIUM(**2**) and LOW(**1**).

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

COURSE	**THIRD SEMESTER - COREPRACTICAL 3**
COURSETITLE	**PRACTICAL 3**
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

ELECTRICITY

Minimum of Eight Experiments from the list:

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

COURSE OUTCOMES	**CO1**	Apply the theoretical concepts in Electricity, Electromagnetism, Heat &Thermodynamics and Optics related experiments
	CO2	Draw the circuit diagram /experimental set up with tabular column/model graph andwrite the formula to calculate the required physical parameters.
	CO3	Execute the technical skills in handling the equipment and observe the requiredmeasurements related to the experiment.
	CO4	Calculate the necessary parameters using the formula/graph and complete the recordwork
	CO5	Analyze the accuracy of the results obtained and compare it with the theoretical value.

MAPPING WITH PROGRAM OUT COMES:

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

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

COURSE	**FOURTH SEMESTER – CORE THEORY 4**
COURSETITLE	**OPTICS and LASER PHYSICS**
CREDITS	4
COURSE OBJECTIVES	To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics; To explain the behavior of light in different mediums; To understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life; To understand the design of optical systems and methods to minims aberrations; To understand the working and applications of laser

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 (**3**), MEDIUM (**2**) and LOW (**1**).

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

COURSE	**FIFTH SEMESTER – CORE THEORY 3**
COURSETITLE	**ELECTRICITY, MAGNETISM ANDELECTROMAGNETISM**
CREDITS	4
COURSE OBJECTIVES	To classify materials based on their electrical and magnetic properties. To analyse the working principles of electrical gadgets. To understand the behaviour of dc, ac and transient currents. To know about the communication by electromagnetic waves.

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

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

MAPPING WITH PROGRAM OUT COMES:

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

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

COURSE	**FIFTH SEMESTER - CORE**
COURSE TITLE	**ATOMIC and NUCLEAR PHYSICS**
CREDITS	4
COURSE OBJECTIVES	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 get knowledge on radioactive decay; To know the concepts used in nuclear reaction; to understand the quark model of classification of elementary particles.

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 and know about different mass spectrographs.
	CO2	Outline photoelectric effect and the terms related to it, State laws of photoelectric emission, Explain experiments and applications of 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 out comes **(CO)** for each course with program outcomes **(PO)** in the3-point scale of STRONG (**3**), MEDIUM (**2**) and LOW (**1**).

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

COURSE	**FIFTH SEMESTER – CORE**
COURSETITLE	**ANALOG AND COMMUNICATION ELECTRONICS**
CREDITS	3
COURSE OBJECTIVES	To study the design, working and applications of semiconducting devices. To construct various electronic circuits. To study them in details. To study the basis of audio and video communication systems and the aspects of satellite and Fibre Optic Communications.

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

COURSE OUTCOMES	**CO1**	Explain the basic concepts of semiconductors devices.
	CO2	know and classify the basic principles of biasing and transistor amplifiers
	CO3	Acquire the fundamental concepts of oscillators.
	CO4	Understand the working of operational amplifiers
	CO5	Learn and analyze the operations of sequential and combinational digital circuits

MAPPING WITH PROGRAM OUT COMES:

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

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

COURSE	**SIXTHSEMESTER – CORE**
COURSETITLE	**QUANTUM MECHANICS AND RELATIVITY**
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 analyses to understand the solutions.

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	Realize the wave nature of matter and understand its importance
	CO4	Derive Schrodinger equation and also realize the use of operators.
	CO5	Apply Schrödinger equation to simple problems.

MAPPING WITH PROGRAM OUT COMES:

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

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

COURSE	**SIXTH SEMESTER – CORE**
COURSETITLE	**SOLID STATE PHYSICS**
CREDITS	4
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.

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

COURSE OUTCOMES	**CO1**	Classify the bonding and crystal structure also learn about the crystal structure analysis using X ray diffraction.
	CO2	Understand the lattice dynamics and thus learn the electrical and thermal properties of materials.
	CO3	Give reason for classifying magnetic material on the basis of their behavior.
	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 the3-point scale of STRONG (**3**), MEDIUM (**2**) and LOW (**1**).

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

COURSE	**SIXTH SEMESTER – DISCIPLINE SPECIFIC ELECTIVE**
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.

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

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

MAPPING WITH PROGRAM OUT COMES:

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

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

COURSE	**SIXTH SEMESTER – CORE PRACTICAL 3**
COURSETITLE	**PRACTICAL -III**
CREDITS	3
COURSE OBJECTIVES	Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.

GENERAL PRACTICAL- III

Minimum of Eight Experiments from the list:

1. Spectrometer– Grating - Normal incidence - Wave length of Mercury spectral lines.
2. Spectrometer – Grating - Minimum deviation - Wave length of Mercury spectral lines.
3. Spectrometer – (i-d) curve.
4. Spectrometer – (i-i′) curve.
5. Cachy's constant
6. Hartmann's constant
7. Spot Galvanometer – Determination of mutual induction
8. Spot Galvanometer –Comparison of mutual induction
9. Spot Galvanometer – High resistance by leakage
10. Spot Galvanometer – Internal resistance of a cell
11. Anderson's bridge
12. Maxwell's bridge
13. Rayleigh's Bridge
14. B.G – Figure of Merit – Charge Sensitivity
15. LCR- Series Resonance Circuit
16. LCR- Parallel Resonance Circuit
17. Impedance and Power factor- LR Circuit
18. Impedance and Power factor- CR Circuit

COURSE OUTCOMES:

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

COURSE OUTCOMES	**CO1**	Apply the theoretical concepts in Electromagnetism, Heat and Optics related experiments
	CO2	Draw/ arrangement for the circuit diagram /experimental set up with tabular column/modelgraph and write the appropriate formula to calculate the required physical parameters
	CO3	Execute the technical skills in handling the equipment and observe the requiredmeasurements related to the experiment.
	CO4	Calculate the necessary parameters using the formula/graph and complete the recordwork.
	CO5	Analyze the accuracy of the results obtained and compare it with the theoretical value.

MAPPING WITH PROGRAM OUT COMES:

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

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

COURSE	**SIXTH SEMESTER – CORE PRACTICAL 4**
COURSETITLE	**ANALOG ELECTRONICS PRACTICAL –IV**
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.

Electronics

Minimum of Ten Experiments from the list:

1. Zener diode – voltage regulations
2. Bride rectifier using diodes
3. Clipping and clamping circuits using diodes.
4. Colpitt's oscillator -transistor.
5. Hartley oscillator - transistor.
6. Astablemultivibrator - transistor.
7. Bistablemultivibrator - transistor.
8. FET - characteristics.
9. UJT -characteristics
10. Operational amplifier - inverting amplifier and summing.
11. Operational amplifier - non-inverting amplifier and summing.
12. Operational amplifier – differential amplifier
13. Operational amplifier - differentiator and integrator.
14. Study of gate ICs – NOT, OR, AND, NOR, NAND, XOR, XNOR
15. Verification of De Morgan's theorem using ICs –NOT, OR, AND
16. NAND as universal building block.
17. NOR as universal building block.
18. Half adder / Half subtractor using basic logic gate ICs

COURSE OUTCOMES:

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

Course Outcome	**CO1**	Describe the methodology of science and the relationship between Observation and theory.
	CO2	Learn to minimize contributing variables and recognize the limitations of equipment.
	CO3	Appreciate the applications of diodes, transistors and op-amps
	CO4	Troubleshoot any simple electronic circuits
	CO5	Report observations and analyses in a scientific manner

MAPPING WITH PROGRAM OUT COMES:

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

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	2	2	2
CO2	3	3	1	1	2
CO3	1	2	2	2	2
CO4	3	3	3	2	1
CO5	1	2	3	2	1

COURSE	**SIXTH SEMESTER – CORE PRACTICAL 5**
COURSETITLE	**DIGITAL ELECTRONICS PRACTICAL –V**
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.

Electronics

Minimum of Ten Experiments from the list:

1. Zener diode – voltage regulations
2. Bride rectifier using diodes
3. Clipping and clamping circuits using diodes.
4. Colpitt's oscillator -transistor.
5. Hartley oscillator - transistor.
6. Astablemultivibrator - transistor.
7. Bistablemultivibrator - transistor.
8. FET – characteristics
9. UJT –characteristics
10. Operational amplifier - inverting amplifier and summing.
11. Operational amplifier - non-inverting amplifier and summing.
12. Operational amplifier – differential amplifier
13. Operational amplifier - differentiator and integrator.
14. Study of gate ICs – NOT, OR, AND, NOR, NAND, XOR, XNOR
15. Verification of De Morgan's theorem using ICs –NOT, OR, AND
16. NAND as universal building block.
17. NOR as universal building block.
18. Half adder / Half subtractor using basic logic gate ICs

COURSE OUTCOMES:

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

Course Outcome	**CO1**	Apply the theoretical concepts in digital electronics.
	CO2	Draw the circuit diagram /experimental set up with tabular column/model graph andwrite the formula to calculate the required physical parameters.
	CO3	Develop the technical skills in handling the equipment and components and observe therequired measurements related to the experiment.
	CO4	Verify the truth tables of the digital circuits and complete the record work. [K3]
	CO5	Analyze the accuracy of the results obtained and compare it with the theoretical value.

MAPPING WITH PROGRAM OUT COMES:

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

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

MATHEMATICAL PHYSICS
Learning Objective: To understand higher mathematical concepts which are applied to solve problems in Physics and similar situations

COURSE OUTCOMES:

On the completion of the course the student will be able to

COURSE OUTCOMES	**CO1**	Describe the mathematical basis of vectors and their application in Physics problems.
	CO2	Explain the concept of eigenvectors and eigenvalues and their physical Meaning.
	CO3	Demonstrate the application of tensors in physics
	CO4	Comprehend the theorems of complex analysis.
	CO5	Describe the usefulness of Fourier series in solving problems associated With periodicity.

MAPPING WITH PROGRAM OUT COMES:

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2	3	3	2	2	1
CO2	1	3	3	2	2	2
CO3	3	2	3	2	2	1
CO4	2	3	3	2	2	1
CO5	2	3	3	-	2	2

ENERGY PHYSICS
Learning Objective: The fundamentals of matrices and vector calculus learnt in earlier course will enable students to learn advanced topics and theorems. The special functions and applications of partial differential equations will be of use in research at a later stage.

COURSE OUTCOMES:

On the completion of the course the student will be able to

COURSE OUTCOME	**CO1**	Learn basic concepts of biomass energy conversion and working principles of different bio-gas plants
	CO2	Learn basic concepts of wind energy conversion and principles of Different wind energy conversion systems.
	CO3	Gain an understanding of the Biomass conversion Technologies
	CO4	Explain the basic principles behind the energy generation in the wind.
	CO5	Learn basic concepts of wind energy conversion and principles of Different wind energy conversion systems.

MAPPING WITH PROGRAM OUT COMES:

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	-	3	2	1	2	3
CO2	2	3	-	2	L	-
CO3	-	-	2	3	3	3
CO4	2	2	3	3	-	-
CO5	1	2	3	2	1	-

PROGRAMMING IN C
Learning Objective: To understand the methods in numerical differentiation and integration and to develop the problem solving skills of the student. To introduce and explain the basic structure, rules of compiling and execution of C programming.

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

COURSE OUTCOME	**CO1**	Comprehend the use of numerical methods in solving physics problems
	CO2	Realize the various methods in numerical integration
	CO3	Recognize the basic concepts of C language
	CO4	Hear and relate the basic concepts of C language
	CO5	Learn the role of functions, arrays, pointers and programming structures of C

MAPPING WITH PROGRAM OUT COMES:

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2	3	3	3	3	2
CO2	2	3	3	3	2	1
CO3	1	3	3	3	2	1
CO4	1	3	3	3	2	1
CO5	1	3	3	3	2	2

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

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

Course Outcome	**CO1**	Acquire the knowledge about the fundamentals of crystal physics, seven Crystal systems and their symmetry in detail.
	CO2	Understand the principles of X-ray diffraction and the methods available, various imperfections in crystals
	CO3	Gain a complete idea about superconductors ,theories involved in superconductivity and its applications
	CO4	Interpret the dielectric and ferroelectric materials, different types of electric polarization
	CO5	Appreciate the novel optical materials, their applications in display Devices, optical modulators.

MAPPING WITH PROGRAM OUT COMES:

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3	3	2	2
CO2	2	3	2	3	2	2
CO3	3	3	-	2	3	2
CO4	2	3	3	2	2	2
CO5	3	3	-	2	2	3

COMMUNICATION PHYSICS
Learning Objective: The students will learn the fundamentals of communication, types of communications, communication instrumentation and their applications also the inter connect between optics with communication.

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

COURSE OUTCOME	**CO1**	Impart knowledge on the introduction to optical communication
	CO2	Understand the classification and frequency radiation loss
	CO3	Appreciate the applications of optical communication
	CO4	Compare the optical communication properties with the electrical communication properties
	CO5	Classify the types optical communication

MAPPING WITH PROGRAM OUT COMES:

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2	3	-	1	2	3
CO2	2	3	-	1	2	2
CO3	2	3	2	1	2	3
CO4	2	3	2	1	2	1
CO5	3	3	-	1	2	3

NANOSCIENCE AND NANO TECHNOLOGY
Learning Objective: This course aims to provide an overall understanding of Nano science and Nanotechnology and introduces different types of nanomaterial, their properties, fabrication methods, characterization techniques and a range of applications.

COURSE OUTCOMES:

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

On the completion of the course the student will be able to

	Course Outcome
CO1	Comprehend the theoretical and experimental aspects of quantum wells, wires and dots
CO2	Understood the principles and Characterization techniques
CO3	Interpret the knowledge of a free electrons, confined electrons, quantum well, quantum transport and tunneling effects.
CO4	Grasp the principles, fabrication and design of Carbon Nano-Tubes
CO5	Understand and improved the applications of CNT

MAPPING WITH PROGRAM OUT COMES:

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2	2	3	3		-
CO2	2	3	3	2	-	3
CO3	3	3	3	2	-	1
CO4	2	2	3	3	1	3
CO5	2	3	3	3	1	3

ELECTRICAL WIRING
Learning Objective: This course aims to provide background of the Physics principles in instrumentation technologies through theoretical and practical learning.

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

#	Course Outcome
CO1	Realize the basic concepts of Electronics
CO2	Understand the characteristics PN junction diode and their applications
CO3	Demonstrating the applications of Diode
CO4	Realize the basics of concepts of transistor biasing
CO5	Comprehend the basic concepts of Field effect Transistor

MAPPING WITH PROGRAM OUT COMES:

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2	1	2	3	2	2
CO2	3	3	1	1	3	-
CO3	3	2	1	2	2	3
CO4	2	3	3	3	1	3
CO5	2	1	3	2	1	3

NON MAJOR ELECTIVES (NME)

PHYSICS FOR EVERYDAY LIFE
Learning Objective: 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

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

	Course Outcome
CO1	Acquire the knowledge of the Principles involved in various appliances viz., electric fan, air conditioner and their working in detail
CO2	Understand the basic physics principles behind Refrigerator, washing machine, etc. and their working in detail
CO3	Acquire the information modern cooking electrical devices
CO4	Comprehend the principles of devices/media used in communication systems.
CO5	Realize the working of various device in the communication systems.

MAPPING WITH PROGRAM OUT COMES:

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

#	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2	1	3	3	2	1
CO2	-	2	2	3	2	-
CO3	1	3	3	3	3	3
CO4	2	2	3	2	-	-
CO5	2	3	1	-	-	1

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

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

	Course Outcome
CO1	Describe the properties of sun, chemical composition of stars, cosmological models,galaxies and astronomical instruments.
CO2	Understand the physical process that governs the universe, its constituents, and their origin using different theories
CO3	Discuss the structure of sun, star, galaxy and various astronomical instruments.
CO4	Apply relevant theories to unravel the properties of astronomical matters.
CO5	Infer the facts about perception of universe

MAPPING WITH PROGRAM OUT COMES:

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

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

BIO MEDICAL INSTRUMENTS
Learning Objective: The students will be exposed to instruments like ECG, EEG, EMG, medical imaging, diagnostic specialties, operation theater and its safety which will kindle interest to specialize in instrument servicing.

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

	Course Outcome
CO1	Understand the elementary concepts of blood pressure
CO2	Learn basic concepts of clinical thermometer
CO3	Learn the Physics of hearing and its application in hearing aid.
CO4	Explain the theory of transducers and their Bio-medical applications,
CO5	Gain an understanding on Radiation therapy and Nuclear Cardiogram.

MAPPING WITH PROGRAM OUT COMES:

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1	2	3	2	1	1
CO2	3	3	-	2	3	-
CO3	3	1	2	-	-	3
CO4	1	2	2	3	-	3
CO5	1	1	3	1	2	-

COURSE	**ALLIED PAPER**
COURSETITLE	**ALLIED PHYSICS – I**
CREDITS	3
COURSE OBJECTIVES	To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

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 back ground of growth of this technology.
	CO4	Articulate the knowledge about electric current resistance, capacitance in terms of potential electric field and electric correlatetheconnectionbetweenelectricfieldandmagneticfield andanalyzethemmathematicallyverifycircuitsandapplythecon cepts 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. InferoperationsusingBooleanalgebraandacquireelementaryid easofICcircuits.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)** in the3-point scale of STRONG (**3**), MEDIUM (**2**) and LOW (**1**).

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

COURSE	**ODD SEMESTER - CORE**
COURSETITLE	**ALLIED PRACTICAL– I**
CREDITS	3
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

Minimum of Eight Experiments from the list:

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 OUTCOMES:

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

	Course Outcomes
CO1	Describe the methodology of science and the relationship between observation and theory.
CO2	Develop the skill of performing experiments accurately
CO3	Appreciate the applications of diodes, transistors and op-amps
CO4	Troubleshoot simple electronic circuits
CO5	Report observations and analyses in a scientific manner

MAPPING WITH PROGRAM OUT COMES:

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	-	2	3	1
CO2	-	3	2	3	3	-
CO3	2	-	1	3	3	1
CO4	3	3	-	2	3	2
CO5	1	2	3	2	1	3

COURSE	**ALLIED PAPER**
COURSETITLE	**ALLIED PHYSICS –II**
CREDITS	3
COURSE OBJECTIVES	To understand the basic concepts of optics, modern Physics, concepts of relativity and quantum physics, semiconductor physics, and electronics.

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

COURSEOUTCOMES	**CO1**	Explain the concepts of interference diffraction using principles of superposition of waves and rephrase the concept of polarization based on wave patterns
	CO2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance ofinterpretingimprovingtheoreticalmodelsbasedonobservation.Appreciateinterdisciplinarynatureofscience and in solar energy related applications.
	CO3	Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on delay rate half-life and mean-life. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy, safety measures carried and get our Govt. agencies like DAE guiding the country in the nuclear field.
	CO4	To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice versa. Relate this with current research in this field and get an overview of research projects of National and International importance, like LIGO, ICTS, and opportunities available.
	CO5	Summarize the working of semiconductor devices like junction diode, Zener diode, 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)** in the3-point scale of STRONG (**3**), MEDIUM (**2**) and LOW (1).

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