ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN (AUTONOMOUS)

CHINNAKALAYAMPUTHUR PALANI – 624 615

PG DEPARTMENT OF PHYSICS

B.Sc Degree - Physics

SYLLABUS

UNDER CHOICE BASED CREDIT SYSTEM

2023 Onwards

Prescribed by

TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION,

CHENNAI – 600 005

ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN

PALANI

B.Sc Physics

MISSION

- To motivate the students to equip with modern trend technical knowledge
- To visit state of the Electrical Electronic Industries and Astronomical Research Centers
- To encourage and guide research oriented Higher Studies through enriched curriculum
- To introduce career oriented Electives and Project works.
- To inculcate scientific attitude among younger generation through Hands on Training and Science Exhibitions.
- To incorporate discipline, dedication and committed work culture through Value Education.
- To Empower Revolutionary Excellence in electronic intelligence.

VISION

- Up gradation of UG Department to PG Department
- Introduction of current trend Electronic Technical Know-Hows in Curriculum
- Preparing Industry ready citizens
- Promoting Academic Excellence with Discipline

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 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. **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

SEMESTERWISE DISTRIBUTION WITH SCHEME OF EXAMINATION –

(CBCS)

(For candidates admitted during the Academic year 2023 - 2024)

DEPARTMENT OF PHYSICS –B.Sc Degree Program

Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System for all UG courses including Lab Hours

First Year

Semester -I

Class	Part	Title of the course	Credit	Hours	Marks		
				Theory/ Practical	Int	Ext	Total
I-B.Sc	Part-I	Tamil	3	6	25	75	100
	Part-II	English	3	6	25	75	100
	Part-III	Core Course -I-CC1 **Properties of Matter and Acoustics**	5	5	25	75	100
		Core Course II –**Physics Practical - I**	4	4	25	75	100
		Allied I **– Allied Mathematics 1**	2	3	25	75	100
		Allied Practical 1 – **Allied Practical 1**	2	2	25	75	100
	Part-IV	Skill Enhancement Course **SEC-1 NME I - Astrophysics**	2	2	25	75	100
		Foundation Course -Introductory Physics	2	2	25	75	100
		Total	23	30			

Semester -II

Class	Part	Title of the course	Hours		Marks		
			Credit	Theory/ Practical	Int	Ext	Total
I-B.Sc	Part-I	Tamil	3	6	25	75	100
	Part-II	English	3	6	25	75	100
	Part-III	Core course III CC3 – **Heat, Thermodynamics and Statistical Physics**	5	5	25	75	100
		Core course IV CC4 – **Physics Practical II**	4	4	25	75	100
		Allied II – **Allied Mathematics II**	2	3	25	75	100
		Allied II – **Allied Mathematics Practicals II**	2	2	25	75	100
	Part-IV	Skill Enhancement Course **SEC-2 NME II - Physics for Everyday Life**	2	2	25	75	100
		Skill Enhancement Course -**SEC-3** **Nano Science and Nano Technology**	2	2	25	75	100
		Total	23	30			

Second Year

Semester -III

Class	Part	Title of the course	Marks				
			Credit	**Theory / Practical**	**Int**	**Ext**	**Total**
II-B.Sc	**Part-I**	Tamil	**3**	**6**	**25**	**75**	**100**
	Part-II	English	**3**	**6**	**25**	**75**	**100**
	Part-III	Core course V –**Mechanics**	**4**	**4**	**25**	**75**	**100**
		Core Course VI – **Physics Practical III**	**4**	**4**	**25**	**75**	**100**
		Allied 1 – **Allied Chemistry 1**	**2**	**3**	**25**	**75**	**100**
		Allied I1 – **Allied Chemistry Practical II**	**2**	**2**	**25**	**75**	**100**
	Part-IV	Skill Enhancement Course -SEC-4 (Entrepreneurial Based) **SEC4- Fundamentals of Computer and Ms Office**	**2**	**2**	**25**	**75**	**100**
		Skill Enhancement Course -**SEC-5** **Astronomy**	**2**	**2**	**25**	**75**	**100**
		EVS –Environmental Science	**-**	1			
		Total	**22**	**30**			

Semester -IV

Class	Part	Title of the course	Marks				
			Credit	Theory/ Practical	Int	Ext	Total
II-B.Sc	**Part-I**	Tamil	**3**	**6**	**25**	**75**	**100**
	Part-II	English	**3**	**6**	**25**	**75**	**100**
	Part-III	Core course **VII – Optics and Laser Physics**	**5**	**5**	**25**	**75**	**100**
		Core Course **VIII – Physics Practical IV**	**4**	**3**	**25**	**75**	**100**
		Allied II– **Allied Chemistry II**	**2**	**3**	**25**	**75**	**100**
		Allied Practical II – **Allied Chemistry Practical II**	**2**	**2**	**25**	**75**	**100**
	Part-IV	Skill Enhancement Course -**SEC-6** **Computer Programming in 'C'**	**2**	**2**	**25**	**75**	**100**
		Skill Enhancement Course -**SEC-7** **Biomedical Instrumentation**	**2**	**2**	**25**	**75**	**100**
		EVS	**2**	1	**25**	**75**	**100**
		Total	**25**	**30**			

Third Year

Semester -V

Class	Part	Title of the course	Marks				
			Credit	Theory / Practical	Int	Ext	Total
III-B.Sc	Part-III	Core Course IX – **Electricity, Magnetism and Electromagnetism**	**4**	**5**	**25**	**75**	**100**
		Core Course X – **Atomic and Nuclear Physics**	**4**	**5**	**25**	**75**	**100**
		Core Course XI – **Analog and Communication Electronics**	**4**	**5**	**25**	**75**	**100**
		Core Course XII - **Physics Practical V**	**4**	**4**	**25**	**75**	**100**
		Elective Course I - EC 1 Option **1**- **Laser and Fiber Optics** Option **2** - **Mathematical Physics**	**3**	**4**	**25**	**75**	**100**
		Elective Course II - EC 2 Option **1** - **Communication Physics**(or) Option **2** – **Digital Photography**	**3**	**5**	**25**	**75**	**100**
	Part-IV	**Value Education**	**2**	**2**	**25**	**75**	**100**
		Internship / Industrial Training (Carried out in II Year Summer Vocation) (30 Hours)	**2**	**-**	**100**	**-**	**100**
		Total	**26**	**30**	**-**	**-**	**-**

Semester -VI

Class	Part	Title of the course	Marks				
			Credit	Theory /Practical	Int	Ext	Total
III-B.Sc	Part-III	Core Course XIII – **Solid State Physics**	3	5	**25**	**75**	**100**
		Core Course XIV – **Digital Electronics and Microprocessor 8085**	3	5	**25**	**75**	**100**
		Core Course XV – **Physics Practical VI**	3	4	**25**	**75**	**100**
		Core Course XVI –**Project**	3	4	**25**	**75**	**100**
		Elective Course III - EC 3 Option **1- Energy Physics** (or) Option **2 -Medical Instrumentation**	3	5	**25**	**75**	**100**
		Elective Course IV -EC 4 - Option **1-Materials Science** (or) Option **2 Advanced Mathematical Physics**	3	5	**25**	**75**	**100**
	Part-IV	Skill Enhancement Course -**SEC-8 - Computer Programming in** 'C' - **Practical**	2	2	**25**	**75**	**100**
	Part-V	Extension Activity, NSS/NCC/YRC/Physical Education (Outside College Hours)	1	-	**100**	**-**	**100**
		Total	**21**	**30**			

EXTRA CREDIT COURSES:

Semester I	**Energy Harvesting - I**
Semester III	**Electrical appliances**
Semester V	**Energy Harvesting - II**

VALUE ADDED COURSE:

Semester II	**Lab equipment training**
Semester IV	**Designing & Fabrication of PCB**
Semester VI	**Opto electronic devices**

FIRST SEMESTER –CORE THEORY 1 -PROPERTIES OF MATTER AND ACOUSTICS

COURSE	**FIRST SEMESTER –COREPAPER (THEORY) 1**		
COURSE TITLE	**PROPERTIES OF MATTER AND ACOUSTICS**		
CREDITS 5	**Hours 5**	**CIA 25**	**CE 75**
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	COURSEDETAILS
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'sstring 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

UNIT-VI	**PROFESSIONAL COMPONENTS:** expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. D.S.Mathur, 2010, Elements of Properties of Matter, S.Chandand Co. 2. BrijLaland N. Subrahmanyam, 2003, Properties of Matter, S.Chandand Co 3. D.R.KhannaandR.S.Bedi, 1969, Textbook of Sound, AtmaRamand sons 4. BrijLal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition,Vikas Publishing House. 5. R.Murugesan,2012, Properties of Matter, S.Chandand 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 and Co. 3. A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.
WEB RESOURCES	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-SuaSu1sandt=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:

CO		**Statements**	**Bloom's Taxonomy / Cognitive Domain**
COURSEOUTCOMES	**CO1**	Relate elastic behavior in terms of three modulii of elasticity and working of torsion pendulum.	**K1 & K2**
	CO2	Able to appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.	**K2**
	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.	**K2**
	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	**K2 & K3**

	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	**K1 & K3**

MAPPING WITH PROGRAM OUTCOMES:

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	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

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3
CO2	3	2	2	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	15	13	14	15	15
Weighted percentage of course contribution to POS	3.0	2.6	2.8	3.0	3.0

FIRST SEMESTER –CORE PRACTICAL- 1

COURSE	**FIRST SEMESTER –CORE PAPER II -PRACTICAL 1**		
COURSETITLE	**PRACTICAL I**		
CREDITS 4	**Hours 4**	**CIA 25**	**CE 75**
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 Poiseullie's flow method.
21. Determination radius of capillary tube by mercury pellet method.
22. Determination of g using compound pendulum.

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

CO		Statements	Bloom's Taxonomy / Cognitive Domain
COURSE OUTCOMES	**CO1**	Apply knowledge of mathematics, physics and instrumentation	**K2**
	CO2	Use standard methods to calibrate the given measuring instruments	**K2**
	CO3	Learning a experience in properties of matter as elastic nature of materials	**K3**
	CO4	Acquire the practical knowledge of surface tension and viscosity	**K3**
	CO5	Able to do error analysis and correlate results	**K2**

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

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

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	2	2	3	3
CO3	3	2	3	3	3

CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	15	13	14	15	15
Weighted percentage of course contribution to POS	3.0	2.6	2.8	3.0	3.0

ALLIED PAPER

COURSE	**ALLIED PAPER**		
COURSETITLE	**ALLIED PHYSICS – I**		
CREDITS – 2	**Hours 3**	**CIA 25**	**CE 75**
COURSE OBJECTIVES	To impart basic principles of 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 – scientific field and chemical applications.
UNIT-II	**PROPERTIES OF MATTER:** *Elasticity*: elastic constants – bending of beam- 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.
UNIT-III	**HEAT AND THERMODYNAMICS:** Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion laws of thermodynamics zeroth law, first law, second law and third law 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 potential using potentiometer –calibration of low range voltmeter–magnetic field due to a current carrying codnuctor – 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.
UNIT-V	**DIGITAL ELECTRONICS AND DIGITAL INDIA:** logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates –NAND and NOR as universal building blocks – Boolean algebra – De Morgan's theorem – verification – overview of Government initiatives: semiconductor laboratories under Dept. of Space – an introduction to

	Digital India
UNIT-VI	**PROFESSIONAL COMPONENTS:** expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. R.Murugesan (2001), AlliedPhysics,S. ChandandCo,NewDelhi. 2. Brijlal and N.Subramanyam (1994), Waves and Oscillations, Vikas Publishing House,NewDelhi. 3. Brijlal and N.Subramaniam (1994), Properties of Matter, S.Chand and Co., NewDelhi. 4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8th edition), S.Chand and Co., New Delhi. 5. R.Murugesan(2005), Optics and Spectroscopy,S.ChandandCo,NewDelhi. 6. A.Subramaniyam, Applied Electronics 2ndEdn. ,National Publishing Co. ,Chennai.
REFERENCE BOOKS	1. Resnick Halliday and Walker (2018). Fundamentals of Physics (11thedition), John Willeyand Sons, Asia Pvt. Ltd., Singapore. 2. V.R. Khanna and R.S. Bedi (1998), TextbookofSound1stEdn. Kedharnaath PublishandCo, Meerut. 3. N.S.Khare and S.S.Srivastava (1983), ElectricityandMagnetism10thEdn.,AtmaRam and Sons, New Delhi. 4. D.R.Khanna and H.R.Gulati(1979). Optics,S. Chand and Co.Ltd.,New Delhi. **5.** V.K.Metha(2004).Principlesofelectronics6thEdn. S.Chandandcompany.
WEB RESOURCES	**1. https://youtu.be/M_5KYncYNyc** **2. https://youtu.be/ljJLJgIvaHY** **3. https://youtu.be/7mGqd9HQ_AU** **4. https://youtu.be/h5jOAw57OXM** **5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/** **6. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://www.youtube.com/watch?v=gT8Nth9NWPMhttps://www.youtube.com/watch?v=9mXOMzUruMQandt=1shttps://www.youtube.com/watch?v=m4u-SuaSu1sandt=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:

CO		Statements	Blooms Taxonomy level
COURSE OUTCOMES	**CO1**	Understand the simple harmonic motion and extend their knowledge in the study of various cases. Gain knowledge of Ultrasonics.	**K1 & K2**
	CO2	Understand the materials and their behaviors and apply it to various situation in laboratory and real life.	**K1 & K3**
	CO3	Understand the basic concepts of thermodynamics, entropy and associated theorems. Acquire the knowledge of low temperature Physics.	**K1 & K2**

	CO4	Acquire knowledge of electricity and magnetism. Correlate the connection between electric field and magnetic field	**K1 & K2**
	CO5	Understand the digital electronics principles. Using Boolean algebra acquire the elementary idea of digital circuits. Acquire information about various Govt. programs/ institutions in this field.	**K1 & K2**

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	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

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3
CO2	2	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	14	14	15	15	15
Weighted percentage of course contribution to POS	2.8	2.8	3.0	3.0	3.0

COURSE	**ODD SEMESTER - CORE**		
COURSE TITLE	**ALLIED PRACTICAL– I**		
CREDITS - 2	**Hours 2**	**CIA 25**	**CE 75**
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:

CO	Statement	Blooms Taxonomy level
CO1	Acquire practical skills on basic principles of Physics.	**K2**
CO2	Enable the students acquire practical knowledge with lecture sessions translated to the laboratory sessions.	**K3**
CO3	Gain knowledge and understanding the components and handling equipments.	**K3**
CO4	Provide a hands-on learning in using simple equipments.	**K3**
CO5	Get knowledge to verify the experimental results with theoretical values.	**K3**

K1 - Remembering K2-Understanding K3-Applying

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**).

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	2	3	3	3	3
CO5	3	3	3	3	3
Weightage	14	15	15	15	15
Weighted percentage of course contributin to POS	2.8	3	3	3	3

NON MAJOR ELECTIVES (NME)

NME I

NME I ASTROPHYSICS			
Credits 2	**Hours 2**	**CIA 25**	**CE 75**
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			

ASTROPHYSICS	
Learning Objective: 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 and 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. andMadhusudan, H.R.,(1999), Eclipse: A Celestial Shadow Play, Orient BlackSwan,

COURSE OUTCOMES:

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

CO	Statements	Bloom's Taxonomy level
CO1	Understand the electromagnetic radiation from celestial objects. Analyze the wave nature of light in the form of ray diagram. Apply the knowledge of	**K2**

	phenomenon of how diffraction limits the resolution of any system having a lens or mirror. Distinguish between reflecting and refracting telescopes and their usage.	
CO2	Recall and explain solar system and to know the recent advances in astrophysics	**K3**
CO3	Understand the basics of eclipse and its types	**K2**
CO4	Have a deep knowledge of fundamentals of stellar evalution	**K1&K2**
CO5	Remember and illustrate the structure of our Milky way galaxy. Classify the types of galaxies. Understand the presence of dark matter in the universe	**K3**

MAPPING WITH PROGRAM OUTCOMES:

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

	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	S	S	S	S	S	M	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	S	S	S

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	2	3	3	3
CO5	3	3	3	3	3
Weightage	15	14	15	15	15
Weighted percentage of course contribution to Pos	3	2.8	3	3	3

FIRST SEMESTER – FOUNDATION COURSE- INTRO DUCTORY PHYSICS

COURSE	**FIRST SEMESTER – FOUNDATION COURSE**
COURSE TITLE	**INTRODUCTORY PHYSICS**

CREDITS - 2	Hours - 2	CIA 25	CE 75
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 lawsof momentum, energy – typesof 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
UNIT-VI	**PROFESSIONAL COMPONENTS:**expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. D.S. Mathur, 2010, Elements of Properties of Matter, S.Chandand Co 2. BrijLaland N. Subrahmanyam, 2003, Properties of Matter, S.Chandand Co.
REFERENCEBOOKS	1. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, S.Chandand Co.
WEB RESOURCES	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/

COURSE OUTCOMES:

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

CO		Statements	Bloom's Taxonomy / Cognitive Domain
COURSE OUTCOMES	**CO1**	Apply concept of vectors to understand concepts of Physics and solve problems	**K1&K2**
	CO2	Appreciate different forces present in Nature while learning about phenomena related to these different forces.	**K2**
	CO3	Quantify energy in different process and relate momentum, velocity and energy	**K3**
	CO4	Differentiate different types of motions they would encounter in various courses and understand their basis	**K2 & K3**

	CO5	Relate various properties of matter with their behaviour and connect them with different physical parameters involved.	**K3**

K1 - Remembering K2-Understanding K3- Applying

MAPPING WITH PROGRAM OUTCOMES:

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

CO\PO	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	S	S	S	M	S	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	S	M
CO5	S	M	S	S	S	S	S	M	2	S

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	2	3
CO4	3	3	3	2	3
CO5	3	3	3	3	3
WEITAGE	15	15	14	13	15
Weighted percentage of course contribution to POS	3.0	3.0	2.8	2.6	3.0

SECOND SEMESTER – CORE THEORY 2 - HEAT, THERMODYNAMICS and STATISTICAL PHYSICS

COURSE	**SECOND SEMESTER – CORE PAPER III (THEORY)**		
COURSETITLE	**HEAT, THERMODYNAMICS and STATISTICAL PHYSICS**		
CREDITS - 5	**Hours 5**	**CIA 25**	**CE 75**
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 C_P and C_V– Meyer's relation – Joly's method for determination of C_V – Regnault's method for determination of C_P **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'sequation (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.
UNIT-VI	**PROFESSIONAL COMPONENTS:** expert lectures –seminars –– webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. BrijlalandN. Subramaniam, 2000, Heat and Thermodynamics, S. 2. , 1969,Heat,Triveni Publishers, Chandand Co. 3. NarayanamoorthyandKrishnaRaoChennai. 4. V.R.KhannaandR.S.Bedi, 1998 1st Edition, Text book of Sound, Kedharnaath Publish and Co, Meerut 5. Brijlal and N. Subramanyam, 2001, Waves and Oscillations,Vikas Publishing House, New Delhi. 6. Ghosh, 1996, Text Book of Sound, S.ChandandCo. 7. R.MurugeshanandKiruthigaSivaprasath, Thermal Physics, S.Chandand Co.
REFERENCE BOOKS	1. J.B.RajamandC.L.Arora, 1976, Heat and Thermodynamics, 8th edition, S.Chandand Co. Ltd. 2. D.S.Mathur, Heat and Thermodynamics, Sultan Chand and Sons. 3. Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand and Co. 4. Resnick, HallidayandWalker,2010, Fundamentals of Physics, 6th Edition. 5. Sears, Zemansky, Hugh D. Young,Roger A. Freedman, 2021 University Physics with Modern Physics 15th Edition, Pearson.
WEB RESOURCES	1. https://youtu.be/M_5KYncYNyc 2. https://www.youtube.com/watch?v=4M72kQulGKkandvl=en 3. Lecture 1: Thermodynamics Part 1 | Video Lectures | Statistical Mechanics I: Statistical Mechanics of Particles | Physics | MIT OpenCourseWare 4. http://www.freebookcentre.net/Physics/Physics-Books-Online.html

COURSE OUTCOMES:

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

CO		Statements	Bloom's Taxonomy
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 and the study of Low temperature Physics.	**K2 & K3**
	CO2	Derive the efficiency of Carnot's engine. Discuss the implications of the laws of Thermodynamics in diesel and petrol engines	**K2**
	CO3	Able to analyze performance of thermodynamic systems viz efficiency by problems. Gets an insight into thermodynamic properties like enthalpy, entropy	**K3**
	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	**K2 & K3**
	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	**K3**

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**).

CO\PO	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

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	15	14	14	15	15
Weighted percentage of course contribution to POS	3.0	2.8	2.8	3.0	3.0

COURSE	**SECOND SEMESTER – CORE PAPER IV (PRACTICAL 2)**		
COURSE TITLE	**PRACTICAL II**		
CREDITS - 4	**Hours 4**	**CIA 25**	**CE 75**
COURSE	Apply their knowledge gained about the concept of heat and sound		

OBJECTIVES	waves, resonance, calculate frequency of ac mains set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

HEAT, OSCILLATIONS, WAVES and SOUND
Minimum of Eight Experiments from the list: 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. Determination of Young's modulus by non uniform bending – Microscope load depression graph. 13. Determination of Young's modulus by -uniform bending – scale and telescope 14. Velocity of sound through a wire using Sonometer. 15. Determination of velocity of sound using Kunds tube. 16. Determination of frequency of an electrically maintained tuning fork 17. To verify the laws of transverse vibration using sonometer. 18. To verify the laws of transverse vibration using Melde's apparatus. 19. To compare the mass per unit length of two strings using Melde's apparatus. 20. Frequency of AC by using sonometer.

COURSE OUTCOMES:

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

CO		**Statements**	**Bloom's Taxonomy level**
COURSE OUTCOMES	**CO1**	Understand the concepts of specific heat, thermal conductivity of good conductor.	**K2**
	CO2	Use standard methods to calibrate the given measuring instruments	**K2**
	CO3	Determine the thermal conductivity of bad conductor by Lee's disc method.	**K3**
	CO4	Learning a experience in theory of stretched string, frequency of an electrically maintained tuning fork.	**K3**
	CO5	Able to determine the Frequency of AC by using sonometer.	**K2**

MAPPING WITH PROGRAM OUTCOMES:

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

CO / PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	M	M	S	S	M	S
CO2	S	M	S	S	M	S	M	M	M	M

CO3	S	M	S	S	M	M	S	S	M	S
CO4	M	M	M	M	S	S	M	S	S	M
CO5	S	M	S	S	S	S	S	S	M	S

CO / PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	2	3	3	3
CO4	3	3	2	3	3
CO5	3	3	3	3	3
WEITAGE	15	14	13	15	15
Weighted percentage of course contribution to POS	3.0	2.8	2.6	3.0	3.0

COURSE	**ALLIED PAPER**		
COURSE TITLE	**ALLIED PHYSICS –II**		
CREDITS - 2	**Hours 3**	**CIA 25**	**CE 75**
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, up to electric 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
UNIT-VI	**PROFESSIONAL COMPONENTS:** expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. R.Murugesan (2005), AlliedPhysics,S.ChandandCo,NewDelhi. 2. K.ThangarajandD.Jayaraman(2004), AlliedPhysics,PopularBookDepot,Chennai. 3. BrijlalandN.Subramanyam(2002), TextbookofOptics,S.ChandandCo,NewDelhi. 4. R.Murugesan (2005), ModernPhysics,S.ChandandCo,NewDelhi. 5. A.SubramaniyamAppliedElectronics, 2nd Edn.,NationalPublishingCo.,Chennai.
REFERENCE BOOKS	1. ResnickHallidayandWalker (2018), FundamentalsofPhysics, 11th Edn.,JohnWilleyandSons, Asia Pvt.Ltd.,Singapore. 2. D.R.KhannaandH.R.Gulati (1979).Optics, S.ChandandCo.Ltd.,New Delhi. 3. A.Beiser (1997), ConceptsofModernPhysics,TataMc-GrawHillPublication,NewDelhi. 4. Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, NewDelhi. 5. V.K.Metha(2004), Principlesofelectronics, 6th Edn. ,S.ChandandCompany, New Delhi.
WEB RESOURCES	**1. https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318andv=D38BjgUdL5Uandfeature=emb_logo** **2. https://www.youtube.com/watch?v=JrRrp5F-Qu4** **3. https://www.validyne.com/blog/leak-test-using-pressure-transducers/** **4. https://www.atoptics.co.uk/atoptics/blsky.htm -** 5. https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects

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

CO		**Statements**	**Bloom's Taxonomy level**
COURSE OUTCOMES	**CO1**	Understand the concepts of interference diffraction using principles of superposition of waves and rephrase the concept of polarization based on wave patterns	**K2**

	CO2	Outline the basics of different atom models and various experiments establishing quantum concepts. Appreciate the solar energy related applications.	**K2**
	CO3	Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy, safety measures carried out.	**K3**
	CO4	Acquire the basic concept of relativity as equivalence principle, inertial frames and Lorentz transformation.. Relate this with current research in this field and get an overview of research projects	**K2&K3**
	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.	**K3**

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**).

CO/PO	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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	2	3
CO5	3	3	3	3	3
WEITAGE	15	15	14	15	15
Weighted percentage of course contribution to POS	3.0	3.0	2.8	2.8	3.0

COURSE	**EVEN SEMESTER - CORE**		
COURSE TITLE	**ALLIED PRACTICAL– II**		
CREDITS - 2	**Hours 2**	**CIA 25**	**CE 75**
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		

Minimum of Eight Experiments from the list:

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

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

COs	Statements	Bloom's Taxonomy level
CO1	Gain knowledge in the scientific methods and learn the process of measuring different Physical variables	**K2**
CO2	Have a deep knowledge of fundamentals of optics electric circuits and electronics	**K2**
CO3	Know the application side of the experiments by using spectrometers, Microscopes	**K3**
CO4	Use standard methods to calibrate the ammeter and to measure resistance of the given coil and various physical quantities	**K3**
CO5	Apply the theory to design the basic electronic circuits	**K3**

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

CO/PO	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	S	S	M	S	S	S
CO3	S	S	S	S	S	M	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	M
CO5	M	S	S	S	S	S	S	S	S	S

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	14	15

Weighted percentage of course contribution to Pos	3	3	3	2.8	3

NON MAJOR ELECTIVES (NME)

NME II

PHYSICS FOR EVERYDAY LIFE			
Credits 2	**Hours 2**	**CIA 25**	**CE 75**
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			
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, GugucoolPublishing, Hyderabad, 2019. 2. For the love of physics, Walter Lawin, Free Press, New York, 2011.		

COURSE OUTCOMES:

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

CO	**Statement**	**Blooms Taxonomy level**
CO1	Know where all Physics principles have been put to use in daily life	**K2**
CO2	Use optical instruments and LASER in everyday life.	**K3**
CO3	Apply the basic Physics principles for home appliances	**K3**
CO4	Gain the knowledge on usage of solar energy.	**K2**
CO5	Know about Indian Physicist and their contributions.	**K3**

K1 - Remembering K2-Understanding K3-Applying

MAPPING WITH PROGRAM OUTCOMES:

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

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

COURSE	**SECOND SEMESTER – Skill Enhancement course III**		
COURSE TITLE	**SEC 3-NANO SCIENCE AND NANO TECHNOLOGY**		
CREDITS - 2	**HOURS - 2**	**CIA 25**	**CE 75**
COURSE OBJECTIVES	To provide foundational knowledge of Nanomaterials. To make the students acquire an understanding the basics of Carbon nanotubes and its synthesis techniques. To know the significance of Molecular Nanotechnology. To comprehend the principles and applications of		

CO4	M	S	S	S	S	S	S	M	S	S
CO5	S	S	S	M	S	S	S	S	S	S

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	2	3	3	3	3
CO5	3	3	3	2	3
Weightage	14	15	15	14	15
Weighted percentage of course contribution to Pos	2.8	3	3	2.8	3

	Nanosensors and Nanorobotics. To help them understand the applications of nanotechnology

UNITS & COURSE DETAILS

UNIT I –NANOMATERIALS

Introduction to Nanoscience& Nanotechnology- nanomaterials – different forms of nanaomaterials – synthesis of nanomaterials- top-down and bottom-up approach- Properties of nanophase particles: Physical, Magnetic, Mechanical and Optical properties.

UNIT II – SYNTHESIS OF NANOMATERIALS

Techniques for synthesis of nanomaterials: Ball milling, Plasma arcing, chemical vapour deposition, Sol gel and Electrode position.

UNIT III – CARBON NANOTUBES (CNT)

Carbon – carbon nanotubes (CNT) – types of CNT- fabrication of carbon nanotubes – electric arc discharge method – pulsed laser deposition – chemical vapour deposition.

UNIT IV – PROPERTIES & APPLICATIONS OF CNT

Properties of CNT: Electrical, Mechanical, Physical, Chemical and Thermal properties- Applications of CNT: Electrical and Electronics, Computer, Chemical, Mechanical and Battery technology

UNIT V – APPLICATIONS OF NANOTECHNOLOGY

Nanomedicine: Drug delivery, Therapy Techniques, Anti-Microbial Techniques-Nanoelectronics-Nanotechnology and Spaceflight-fuel cells and Nanotechnology-Solar cells and Nanotechnology-Nano Battery.

BOOKS FOR STUDY

- Origin and Development of NanaoTechnology by P.K.Sharma
- Engineering Physics–II by Dr.P.Mani
- Nanotechnology by Manoj Bhatia

BOOKS FOR REFERENCE

- Basics of Nano Physics – G.P.Singh
- Nanotechnology and Micromachines - Dr.N.L. Kaushik

COURSE OUTCOMES:

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

CO	Statement	Blooms Taxonomy level
CO1	Gain an overall understanding of Nano science and Nanotechnology	**K3**
CO2	Understand the different types of nano materials, their properties,	**K2**
CO3	Acquire adequate knowledge on fabrication methods and	**K2**
CO4	Analyze the various characterization techniques.	**K3**

CO5	Know the applications of nanomaterials in recent medical field.	**K3**

K1 - Remembering K2-Understanding K3-Applying

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**).

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of course contributin to POS	3	3	3	3	3

THIRD SEMESTER – CORE - MECHANICS

COURSE	**THIRD SEMESTER – CORE PAPER V (Theory)**		
COURSE TITLE	**MECHANICS**		
CREDITS - 4	**Hours 4**	**CIA 25**	**CE 75**
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 aparticlein 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: c**onservation of linear and angular momentum – Internal forces and momentum conservation – center of mass – examples – general elastic collision of particles of different masses – system with variable mass – examples – conservation of angular momentum – torque due to internal forces – torque due to gravity – angular momentum about center of mass – 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: t**ranslational 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.
UNIT-VI	**PROFESSIONAL COMPONENTS:** expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. J.C.Upadhyaya, 2019, Classical Mechanics, Himalaya Publishing house, Mumbai. 2. P.DuraiPandian, LaxmiDuraiPandian, MuthamizhJayapragasam,2005, Mechanics, 6th revised edition, S.Chandand Co. 3. D.S.Mathur and P.S.Hemne, 2000, Mechanics, Revised Edition, S.Chandand Co. 4. Narayanamurthi, M.andNagarathnam. 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 and 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
WEB RESOURCES	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:

CO		Statements	Bloom's Taxonomy
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	K1 & K2
	CO2	Acquire the knowledge on the conservation laws	K2
	CO3	Apply conservation law and calculate energy of various systems, understand and differentiate conservative and non-conservative forces	K2 & K3
	CO4	Gain knowledge on rigid body dynamics and solve problems based on this concept	K3
	CO5	Appreciate Lagrangian system of mechanics, apply D' Alemberts principle	K3

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**).

CO/PO	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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	15	14	15	15	15
Weighted percentage of course contribution to POS	3.0	2.8	3.0	3.0	3.0

THIRD SEMESTER – CORE PRACTICAL -3

COURSE	THIRD SEMESTER – CORE PAPER VI (PRACTICAL 3)		
COURSE TITLE	PRACTICAL III		
CREDITS - 4	Hours 4	CIA 25	CE 75
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. 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 Outcomes:

On completion of the Course the student will be able to,

CO	Statement	Blooms Taxonomy level
CO1	Use the standard methods to calibrate the given measuring instruments	**K3**
CO2	Gain knowledge in scientific methods and learn the process of measuring different physical variables	**K3**
CO3	Understand the usage of basic laws and theories to determine the various properties of materials	**K2**
CO4	Apply the theory to design basic electric circuits	**K1& k3**
CO5	Understand the application side of experiments	**K3**

K1 - Remembering K2-Understanding K3-Applying

Mapping of Course Outcome with POs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10

CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	M	M	M	S	S	M	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	S	S	S	M	S	S	S	M	M	M

S- Strong M-Medium L-Low

K1 - Remembering K2-Understanding K3-Applying

Mapping of Course Outcome with PSOs:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	2	3	3	3
CO5	3	3	3	3	3
Weightage	15	14	15	14	15
Weighted percentage of course contribution to POS	3	2.8	3	2.8	3

COURSE	**THIRD SEMESTER – SKILL ENHANCEMENT COURSE VI**			
COURSE TITLE	**SEC 4- FUNDAMENTALS OF COMPUTER AND MS OFFICE (Entrepreneurial Based)**			
CREDITS - 2	**Hours 2**	**CIA 25**	**CE 75**	
COURSE OBJECTIVES	To give an in-depth understanding of why computers are essential components in business, education and society. To provide hands-on use of Microsoft Office Word, Create a document in Microsoft Word with formatting. To teach the fundamentals of power point presentation			

UNITS AND COURSE DETAILS

UNIT – I: COMPUTER FUNDAMENTALS

Introduction – History of computers – Characteristics of computers – Need for a computer – Computer applications – Concept of computer – Structure of computer (Block Diagram & components) – Classification of computers – Types of computer.

UNIT –II: INPUT & OUTPUT DEVICES

Input devices – Keyboard – Mouse –Trackball – Joystick – Electronic pen – Touch screen - data scanning devices – image scanner – optical character recognition (OCR) – Optical mark reader - Bar code Reader – Magnetic ink character recognition (MICR) - Output devices – Monitor – Printer Impact of non – impact printers – Main memory – RAM, ROM – Secondary storage devices. Magnetic tapes and disks - optical disks.

UNIT – III: MS WORD

Windows Layout – Menus – File : opening, typing and editing a file – Edit – copying, moving and inserting –formatting fundamentals: characters and fonts – formatting paragraphs - Views in MS-Word – Insert tools – Tables –Windows – Saving & exiting – Spell check – Table creation – Inserting pictures- applying WordArt - Mail merge.

UNIT – IV: MS EXCEL

Building a Worksheet – Selecting Worksheet items – Using Auto fill – Adding rows and columns – Copying and Moving information – Creating and Copying formulas –Naming ranges– Using functions – Improving the appearance of worksheet – Changing column Width – Formatting Text and Numbers – Using auto format – Spell Checking – Using Chart Wizard – Creating, Enhancing and Printing a chart.

UNIT – V: MS POWER POINT

About power point: Starting power point-creating a presentation using auto content wizard-creating a design template- creating a blank presentation-opening an existing presentation- saving and closing a presentation- view, insert & edit in presentations-formatting in presentations.

BOOKS FOR STUDY:

1. MS Office 2000 for every one – Sanjay Saxena
2. MS Office-C.NellaiKannan

BOOKS FOR REFERENCE:

1. Computer Fundamentals**-** Anita Goel
2. Computer Basics- SeemaSirpal
3. Microsoft Office Excel-TorbenLageFrandsen.

Semester III

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

CO	Statements	Bloom's Taxonomy level
CO1	Describe the usage of computers and why computers are essential components in business and society.	**K1**
CO2	Work with the basic features of Word, create high quality document designs and layouts.	**K3**
CO3	Modify worksheet data and structure and format data in a Worksheet	**K1**
CO4	Sort data, manipulate data using formulas and functions and add and modify charts in a worksheet	**K3**
CO5	Prepare power point presentation for a seminar	**K3**

K1 - Remembering K2-Understanding K3-Applying

MAPPING WITH PROGRAM OUTCOMES:

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

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3

CO4	3	3	2	3	3
CO5	3	3	3	3	3
WEITAGE	15	15	14	15	15
Weighted percentage of course contribution to POS	3.0	3.0	2.8	3.0	3.0

COURSE	**THIRD SEMESTER – SKILL ENHANCEMENT COURSE V**		
COURSE TITLE	**SEC-5 ASTRONOMY**		
CREDITS - 2	**Hours - 2**	**CIA 25**	**CE 75**
COURSE OBJECTIVES	To make the students know about fundamentals of telescopes, solar system, stars and galaxies.		

UNITS AND COURSE DETAILS

UNIT – I: INTRODUCTION TO ASTRONOMY

Birth of Modern Astronomy – Celestial Sphere – Celestial Coordinates – Geocentric theory – Heliocentric theory – Planets: Terrestrial and Jovian Planets – Asteroids – Comets – Meteors.

UNIT – II: ASTRONOMICAL INSTRUMENTS

The orientation of Earth in Space – Arc and Time Units – Local Time – Standard time – Kinds of Optical Telescopes: Refracting Telescope and Reflecting Telescope – Radio Telescope.

UNIT – III: SOLAR PHYSICS

Introduction – Physical Properties of the Sun – Structure of the Sun – Sun spots – Solar Wind – Auroras – Solar Flares – Space weather effects.

UNIT – IV: STELLAR PHYSICS

Classification of stars – Hertzsprung – Russell diagram – Luminasity of a star – Stellar evolution; Birth of a star, maturity, ageing stars, death of a star – White dwarfs – Neutron stars – Black holes.

UNIT – V: GALAXIES

Galaxy Nomenclature – Types of Galaxies: Elliptical, Spiral, Barred Spiral and Irregular galaxies – Milky Way Galaxy – Star Clusters – Galactic Clusters – Pulsars – Supernova explosion.

BOOKS FOR STUDY

- Introduction to Astrophysics – Dr. A. MUJIBER RAHMAN Theni – Edition 2018.
- Astronomy – S. KUMARAVELU & SUSHEELA KUMARAVELU, MurugaBhavonam, Chidambaranagar, Nagercoil.

BOOKS FOR REFERENCE

- Discovering Astronomy – R.D. CHOPMAN, W.H. FREEMAN CO., 1989.
- The Frontier Between Physics and Astronomy - J.V. NARLIKER,IIT, Madras series 1989.

COURSE OUTCOMES:

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

CO	Statements	Bloom's Taxonomy level
CO1	Understand the basics of celestial bodies	K2

CO2	Apply the knowledge to find how diffraction limits the resolution of any system having a lens or mirror. Distinguish between reflecting and refracting telescopes and their usage.	K3
CO3	Understand the basics of eclipse and its types	K2
CO4	Have a deep knowledge of fundamentals of stellar evolution	K1
CO5	Remember and illustrate the structure of our Milky way galaxy and types of galaxies.	K3

MAPPING WITH PROGRAM OUTCOMES:

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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	M	S	M	S	M	S	S	S	S	M
CO3	S	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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	2
Weightage	15	15	15	15	13
Weighted percentage of course contribution to Pos	3	3	3	3	2.6

COURSE	**THIRD SEMESTER – Part - IV**			
COURSE TITLE	**ENVIRONMENTAL SCIENCE**			
CREDITS - NIL		**Hours - 1**	**CIA 25**	**CE 75**
COURSE OBJECTIVES	Environmental Activity means any investigation, study, assessment, evaluation, sampling, testing, monitoring, containment, removal, disposal, closure, corrective action, remediation (regardless of whether active or passive), natural attenuation, restoration, bioremediation, response, repair, corrective measure, cleanup or abatement that is required or necessary under any applicable			

The students are to be engaged in Environmental activities such as:

- Start a Garden Club
- Plant .. Anything
- Go on a Nature Scavenger Hunt
- Recycle Waste Materials
- Start a Green Team
- Do Mini Greenhouse Craft
- Create Worm Farm
- Take Plastic Pledge
- Access the Wisdom of Local Community
- Hold an Energy-free (or Energy-Light) Day etc.

Evaluation:

The participation and performance of the students in Environmental activities will be assessed and best performers will be rewarded.

FOURTH SEMESTER – CORE THEORY 4 - OPTICS and LASER PHYSICS

COURSE	**FOURTH SEMESTER – CORE PAPER VII (THEORY)**		
COURSE TITLE	**OPTICS and LASER PHYSICS**		
CREDITS - 5	**Hours 5**	**CIA 25**	**CE 75**
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 understand the working and applications of laser		

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*: aberrations: spherical aberration, chromaticaberrations, 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 D_1 and D_2 lines 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	**LASERS:** general principles of lasers – properties of lasers action – spontaneous and stimulated emission – population inversion – optical pumping – He-Ne laser (principle and working) – CO_2 laser (principle and working) semiconductor laser – laser applications – holography.
UNIT-VI	**PROFESSIONAL COMPONENTS:** expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. Subramaniam. N andBrijlal, 2014, Optics, 25thEd,S.Chandand Co. 2. P.R.Sasikumar, 2012, Photonics, PHIPvt Ltd, New Delhi. 3. V.Rajendran, 2012, Engineering Physics, Tata McGraw Hill.
REFERENCE BOOKS	1. Sathyaprakash, 1990,Optics,VIIedition, RatanPrakashanMandhir, New Delhi. 2. AjoyGhatak, 2009, Optics, 4thedition, PHIPvt Ltd, New Delhi. 3. D.Halliday,R.Resnick and J. Walker, 2001, Fundamentals of Physics,6th edition, Willey, New York. 4. 7. JenkinsA.Francisand White, 2011, Fundamentals of Optics, 4th edition, McGraw Hill Inc., NewDelhi.
WEB RESOURCES	1. https://science.nasa.gov/ems/ 2. https://www.youtube.com/watch?v=tL3rNc1G0qQandlist=RDCMUCzwo7UlGkb-8Pr6svxWo-LAandstart_radio=1andt=2472 3. https://science.nasa.gov/ems/ 4. https://imagine.gsfc.nasa.gov/educators/gammarabursts/imagine/index.html 5. 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:

CO		**Staatements**	**Bloom's Taxonomylevel**
COURSE OUTCOMES	**CO1**	Outline basic knowledge of methods of rectifying different defects in lenses, articulate technological applications of eyepieces	**K1 & K2**

	CO2	Discuss the principle of superposition of wave, use these ideas to understand the wave nature of light through working of interferometer	**K2 & K3**
	CO3	Extend the knowledge about nature of light through diffraction techniques; apply mathematical principles to analyse the optical instruments	**K3**
	CO4	Interpret basic formulation of polarization and gain knowledge about polarimeter, appraise its usage in industries	**K2 & K3**
	CO5	Relate the principles of optics to various fields of IR, Raman and UV spectroscopy and understand their instrumentation and application in industries	**K3**

MAPPING WITH PROGRAM OUT COMES:

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

CO/PO	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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	15	15	14	15	15
Weighted percentage of course contribution to POS	3.0	3.0	2.8	3.0	2.8

COURSE	**FOURTH SEMESTER – CORE PAPER VIII (PRACTICAL 4)**			
COURSE TITLE	**PRACTICAL 4**			
CREDITS - 4	**Hours - 3**	**CIA 25**	**CE 75**	
COURSE OBJECTIVES	Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.			
LIGHT(any eight experiments)				

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. 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 Outcomes:

On completion of the Course the student will be able to,

CO	Statement	Blooms Taxonomy level
CO1	Acquire practical knowledge about many theories related to lenses, Aberrations, Refractive Indices and Wavelengths	**K2**
CO2	Understand the application side of experiments by using spectrometers Microscopes and telescopes.	**K3**
CO3	Gain knowledge in the scientific methods and learn the process of measuring different physical variables	**K3**
CO4	Use the basic laws to study the spectral properties and optical properties of the Prism	**k3**
CO5	Understand the given concepts and its physical significance	**K2**

K1 - Remembering K2-Understanding K3-Applying

Mapping of Course Outcome with POs:

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

S- Strong M-Medium L-Low

K1 - Remembering K2-Understanding K3-Applying

Mapping of Course Outcome with PSOs:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	2	3	3	3
CO5	3	3	3	3	3
Weightage	15	14	15	15	15

Weighted percentage of course contributin to POS	3	2.8	3	3	3

S- Strong M-Medium L-Low

K1 - Remembering K2-Understanding K3-Applying

COURSE	**FOURTH SEMESTER – SKILL ENHANCEMENT COURSE VI**		
COURSE TITLE	**COMPUTER PROGRAMMING IN C**		
CREDITS - 2	**Hours - 2**	**CIA 25**	**CE 75**
COURSE OBJECTIVES	To understand the basic concepts of 'C' programming. To make the students write algorithm and draw flow charts for a given problem and to enable them write simple programs in 'C'. To understand the concepts of functions control statements and looping statements. arrays, structure and union.		

UNITS AND COURSE DETAILS

UNIT – I INTRODUCTION TO C

The C character set – Identifiers and keywords - data types –Constants – Variables – Declaration – Expressions - Various types of Operators – Bit wise operations - Input and output functions and writing simple programs.

Unit II - Conditional and unconditional control statements Conditional and unconditional control statements – Branching, Looping - Nested control structures – Switch – Break – Continue – Go to.

UNIT – III – FUNCTIONS

Over view – Defining a function – Accessing a function – Passing arguments to a function – Recursion – Library function – the preprocessor directives. Storage classes - Scope of the variables – Automatic variables – Global variables – Static variables – Register variables.

UNIT – IV – ARRAYS

Defining, initialization rules and processing of arrays and subscripted variables – Passing arrays to functions – Multi dimensional arrays – Arrays and strings. Arranging the given set of numbers in ascending order – Arranging given set of numbers in descending order - Finding the largest number in the given set of numbers –Multiplication of two matrices of order (l x m) and (m x n) –addition and subtraction of two matrices.

UNIT V – CASE STUDIES

Sum of n-natural numbers –Fibonacci series –roots of a quadratic equation $ax^2+bx+c=0$ - Armstrong numbers - simple interest and Compound interest.

The factorial of a given number – check whether given number is odd or even. Using function to sum integer values between 1-N using recursion techniques.

BOOK FOR STUDY

1. Programming in C and Application by D. Arulselvam

BOOKS FOR REFERENCE

1. Programming in C – E. Balagurusamy

2. Computer programming in C – Jayasree.

COURSE OUTCOMES:

On completion of the Course the student will be able to,

CO	Statement	Blooms Taxonomy level
CO1	Students get a basic knowledge of fundamental concepts of 'C' programming language	**K1**
CO2	Students become bale to write algorithm and are able to draw flow charts.	**K2**
CO3	They come to know how to write simple programmes in 'C'	**K3**
CO4	They gained thorough knowledge of various control statements, if, if-else, do-while, while switch case. They understand how to use 'for' loops to create iteration	**K2**
CO5	They are able to write programs with structure, union and pointers	**K3**

K1 - Remembering K2-Understanding K3-Applying

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

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	2	3	3	3
WEITAGE	15	13	15	15	15
Weighted percentage of course contribution to POS	3.0	2.6	3.0	3.0	3.0

COURSE	**FOURTH SEMESTER – SKILL ENHANCEMENT COURSE VII**		
COURSE TITLE	**SEC-7 - BIOMEDICAL INSTRUMENTATION**		
CREDITS - 2	**Hours - 2**	**CIA 25**	**CE 75**
COURSE OBJECTIVES	There is a tremendous increase in the use of modern medical equipment in the hospitals and research institutes. It is necessary for every student to understand the design and functioning of various medical equipment.		

UNITS AND COURSE DETAILS

UNIT–I - SAFETY INSTRUMENTATION

Introduction– Radiation safety instrumentation– physiological effects due to 50 Hz current passage – Micro shock and macro shock – Electrical accidents in hospitals – Devices to protect against electrical hazards.

UNIT-II-ADVANCES IN BIOMEDICAL INSTRUMENTATION

Introduction – Computer in medicine – Lasers in medicine – Endoscopes – Cryogenic surgery – Nuclear imaging Techniques – Thermography – ultrasonic imaging systems – Magnetic Resonance imaging (MRI) – imaging processes – MRI instrumentation – positron emission Tomography.

UNIT- III - SPECIALISED MEDICAL EQUIPMENT

Introduction – Blood cell counter – Electron microscope – Radiation detectors – Photometers and colorimeters – Digital thermometer – Audiometers – X-ray tube – X-ray machine – Radiography and fluoroscopy – image intensifiers – Angiography – Applications of X-ray.

UNIT –IV- BIO-POTENTIAL RECORDERS

Characteristics of basic recording system – Electro cardio Graphy (ECG) - Block diagram – E.C.G leads – unipolar and bipolar – ECG recording setup – Electro Encaphalo graph (EEG) – Origin – Block diagram of EGG unit – Electro myograph EMG. Block diagram EMG recorders – Digital thermometer – Computer to myography (CT) principle – Block diagram of CT scanner.

UNIT – V – PHYSIOLOGICAL ASSIST DEVICES

Introduction – pacemakers – methods of stimulation – Different modes of operation – Ventricular synchronous pace makers – pacemaker batteries – Artificial Heart values – Heart-lung machine – kidney machine.

BOOKS FOR STUDY

1. Biomedical Instrumentation - Dr.M.Arumugam

BOOK FOR REFERENCE

1. Hand book of Biomedical Instrumentation –
2. R.S. Khandpur 1999 Tata Mecraw - Hill

COURSE OUTCOMES:

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

CO	Statements	Bloom's Taxonomy level
CO1	Learn the fundamentals of bioelectric potentials and electrodes	K1
CO2	Understand the basics of transducers and its types	K2
CO3	Learn about the function of ECE and EEG,	K1
CO4	Know the working of EMG, ERG and EOG. Pacemakers and its types	K3
CO5	Understand applications of Computer Tomotography(CT)	K2

MAPPING WITH PROGRAM OUTCOMES:

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

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	3	3	3
Weightage	15	15	13	15	15
Weighted percentage of course contribution to Pos	3	3	2.6	3	3

COURSE	**FOURTH SEMESTER – PART– IV**		
COURSE TITLE	**ENVIRONMENTAL SCIENCE**		
CREDITS - 2	**Hours 1**	**CIA 25**	**CE 75**
COURSE OBJECTIVES	To enable the students realize their roles, responsibilities, and identities as citizens, consumers in various environmental activities in a complex, interconnected world to bring a better environment for the future generations.		

COURSE CONTENT

Unit – I: The Environment:

The Atmosphere, Hydrosphere, Lithosphere, Biosphere, Ecology, Ecosystem, Biogeochemical Cycle (Carbon Cycle, Nitrogen Cycle),

Unit – II: Environment Pollution:

Air Pollution, Water Pollution, Soil Pollution, Radiation Pollution.

Unit – III: Population Ecology:

Individuals, Species, Pollution, Community, Control Methods of Population, Urbanization and its effects on Society, Communicable Diseases and its Transmission, Non-Communicable Diseases.

Unit- IV: Environmental Movements in India:

Grassroot Environmental movements in India, Role of women, Environmental Movements in Tamil Nadu, State Pollution Control Board, Central Pollution Control Board.

Unit –V Natural Resources:

Conservation of Natural Resources, Management and Conservation of Wildlife, Soil Erosion and Conservation, Environmental Laws: Water Act, 1974, Air Act, 1981, The Wildlife (Protection) Act, 1972, Environment Protection, 1986, Natural Disasters and their Management.

References:

1. Dr Bharucha Erach, Text Book of Environmental Studies for UG Course, University Press(India) Pvt. Ltd.
2. Dr Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad – 380013, India.
3. Katyal Timi & Satake M., Environmental Pollution, Anmol Publication Pvt. Ltd, New Delhi.
4. G. R. Chhatwal, M. C. Mehra, M. Satake, T. Katyal & Mohan V., Environmental Radiationand Thermal Pollution and their control, Anmol Publications, New Delhi.
5. R. C. Brunner, Hazardous Waste Incineration, Mc Graw Hill Inc.
6. K. C. Agarwal, Environmental Biology, Nidi Publishing Ltd, Bikaner.
7. R. N. Basu (Editor), Environment Calcutta University, Kolkata.

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

CO		Statements	Bloom's Taxonomy level
COURSE OUTCOMES	**CO1**	Demonstrate an integrative approach to environmental issues with a focus on sustainability.	**K3**
	CO2	Use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving.	**K3& K4**
	CO3	Understand and evaluate the global scale of environmental problems and	**K2 & K3**
	CO4	Reflect critically on their roles, responsibilities, and identities as citizens, consumers and environmental actors in a complex, interconnected world.	**K4**
	CO5	Communicate complex environmental information to both technical and non-technical audiences	**K2 & K3**

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**).

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10

CO1	S	S	S	S	S	S	S	M	S	M
CO2	S	M	S	S	M	S	S	S	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	M	S	S	S	S	S	S	M	M
CO5	S	S	M	S	S	S	M	M	S	M

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	2
CO5	3	3	3	3	3
WEITAGE	15	14	15	15	14
Weighted percentage of course contribution to POS	3.0	2.8	3.0	3.0	2.8

FIFTH SEMESTER – CORE–IX ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM

COURSE	**FIFTH SEMESTER – CORE THEORY IX**		
COURSE TITLE	**ELECTRICITY, MAGNETISM ANDELECTROMAGNETISM**		
CREDITS - 4	**Hours 5**	**CIA 25**	**CE 75**
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.		

UNITS	**COURSE DETAILS**
UNIT-I	**CAPACITORS AND THERMO ELECTRICITY:** capacitor – principle – capacitance of spherical and cylindrical capacitors – capacitance of a parallel plate capacitor (with and without dielectric slab) – effect of dielectric –Carey Foster bridge – temperature coefficient of resistance Seebeck effect – laws of thermo emf – Peltier effect – Thomson effect – thermoelectric diagrams –uses of thermoelectric diagrams – thermodynamics of thermo couple
UNIT-II	**MAGNETIC EFFECTS OF CURRENT:** Biot and Savart's law – magnetic induction due to circular coil – magnetic induction due to solenoid – Helmholtz tangent galvanometer –force on a current element by magnetic field – force between two infinitely long conductors – torque on a current loop in a field - moving coil galvanometer – damping correction – Ampere's circuital law – differential form – divergence of magnetic field.

UNIT-III	**MAGNETISM AND ELCTROMAGNETIC INDUCTION:** magnetic induction B – magnetization M - relation between B, H and M – magnetic susceptibility – magnetic permeability – experiment to draw B-H curve – energy loss due to hysteresis - Importance of hysteresis curves – Faraday and Lenz laws –vector form – self-induction – coefficient of self-inductance of solenoid – Anderson's method – mutual induction – coefficient of mutual inductance between two coaxial solenoids – coefficient of coupling
UNIT-IV	**TRANSIENT AND ALTERNATING CURRENTS:** growth and decay of current in a circuit containing resistance and inductance – growth and decay of charge in a circuit containing resistance and capacitor – growth and decay of charge in an LCR circuit (expressions for charge only) – peak, average and rms values of ac – LCR series and parallel circuits – resonance condition – Q factor – power factor.
UNIT-V	**MAXWELLS EQUATIONS AND ELECTROMAGNETIC WAVES:** Maxwell's equations in vacuum, material media– physical significance of Maxwell's equations –displacement current – plane electromagnetic waves in free space – velocity of light – Poynting vector–electromagnetic waves in a linear homogenous media – refractive index.
UNIT-VI	**PROFESSIONAL COMPONENTS:** expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. Murugeshan. R., - Electricity and Magnetism, 8thEdn, 2006, S.Chandand Co, New Delhi.\ 2. Sehgal D.L., Chopra K.L, Sehgal N.K., - Electricity and Magnetism, 3. Sultan Chand and Sons, New Delhi. 4. M. Narayanamurthy and N. Nagarathnam, Electricity and Magnetism, 4th Edition. 5. National Publishing Co., Meerut.
REFERENCE BOOKS	1. 1. Brijlal and Subramanian, Electricity and Magnetism, 6th Edn.,RatanandPrakash, Agra. 2. Brijlal, N.Subramanyan and JivanSeshan, Mechanics and Electrodynamics (2005), 3. Eurasia Publishing House (Pvt.) Ltd., New Delhi. 4. David J. Griffiths, Introduction to Electrodynamics, 2ndEdn. 1997, Prentice Hall of 5. India Pvt. Ltd., New Delhi 6. D. Halliday, R. Resnik and J. Walker - Fundamentals of Physics, 6thEdn., Wiley, NY, 2001.
WEB RESOURCES	8. https://www.edx.org/course/electricity 9. https://www.udemy.com/courses/ electricity 10. https://www.edx.org/course/magnetism 11. http://www.hajim.rochester.edu/optics/undergraduate/courses.html

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

CO		Statements	Bloom's Taxonomy level
	CO1	Describe various thermo-electric effects and their properties.	**K3**
	CO2	Apply Biot and Savart law to study the magnetic effect of electric current.	**K3**

COURSE OUTCOMES	**CO3**	Use Faraday and Lenz laws in explaining self and mutual inductance.	**K2 & K3**
	CO4	Analyze the time variation of current and potential difference in AC circuits.	**K4**
	CO5	Relate different physical quantities used to explain magnetic properties of materials.	**K1 & K3**

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**).

CO/PO	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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	15	14	15	15	15
Weighted percentage of course contribution to POS	3.0	2.8	3.0	3.0	3.0

FIFTH SEMESTER – CORE PAPER X (Theory) ATOMIC and NUCLEAR PHYSICS

COURSE	**FIFTH SEMESTER – CORE PAPER X (Theory)**		
COURSE TITLE	**ATOMIC and NUCLEAR PHYSICS**		
CREDITS 4	**Hours 5**	**CIA 25**	**CE 75**
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.		

UNITS	COURSE DETAILS

UNIT-I	**VECTOR ATOM MODEL:** introduction to atom model – vector atom model – electron spin –spatial quantisation– quantum numbers associated with vector atom model – L-S and J-J coupling – Pauli's exclusion principle – magnetic dipole moment due to orbital motion and spin motion of the electron – Bohr magnetron – Stern-Gerlach experiment – selection rules – intensity rule.
UNIT-II	**ATOMIC SPECTRA:** origin of atomic spectra – excitation and ionization potentials – Davis and Goucher's method – spectral terms and notations – fine structure of sodium D-lines – Zeeman effect –Larmor's theorem – quantum mechanical explanation of normal Zeeman effect – anomalous Zeeman effect (qualitative explanation) –Paschen-Back effect – Stark effect.
UNIT-III	**RADIOACTIVITY:** discovery of radioactivity – natural radio activity – properties of alpha rays, beta rays and gamma rays – Geiger-Nuttal law –Gammow's theory of alpha decay (qualitative study)– neutrino theory of beta decay – nuclear isomerism –
UNIT-IV	**NUCLEAR REACTIONS:** conservation laws of nuclear reaction – Q-value equation for a nuclear reaction – threshold energy – scattering cross section – artificial radio activity – application of radio isotopes – classification of neutrons – models of nuclear structure – liquid drop model – shell model.
UNIT-V	**ELEMENTARY PARTICLES:** classification of elementary particles – fundamental interactions – elementary particle quantum numbers –iIsospin and strangness quantum number – Conservation laws and symmetry – quarks – quark model (elementary ideas only) – discovery of cosmic rays – primary and secondary cosmic rays – latitude effect– altitude effect.
UNIT-VI	**PROFESSIONAL COMPONENTS:**expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	11. R. Murugesan, Modern Physics, S. Chand and Co**.** (All units) (Units IandII-Problems) 12. Brijlaland N. Subrahmanyam, Atomic and Nuclear Physics, S. Chand and Co. (All units) 13. J. B. Rajam, Modern Physics, S. Chand and Co. 14. SehgalandChopra, Modern Physics, Sultan Chand, New Delhi 15. Arthur Beiser– Concept of Modern Physics, McGraw Hill Publication, 6th Edition.
REFERENCE BOOKS	1. Perspective of Modern Physics, Arthur Beiser, McGraw Hill. 2. Modern Physics, S. Ramamoorthy, National Publishing and Co. 3. Laser and Non-Linear Optics by B.B.Laud, Wiley Easter Ltd.,NewYork,1985. 4. Tayal, D.C.2000 – Nuclear Physics, Edition, Himalaya Publishing House, Mumbai. 5. Irving Kaplan (1962) Nuclear Physics, Second Edition, Oxford and IBH Publish and Co, New Delhi. 6. J.B. Rajam– Atomic Physics, S. Chand Publication, 7th Edition. 7. Roy and Nigam, – Nuclear Physics (1967) First edition, Wiley Eastern Limited, New Delhi.
WEB RESOURCES	1. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html 2. https://makingphysicsfun.files.wordpress.com/2015/01/photoelectric-effect.pptx 3. https://www.khanacademy.org/science/physics/quantum-physics/in-in-nuclei/v/types-of-decay

	4. https://www.khanacademy.org/science/in-in-class-12th-physics-india/nuclei

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

CO		Statements	Bloom's Taxonomy level
COURSE OUTCOMES	CO1	List the properties of electrons and positive rays, define specific charge of positive rays and know about different mass spectrographs.	K1,K2 & K3
	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.	K2 & K3
	CO3	Explain different atom models, Describe different quantum numbers and different coupling schemes.	K1 & K2
	CO4	Differentiate between excitation and ionization potentials, Explain Davis and Goucher's experiment, Apply selection rule, Analyse Pasche - Back effect, Compare Zeeman and Stark effect.	K2 & K3
	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)** in the 3-point Scale of STRONG(**S**), MEDIUM (**M**) and LOW(**L**).

CO\PO	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

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	2	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	14	13	15	15	15
Weighted percentage of course contribution to POS	2.8	3.0	3.0	3.0	3.0

FIFTH SEMESTER – CORE -ANALOG AND COMMUNICATION ELECTRONICS

COURSE	**FIFTH SEMESTER – CORE PAPER XI (Theory)**		
COURSETITLE	**ANALOG AND COMMUNICATION ELECTRONICS**		
CREDITS - 4	**Hours 5**	**CIA 25**	**CE 75**
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.		

UNITS	COURSE DETAILS
UNIT-I	**DIODES:** diode characteristics – rectifiers - clipper circuits, clamping circuits. half wave rectifier, center tapped and bridge full wave rectifiers, calculation of efficiency and ripple factor. DC power supply: Block diagram of a power supply, qualitative description of shunt capacitor filter, Zener diode as voltage regulator.
UNIT-II	**TRANSISTOR AMPLIFIERS:** transfer configurations: CB, CE CC modes – I-V characteristics and hybrid parameters – DC load line – Q point self-bias – RC coupled CE amplifier –power amplifiers – classification of power amplifiers: A, B, C – push pull amplifiers.
UNIT-III	**TRANSISTOR OSCILLATORS:** feedback amplifier - principle of feedback, positive and negative feedback of voltage and current gain, advantages of negative feedback - Barkhausen's criterion. Transistor oscillators: Hartely, Colpitt, Phase shift oscillators with mathematical analysis.
UNIT-IV	**OPERATIONAL AMPLIFIERS:** differential amplifiers **–** OPAMP characteristics –IC 741 pin configuration **–** inverting and non-inverting amplifiers – unity follower –summing and difference amplifiers – differentiator and integrator.
UNIT-V	**MODULATION AND DEMODULATION t**heory of amplitude modulation - frequency modulation – comparison of AM and FM – phase modulation – sampling theorem – pulse width modulation – pulse modulation systems: PAM, PPM, and PCM – d**emodulation**: AM and FM detection - duper heterodyne receiver (block diagram)
UNIT-VI	**PROFESSIONAL COMPONENTS:** expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. V.K.Mehta - Principles of Electronics, S.Chandand Co. Ltd., 2004. 2. V.Vijayendran - Integrated Electronics, S.Vishwanathan Publishers, Chennai. 3. B.L. Theraja - A Text Book of Electrical Technology. 4. John D. Ryder - Electronic fundamentals and Applications. 5. Malvino - Electronic Principles, Tata McGraw Hill.
REFERENCE BOOKS	1. B. Grob - Basic Electronics, 6th edition, McGraw Hill, NY, 1989. 2. Herbert Taub and Donald schilling - Digital Integrated Electronics, McGraw Hill, NY. 3. Ramakant A. – Op amp principles and linear integrated circuits, Gaykward 4. Bagde and S. P. Singh - Elements of Electronics. 5. Millman and Halkias**-** Integrated Electronics, Tata McGraw Hill.
WEB	1. https://www.queenmaryscollege.edu.in/eresources/undergraduate

RESOURCES	program/py157 2. www.ocw.mit.edu>...> Circuits and Electronics 3. www.ocw.mit.edu>...> Introductory Analog Electronics Laboratory 4. https:// www.elprocus.com> semiconductor devices 5. https:// www.britannica.com>technology

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

CO		Statements	Bloom's Taxonomy level
COURSE OUTCOMES	**CO1**	Explain the basic concepts of semiconductors devices.	**K2 & K3**
	CO2	Know and classify the basic principles of biasing and transistor amplifiers	**K1 & K2**
	CO3	Acquire the fundamental concepts of oscillators.	**K2 & K3**
	CO4	Understand the working of operational amplifiers	**K1 & K2**
	CO5	Learn and analyze the operations of sequential and combinational digital circuits	**K2 & K3**

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**).

CO\PO	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	L	S	S	L	S	S	S
CO4	M	S	S	S	S	S	S	M	L	M
CO5	S	M	S	S	M	M	S	M	M	S

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	2	2	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	15	13	14	15	15
Weighted percentage of course contribution to POS	3.0	2.6	2.8	3.0	3.0

EC 1 Option 1 -LASERS AND FIBEROPTICS

ELECTIVE COURSE I LASERS AND FIBEROPTICS			
Credits 3	**Hours 4**	**CIA 25**	**CE 75**
Learning Objective: The students will learn the fundamentals, types of lasers, laser instrumentation and their applications also the inter connect between optics with lasers.			
UNITS	**COURSE DETAILS**		
UNIT-I	**FUNDAMENTALS OF LASER:** basic principles: spontaneous and stimulated emission – Einstein's coefficient – pumping mechanism: optical, electrical and laser pumping – population inversion – two and three level laser system – resonat or configuration – quality factor – threshold condition – concept of Qswitching– theory of– cavitydumping.		
UNIT-II	**TYPES OF LASER: s**olid state laser: ruby laser, Nd:YAG laser,Nd:Glass laser– semiconductor laser: intrinsic semiconductor laser, doped semiconductorlaser, injection laser – dye laser – chemical laser: HCL laser, DF- CO_2, COchemical laser. Gaslaser: neutral atom gas laser (He-Ne laser), CO_2laser, Copper vapour laser.		
UNIT-III	**APPLICATIONSOFLASER:** application of laser in metrology – optical communication – material processing: laser instrumentation of material processing, powder feeder, laser heating, laser welding, laser melting – medical application – Laser instrumentation for surgeries– laserin astronomy		
UNIT-IV	**FIBER OPTICS:** basic components of optical fiber communication – principles of light propagation through fiber – total internal reflection – optical fiber – coherent bundle – numerical aperture and skew mode – phase shift and attenuation during total internal reflection – types of fiber: single mode and multi-mode fiber – step index and graded index fiber – fiber optic sensors –application of fiberoptics.		
UNIT-V	**CHARACTERISTICS AND FABRICATION OF OPTICAL FIBER:** fiber characteristics: mechanical and transmission characteristics – absorption loss and scattering loss measurements – dispersion – connect or sandsplicers – fiber termination – optical time domain reflectometer(OTDR) and its uses – fiber material – fiber fabrication – fiber optic cables design.		
TEXT BOOKS	1. B.B. Laud - Laser and Non-linear Optics, New Age International Publications Third Edition, New Delhi. 2. An Introduction to laser, theory and applications by Avadhunulu, M.N.S.,Chand and Co, New Delhi 3. J. Wilson and J.F.B. Hawkes. 'Introduction to Opto Electronics', Pearson Education, 2018.		
REFERENCE BOOKS	1. A.Sennaroglu,"PhotonicsandLaserEngineering:Principles,Devicesand Applications"McGraw-HillEducation,2010. 2. K.R.Nambiar, "Lasers: Principles, Typesand Applications", New Age International, 2004. 3. Optic, AjoyGhatak, McGraw-Hill Education (India) Pvt, Ltd, 6th Edn., 2017.		

COURSE OUTCOMES:

On completion of the Course, the student will be able to,

CO	Statement	Blooms Taxonomy level

CO1	Explore the Laser fundamentals	**K2**
CO2	Understand the types of Lasers	**K3**
CO3	Get adequate knowledge about Industrial and medical applications of laser for day-to-day applications	**K2**
CO4	Recognize and classify the structure of Optical fibre	**K1&K2**
CO5	Understand the Optical sensors and their applications	**K2&K3**

K1 - Remembering K2-Understanding K3-Applying

MAPPING WITH PROGRAM OUTCOMES:

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

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

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	15	15	15	15	15
Weighted percentage of course contribution to POS	3.0	3.0	3.0	3.0	3.0

EC 1 Option 2- MATHEMATICAL PHYSICS

ELECTIVE COURSE I MATHEMATICAL PHYSICS			
Credits 3	**Hours 4**	**CIA 25**	**CE 75**
Learning Objective: To understand higher mathematical concepts which are applied to solve problems in Physics and similar situations			
UNITS	**COURSE DETAILS**		
UNIT-I	**MATRICES:** types of matrices – symmetric, Hermitian, unitary and orthogonal matrices– characteristic equation of a matrix – Eigen values and Eigen vectors of a matrix – Cayley-Hamilton theorem – inverse of matrix by Cayley-Hamilton theorem – similarity transformations – diagonalization of 2x2 real symmetric matrices.		
UNIT-II	**VECTOR CALCULUS:** vector differentiation – directional derivatives –definitions and Physical significance of gradient, divergence, curl – Laplace operators– vector identities – line, surface and volume integrals – statement, proof and simple problems for Gauss's divergence theorem, Stoke's theorem, Green's theorem.		
UNIT-III	**ORTHOGONAL CURVILINEAR COORDINATES:** tangent basis vectors – scale factors – unit vectors in cylindrical and spherical		

	coordinate systems –gradient of a scalar –divergence and curl of a vector – Laplacian in these coordinate systems.
UNIT-IV	**FOURIER SERIES:** periodic functions –Dirichlet's conditions – general Fourier series – even and odd functions and their Fourier expansions – Fourier cosine and sine – half range series – change of length of interval. Fourier analysis of square wave, saw-tooth wave, half wave/full wave rectifier wave forms. **FOURIER TRANSFORMS**: Fourier Integral theorem(Statement only)–Fourier, Fourier sine and Fourier cosine transforms,– Fourier transform of single pulse – trigonometric, exponential and Gaussian functions – inverse Fourier transform – convolution theorem.
UNIT-V	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS (PDE):** PDE for transverse vibrations in elastic strings (one dimensional wave equation) –one dimensional heat flow equation – solutions to these PDE's by method of separation of variables – problems based on boundary conditions and initial conditions.
TEXT BOOKS	1. Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India. 2. Mathematical Physics – P. K. Chattopadhyay, New Age International Publishers. 3. Mathematical Physics – B. D. Gupta. 4. Mathematical Physics – H. K. Das, S. Chand and Co, New Delhi.
REFERENCE BOOKS	1. Fourier Analysis by M.R. Spiegel, 2004, Tata McGraw-Hill. 2. Engineering Mathematics III- B, M. K. Venkataraman, 3. Applied Mathematics for Scientists and Engineers, Bruce R. Kusseand Erik A. Westwig, 2nd Ed, WILEY-VCH Verlag, 2006. 4. Vector space and Matrices – J. C. Jain, Narosa Publishing House Pvt. Ltd.

COURSE OUTCOMES:

On completion of the Course the student will be able to,

CO	Statement	Blooms Taxonomy level
CO1	Solve ordinary and partial differential equations in physical sciences.	**K3**
CO2	Use and apply Green Functions	**K2& K3**
CO3	Use Fourier series and integral transformations and understand the basic theory of vectors and tensors.	**K1**
CO4	Understand the functions of complex variables and elements of distribution theory	**K2**
CO5	Analyze Fourier series	**K3**

K1 - Remembering K2-Understanding K3-Applying

MAPPING WITH PROGRAM OUTCOMES:

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

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

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	2	3	3
CO5	3	2	3	3	3
WEITAGE	15	13	14	15	15
Weighted percentage of course contribution to POS	3.0	2.6	2.8	3.0	3.0

EC 2 Option 1 -COMMUNICATION PHYSICS

ELECTIVE COURSE II COMMUNICATION PHYSICS			
Credits 3	**Hours 5**	**CIA 25**	**CE 75**
Learning Objective: To get a thorough knowledge on transmission and reception of radio waves, the different types of communication like fibre optic, radar, satellite, cellular			
UNITS	**COURSE DETAILS**		
UNIT-I	**RADIO TRANSMISSION AND RECEPTION:** transmitter – modulation types of modulation – amplitude modulation – limitations of amplitude modulation – frequency modulation – comparison of FM and AM – demodulation- essentials in demodulation – receivers: AM radio receivers – types of AM radio receivers – stages of super heterodyne radio receiver, advantages – FM receiver – difference between FM and AM receivers.		
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: i**ntroduction - 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 (basic ideas)
TEXT BOOKS	1. V.K.Metha, Principles of Electronics, S. Chand andCoLtd., 2013 2. Anokh Singh and Chopra A.K., Principles of communication Engineering, S.Chandand 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 OUTCOMES:

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

CO	Statement	Blooms Taxonomy level
CO1	Understand the principles of photography and image formation.	**K2**
CO2	Understand the essential components of conventional and cameras.	**K3**
CO3	Become familiar with camera using films and its different types.	**K3**
CO4	Know the principle, function and types of digital cameras and apply the ideas in recent developments.	**K3**
CO5	Recognize the applications of digital imaging system in recent days.	**K2 &K3**

K1 - Remembering K2-Understanding K3-Applying

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**).

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	S	S	S	S	M	S	M
CO2	S	S	M	S	M	S	S	M	M	M
CO3	M	M	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	S	M

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	2	3	3	3
CO5	3	3	3	3	3
Weightage	15	14	15	15	15
Weighted percentage of course contributin to POS	3	2.8	3	3	3

EC 2 Option 1 -- DIGITAL PHOTOGRAPHY

ELECTIVE COURSE II - DIGITAL PHOTOGRAPHY			
Credits 3	**Hours 5**	**CIA 25**	**CE 75**
Learning Objective: To understand the principles of photography and image formation and the science and arts behind it. To understand the essential components of conventional and 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 and 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 and contrast – colour balance – hue/saturation – dodge/burn – cloning and 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. Michel J.Langford , Anna Fox and Richard Sawdon Smith, Basic photography, 9th Edition, , 2010-NL, Focal press, London **2.** Henry Carroll, Read this if you want to take great photographs of people, Laurence King Publishing
REFERENCE BOOKS	1. Mark Galer, Digital Photography in Available Light essential skills, 2006, Focal press, London **2.** Paul Harcourt Davies, The Photographer's practical handbook, 2005, UK PRESS

COURSE OUTCOMES:

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

CO	Statement	Blooms Taxonomy level
CO1	Understand the principles of photography and image formation.	**K2**
CO2	Understand the essential components of conventional and cameras.	**K3**
CO3	Become familiar with camera using films and its different types.	**K3**
CO4	Know the principle, function and types of digital cameras and apply the ideas in recent developments.	**K3**
CO5	Recognize the applications of digital imaging system in recent days.	**K2 &K3**

K1 - Remembering K2-Understanding K3-Applying

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**).

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	S	S	S	S	M	S	M
CO2	S	S	M	S	M	S	S	M	M	M
CO3	M	M	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	S	M

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	2	3	3	3
CO5	3	3	3	3	3
Weightage	15	14	15	15	15

Weighted percentage of course contribution to POS	3	2.8	3	3	3

COURSE	**FIFTH SEMESTER –XII (CORE PRACTICAL)**		
COURSE TITLE	**PRACTICAL 5**		
CREDITS - 4	**Hours 4**	**CIA 25**	**CE 75**
COURSE OBJECTIVES	Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.		
GENERAL			

Minimum of Eight Experiments from the list:

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

COURSE OUTCOMES:

On completion of the Course the student will be able to,

CO	Statement	Blooms

		Taxonomy level
CO1	Have a deep knowledge of fundamentals of optics, electric circuits and magnetism	**K3**
CO2	Gain the knowledge and understanding the components and handling equipments	**K1**
CO3	Verify the experimental results with theoretical values	**K3**
CO4	Get the idea about experimental setup and arrangement of devices	**k3**
CO5	Understand the basic concepts in optics and electricity	**K1 & K2**

K1 - Remembering K2-Understanding K3-Applying

MAPPING OF COURSE OUTCOME WITH POS:

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

S- Strong M-Medium L-Low

K1 - Remembering K2-Understanding K3-Applying

MAPPING OF COURSE OUTCOME WITH POS:

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	2	3	3	3
Weightage	15	14	15	15	15
Weighted percentage of course contributin to POS	3	2.8	3	3	3

COURSE	**FIFTH SEMESTER – Part IV**		
COURSE TITLE	**VALUE EDUCATION**		
CREDITS - 2	**Hours 2**	**CIA 25**	**CE 75**
COURSE OBJECTIVES	This course aims to build physical and mental strength of the learners, strengthen the emotional and spiritual aspects of the learners. make the learners responsible and cooperative citizens, develop democratic way of thinking and inculcate spirit of national integration, develop the practice of paying respect for dignity of individual and diversity in society		

COURSE CONTENT

Unit I - Yoga and Physical Health

1.1 Physical Structure – Three bodies – Five limitations

1.2 Simplified Physical Exercises – Hand Exercises -Leg Exercises – Breathing Exercises – Eye Exercises – Kapalapathi

1.3 Maharasanas 1-2 – Massages – Acu-puncture – Relaxation

1.4 Yogasanas – [illegible] – Padmasana – Vajrasanas – Chakrasanas (Side) – Viruchasanas – Yoga muthra – Patchimothasanas – Ustrasanas – Vakkarasanas – Salabasanas

Unit II - Art of Nurturing the life force and Mind

2.1 Maintaining the youthfulness – Postponing the ageing process

2.2 Sex and Spirituality - Significance of sexual vital fluid – Married life – Chastity

2.3 Ten stages of Mind

2.4 Mental frequency – Methods for concentration

Unit III - Sublimation

3.1 Purpose and Philosophy of life

3.2 Introspection – Analysis of Thought

3.3 Moralization of Desires

3.4 Neutralization of Anger

Unit IV – Human Resources Development

4.1 Eradication of worries

4.2 Benefits of Blessings

4.3. Greatness of Friendship

4.4 Individual Peace and World Peace

Unit V – Law of Nature

5.1 Unified force – Cause and Effect system

5.2 Purity of Thought and Deed and Genetic Centre

5.3 Love and Compassion

5.4 Cultural Education – Five fold Culture

1) யோகமும் உடல்நலமும் (16 hours)

1.1 உடலமைப்பு – 3 உடல்கள் - ஐந்தில் அளவுமுறை

1.2 எளியமுறை உடற்பயிற்சி – கைப்பயிற்சி – கால் பயிற்சி - மூச்சுபயிற்சி – கண் பயிற்சி – கபாலபதி

1.3 மகராசனம் 1-2 – உடல் தேய்த்தல் - அக்குபிரஷர் பயிற்சி – உடல் தளர்த்தல்

1.4 யோகாசனங்கள்: [redacted] - பத்மாசனம் - வஜ்ராசனம் - சக்கராசனம் (பக்கவாட்டில்) – விருச்சாசனம் - யோக முத்ரா – பச்சி மோத்தாசனம் - உஸ்ட்ராசனம் - வக்கராசனம் - சலபாசனம்

2) உயிர்வளமும் - மனவளமும் (16 hours)

2.1 இளமை காத்தல் - முதுமையைத் தள்ளிப்போடுதல்

2.2 பாலுணர்வும் ஆன்மீகமும் - வித்தின் மகிமை - இல்லற வாழ்வு – கற்புநெறி

2.3 மனதின் பத்து படிநிலைகள்

2.4 மன அலைச்சுழல் - மன ஓர்மைக்கான பயிற்சிகள்

3) குணநலப்பேறு (16 hours)

3.1 வாழ்வின் நோக்கம் - வாழ்க்கைத் தத்துவம்

3.2 அகத்தாய்வு – எண்ணம் ஆராய்தல்

3.3 ஆசை சீரமைத்தல்

3.4 சினம் தவிர்த்தல்

4) மனிதவள மேம்பாடு (16 hours)

4.1 கவலை ஒழித்தல்

4.2 வாழ்த்தும் பயனும்

4.3 நட்பு நலம்

4.4 தனிமனித அமைதி – உலக அமைதி

5) இயற்கை நியதி (16 hours)

5.1 ஒருங்கிணைப்பு ஆற்றல் - செயல்விளைவுத் தத்துவம்

5.2 மனத்தூய்மை, வினைத்தூய்மை – கருமையம்

5.3 அன்பும் கருணையும்

5.4 பண்பாட்டுக் கல்வி – ஐந்தொழுக்கப் பண்பாடு

Reference Book:

Manavalakalai Yoga, Vethathri Publications, Tamil Nadu, 2008.

Evaluation Pattern:

Practical [Performing Yoga & Meditation] – 25 marksTheory [End-Semester Examination] – 75 marks

CO	Statements	Bloom's Taxonomylevel
CO1.	Build physical and mental strength of the learners	Synthesis (Level K6)
CO2.	Strengthen the emotional and spiritual aspects of the learners	Synthesis (Level K6)
CO3.	Make the learners responsible and cooperative citizens	Synthesis (Level K6)
CO4.	Develop democratic way of thinking and inculcate spirit of national integration	Application (Level K3)
CO5.	Develop the practice of paying respect for dignity of individual and diversity in society	Application (Level K3)

MAPPING OF COURSE OUTCOME WITH POS:

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

S- Strong M-Medium L-Low

K1 - Remembering K2-Understanding K3-Applying

MAPPING OF COURSE OUTCOME WITH POS:

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	14	15	15
Weighted percentage of course contributin to POS	3	3	2.8	3	3

COURSE	**FIFTH SEMESTER – Part IV**
COURSE TITLE	**SUMMER INTERNSHIP / INDUSTRIAL TRAINING**
CREDITS - 2	**Hours NIL**
COURSE OBJECTIVES	To offer a hands-on-learning experience, that allows the learners to maximize the outcome and benefits of their theoretical knowledge through practical implementation. By adding technical skills, soft skills and professional experience to the learners' resume, they can enhance their chances of securing the job they desure To provide the learners an experience of the real corporate world and thus help them understand the expectations and requirements of the industry. To enable the learners build their network and professional relationships, which turns them into confident future professionals.

Duration of the Training:

- The learners of all the Under-Graduation Programmes are to undergo the Internship / Industrial Training during the summer vacation, after completion of the IV Semester examinations. The training period is 30 working days.
- Evaluation:
- After completion of the training, the evaluation of the performance of the learners willbe done in the V semester.
- Two credits will be awarded for the best performers.
- Viva-voce examination will be conducted and the learners have to appear for theViva-voce individually.
- At the time of Viva-voce, the learners have to submit the given records to theexaminer.
    - Work Diary, endorsed by the trainer
    - A complete report on the objectives, modules and outcomes.
    - A certificate, duly signed and issued by the trainer
-

CO1.	Offer a hands-on-learning experience, that allows the learners to maximize the outcome and benefits of their theoretical knowledge through practical implementation.	Knowledge (Level K1)
CO2.	Add technical skills, soft skills and professional experience to the learners' resume	Comprehension (Level K2)
CO3.	Enhance their chances of securing the job they desire	Analysis (Level K4)
CO4.	Provide the learners an experience of the real corporate world and thus help them understand the expectations and requirements of the industry	Comprehension (Level K2)
CO5.	Enable the learners build their network and professional relationships, which turns them into confident future professionals.	Application (Level K3)

MAPPING OF COURSE OUTCOME WITH POS:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10

CO1	S	S	S	M	S	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	M	M	S	M	S	S	S	M	M
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	M	S	S	M	S	S

S- Strong M-Medium L-Low

K1 - Remembering K2-Understanding K3-Applying

MAPPING OF COURSE OUTCOME WITH POS:

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	2	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	14	14	15
Weighted percentage of course contributin to POS	3	3	2.8	2.8	3

COURSE	**SIXTH SEMESTER – CORE PAPER XIII (Theory)**		
COURSE TITLE	**SOLID STATE PHYSICS**		
CREDITS 3	**Hours 5**	**CIA 25**	**CE 75**
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 – Vander-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 monoatomic and 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 – T^3 law (qualitative only)–properties of metals – classical free electron theory of metals(Drude-Lorentz) – Ohm's law – electrical and thermal conductivities – Weidemann-Franz' law.
UNIT-III	**MAGNETIC PROPERTIES OF SOLIDS:** permeability, susceptibility, relation between them – classification of magnetic materials – properties of dia, para,ferro, ferri and anti ferromagnetism– Langevin's theory of diamagnetism – Langevin's theory of paramagnetism– Curie-Weiss law – Weiss theory of ferromagnetism(qualitative only) – domains – discussion of B-H curve –hysteresis and energy loss – soft and hard magnets.
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 – classical theory of electric polarisability –normal and anomalous dispersion –Langevin-Debye equation.
UNIT-V	**FERROELECTRIC and SUPERCONDUCTING PROPERTIES OF MATERIALS:** *ferroelectric effect*: Curie-Weiss Law – ferroelectric domains, P-E hysteresis loop – *elementary band theory:* band gap(no derivation) – conductor, semiconductor (P and N type) and insulator– Hall effect – measurement of conductivity (four probe method) - Hall coefficient. *Superconductivity:* experimentalresults –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)
UNIT-VI	**PROFESSIONAL COMPONENTS:** expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. Introduction to Solid State Physics, Kittel, Willey Eastern Ltd (2003). 2. Solid state Physics, Rita John,1st edition, Tata McGraw Hill publishers (2014). 3. Solid State Physics , R L Singhal, Kedarnath Ram Nathand 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. PuriandBabber – Solid State Physics – S.ChandandCo. 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
WEB RESOURCES	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:

CO		**Statements**	**Bloom's Taxonomy level**
COURSE OUTCOMES	**CO1**	Classify the bonding and crystal structure also learn about the crystal structure analysis using X ray diffraction.	**K2 & K3**
	CO2	Understand the lattice dynamics and thus learn the electrical and thermal properties of materials.	**K1 &K2**
	CO3	Give reason for classifying magnetic material on the basis of their behaviour.	**K3**
	CO4	Comprehend the dielectric behavior of materials.	**K3**
	CO5	Appreciate the ferroelectric and super conducting properties of materials.	**K2 & K3**

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**).

CO/PO	**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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	15	14	14	15	15
Weighted percentage of course contribution to POS	3.0	2.8	2.8	3.0	3.0

SIXTH SEMESTER - DIGITAL ELECTRONICS AND MICROPROCESSOR 8085

COURSE	**SIXTH SEMESTER– CORE PAPER XIV (Theory)**		
COURSE TITLE	**DIGITAL ELECTRONICS AND MICROPROCESSOR 8085**		
CREDITS 3	**Hours 5**	**CIA 25**	**CE 75**
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 and 2's complement methods – Boolean laws – De-Morgan's theorem –basic logic gates -universal logic gates (NAND and NOR) –standard representation of logic functions (SOP and POS) – minimization techniques (Karnaughmap: 2, 3, 4 variables).
UNIT-II	adders, half and full adder – subtractors, half and full subtractor – parallel binary adder – magnitude comparator – multiplexers (4:1) and 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:- synchronousmod-8, mod-10, 4-bit and ring counter – general memory operations, ROM, RAM (static and dynamic), PROM, EPROM, EEPROM, EAROM. IC – logic families: RTL, DTL, TTL logic, CMOS NAND and NOR Gates, CMOS Inverter.
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 – programes for addition (8-Bit and 16-Bit), subtraction (8-Bit and 16-Bit), multiplication (8- Bit), division (8- Bit) –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).
UNIT-VI	**PROFESSIONAL COMPONENTS:** expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
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 and 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 and Applications". TMH.1994. 4. Malvino and Leach. "Digital Principles and Applications". TMG Hill Edition 5. Microprocessors and Interfacing – Douglas V. Hall 6. Microprocessor and Digital Systems – Douglas V. Hall
WEB RESOURCES	1. https://youtu.be/-paFaxtTCkI 2. https://youtu.be/s1DSZEaCX_g

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

CO		**Statements**	**Bloom's Taxonomy level**
COURSE OUTCOMES	**CO1**	Learn about number systems, Boolean algebra, logical operation and logic gates	**K2 &K3**
	CO2	Understand the working of adder, subractors, multiplexers and demultiplexers.	**K1& K2**
	CO3	Get knowledge on flip-flops and storage devices.	**K2**
	CO4	Gain inputs on architecture of microprocessor 8085.	**K2**
	CO5	Develop program writing skills .on microprocessor 8085.	**K3**

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**).

CO/PO	**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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	15	15	14	15	15
Weighted percentage of course contribution to POS	3.0	3.0	2.8	3.0	3.0

Core Course XVI - Project

Credits 3 Hours 4 CIA 25 CE 75

Course Objectives :Students are provided with a core paper as Project (Individual project) other than theory and practical lectures, internships, field visits, assignments and seminars, the learners are put in the practice of doing subject specific projects either as theoretical work (calculations) or experimental / research level project works at the Under-Graduation level. Thus they are encouraged and motivated to pursue higher studies and research activities.

Methodology:

Every individual learner is encouraged to carry out a minor research work in the area related to the core subjects or Inter-disciplinary courses.

The project work must retain its originality and avoidance of plagiarism is mandatory

Evaluation Pattern:

After completion of eighty percent of the working days in the concerned semester, the candidate has to submit the research/ project work to the Examination section of the institution for evaluation.

The final product of the research work must be duly signed by the candidate, the Research Supervisor and the Head f the Department

The Examination section of the institution will fix a date for Viva-voce examination. Each individual has to appear for the Viva-voce.

Thrust areas for Project: (either theoretical or experimental work)

- Optics – Using optical instruments
- Properties of matter – Viscosity, elasticity & surface tension
- Electricity and electromagnetism
- Atomic and nuclear Physics
- Condensed matter Physics

- Electronics
- Digital electronics
- Communication Physics
- Nano science and technology
- Crystallography.

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

CO		Statements	Bloom's Taxonomy level
COURSE OUTCOMES	**CO1**	Learn to be specific in the (her) area of interest	**K2 &K3**
	CO2	Understand the method of working highly coherent to the topic.	**K1& K2**
	CO3	Gain knowledge on the collection of voluminous data.	**K2**
	CO4	Able to analyze the problems arising in doing the project	**K2**
	CO5	Able to solve, criticize and evaluate the results of the project	**K3**

MAPPING OF COURSE OUTCOME WITH POS:

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

S- Strong M-Medium L-Low
K1 - Remembering K2-Understanding K3-Applying

MAPPING OF COURSE OUTCOME WITH POS:

CO\PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	14	15	15

Weighted percentage of course contributin to POS	3	3	2.8	3	3

EC 3 Option 1 - ENERGY PHYSICS

ELECTIVE COURSE III ENERGY PHYSICS			
Credits 3	**Hours 5**	**CIA 25**	**CE 75**
Learning Objective: 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 and 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-Conventional Sources of Energy, Khanna Publishers, 2009, 4th Edn. 2. S P Sukhstme, J K Nayak, Solar Energy, Principles of Thermal Collection and Storage, McGraw Hill, 2008, 3rd Edn. 3. D P Kothari, K P Singal, RakeshRajan, PHI Learning Pvt Ltd, 2011, 2nd Edn.		
REFERENCE BOOKS	1. John Twidelland Tony Weir, Renewable Energy Resources, Taylor and Francis, 2005, 2nd Edn. 2. S.A. Abbasi and NasemaAbbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd, 2008. 3. M. P. Agarwal, Solar Energy, S. Chand and Co. Ltd., New Delhi,1982		

	4. H. C. Jain, Non-Conventional Sources of Energy, Sterling Publishers,1986.

COURSE OUTCOMES:

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

CO	Statements	Bloom's Taxonomy level
CO1	To identify various forms of renewable and non-renewable energy sources	**K1**
CO2	Understand the components of solar radiation, their measurement and apply them to utilize solar energy.	**K2**
CO3	Discuss the working of a windmill and analyze the advantages of wind energy.	**K3**
CO4	Distinguish aerobic digestion process from anaerobic digestion.	**K4**
CO5	Understand the importance of energy storage, advantages and disadvantages and applications of fuel cells and hydrogen storage	**K3**

MAPPING WITH PROGRAM OUTCOMES:

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

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	2	3	3	3
CO5	3	3	3	3	3

Weightage	15	14	15	15	15
Weighted percentage of course contribution to Pos	3	2.8	3	3	3

Ec 3 Option 2 - MEDICAL INSTRUMENTATION

ELECTIVE COURSE III MEDICAL INSTRUMENTATION	
Credits - 3 Hours - 5 CIA 25 CE 75	
Learning Objective: This course aims to provide background of the Physics principles in medical instrumentation technologies through theoretical and practical learning.	
UNITS	**COURSE DETAILS**
UNIT-I	**BIOMETRICS:** introduction to man-instrument system and its components – problems encountered in measuring living systems – transducers– force, motion, pressure transducers. **AUDIOMETRY:** mechanism of hearing – air and bone conduction – threshold of hearing – audiometer – masking in audiometry – pure tone and speech audiometer – evoked response audiometry – hearing aids
UNIT-II	**BIOELECTRIC POTENTIALS AND ELECTRODES:** biomedical signals – sources of bioelectric potentials – resting, action and propagation of bioelectric potentials –bio-potential electrodes – skin surface, needle electrodes. **BIOMEDICAL RECORDERS:** electro-conduction system of heart – electro cardiogram (ECG) – Einthoven's triangle –– electro encephalogram (EEG) –brain waves – EEG instrumentation – recording of evoked potentials – electro myogram (EMG)–pulse oximeter.
UNIT-III	**DIAGNOSTIC RADIOLOGY:** radiography – primary radiological image – contrast agents, filters – beam restrictor, grid – image quality **COMPUTED TOMOGRAPHY:** linear tomography – computed tomography – helical and multi slice – image quality– radiation dose. **RADIOISOTOPES AND NUCLEAR MEDICINE:** radioisotopes – radiopharmaceuticals – technetium generator – gamma camera – positron emission tomography – disposal of radioactive waste.
UNIT-IV	**ULTRASOUND IMAGING:** ultrasound transducer – ultrasound imaging– Doppler ultrasound – ultrasound image quality and bio-effects. **MAGNETIC RESONANCE IMAGING:** proton and external magnetic field – precession – radiofrequency and resonance – MRI signal – relaxation time – MRI instrumentation – imaging sequences – biosafety
UNIT-V	**PROJECT ASSIGNMENT:** clinical practice of *one* of the following: electro cardiogram, electro encephalogram, electro myogram, electro oculogram, computed tomography, positron emission tomography, ultrasound
TEXT BOOKS	1. Leslie Cromwell, Fred Weibell, Erich Pfieffer (2002) Biomedical Instrumentation and Measurements Prentice Hall of India, New Delhi. 2. R. S. Khandpur (2003) Handbook of Biomedical Instrumentation 2nd Edn. Tata McGraw Hill, New Delhi. 3. KuppusamyThayalan (2017), Basic Radiological Physics 2nd Edn. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.
REFERENCE BOOKS	1. John Webster (2004) Bioinstrumentation John Wiley and Sons, Singapore.

	2. John Enderle, Susan Blanchard, Joseph Bronzino (2005) Introduction to Biomedical Engineering, 2nd ed. Elsevier, San Deigo 3. William Hendee, Geoffrey Ibbott, Eric Hendee (2005) Radiation therapy Physics 3rd ed. Wiley-Liss, New Jersey

COURSE OUTCOMES:

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

COs	Statements	Bloom's Taxonomy level
CO1	Learn the fundamentals and applications of Biometrics and Audio metry.	**K1**
CO2	Understand the basics of bioelectric potentials and electrodes. Learn about ECE, EEG, EMG and basic principles of pulse oximeter.	**K2**
CO3	Apply knowledge on Radiation Physics	**K3**
CO4	Analyze Radiological imaging and filters	**K4**
CO5	Assess the principles of radiation protection	**K5**

MAPPING WITH PROGRAM OUTCOMES:

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

CO/PO	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	S	S	S	S	S	M	S	S	M	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	M	S	S	S	S	S	S	S	S	S

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	3	3	3	3
CO4	3	2	3	3	3
CO5	3	3	3	3	3
Weightage	15	14	15	14	15
Weighted percentage of course contribution to Pos	3	2.8	3	2.8	3

EC4 – Option 1 - MATERIALS SCIENCE

ELECTIVE COURSE IV - MATERIALS SCIENCE			
Credits 3	**Hours 5**	**CIA 25**	**CE 75**
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.			
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 and twist boundaries, twin boundaries, stacking faults – volume defects – effect of imperfections.		
UNIT-II	**MATERIAL DEFORMATION: i**ntroduction – 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. Material science and Engineering, Raghavan V, Prentice Hall of India, Sixth Edition, 2015 2. Materials science, V. Rajendran, McGraw Hill publications 2011		
REFERENCE BOOKS	1. William D. Callister, Jr., Material Science and Engineering – An Introduction, 8th Edition, John Wiley and Sons, Inc., 2007 2. W. Bolton, "Engineering materials technology", 3rd Edition, Butterworth and Heinemann, 2001. 3. Donald R. Askeland, Pradeep P. Phule, "The Science and Engineering of Materials", 5th Edition, Thomson Learning, First Indian Reprint, 2007. 8. William F. Smith, "Structure and Properties of Engineering Alloys", Mc-Graw-Hill Inc., U.S.A, 2nd edition, 1993.		

COURSE OUTCOMES:

On completion of the Course the student will be able to,

CO	Statement	Blooms Taxonomy level
CO1	Learn the imperfections in the crystals	**K2**
CO2	Learn the different kinds of mechanical behavior of materials	**K2 & K3**
CO3	Understand the knowledge of deformation and strengthening methods of materials	**K2**
CO4	Study the behavior of optical materials and their applications, function of optical devices like LED, LCD	**K2**
CO5	Apply the various destructive and non destructive methods of testing of materials.	**K3**

K1 - Remembering K2-Understanding K3-Applying

Mapping of Course Outcome with POs:

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

S- Strong M-Medium L-Low
K1 - Remembering K2-Understanding K3-Applying

Mapping of Course Outcome with POs:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	14	15
Weighted percentage	3	3	3	2.8	3

of course contributin to POS					

S- Strong M-Medium L-Low
K1 - Remembering K2-Understanding K3-Applying

EC 4 Option 2 - ADVANCED MATHEMATICAL PHYSICS

ELECTIVE COURSE IV -ADVANCED MATHEMATICAL PHYSICS			
Credits 3	**Hours 5**	**CIA 25**	**CE 75**
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.			
UNITS	**COURSE DETAILS**		
UNIT-I	**MATRICES: i**ntroduction – special types of matrices – transpose – conjugate– conjugate transpose– symmetric and anti symmetric – Hermitian and skew Hermitian – orthogonal and unitary – properties – characteristic equation – roots and characteristic vectors – diagonalization– Cayley–Hamilton theorem –simple problems		
UNIT-II	**VECTOR CALCULUS:**∇operator – divergence – second derivative of vector functions or fields – Laplacian operator – curl of a vector – line integral – line Integral of a vector field around an infinitesimal rectangle – curl of conservative field – surface integral – volume integral (without problem) – Gauss's divergence theorem and proof – Stroke's theorem and proof –simple problems.		
UNIT-III	**SPECIAL FUNCTIONS:** definition –Beta function – Gamma function – evaluation of Beta function – other forms of Beta function – evaluation of Gamma function – other forms of Gamma function – relation between Beta and Gamma functions – simple problems.		
UNIT-IV	**FROBENIUS METHOD AND SPECIAL FUNCTIONS:** singular points of second order linear differential equations and importance – singularities of Bessels and Laguerre equations, Frobenius method and applications to differential equations: Legendre and Hermite differential equations – Legendre and Hermite polynomials – Rodrigues formula –generating function – orthogonality		
UNIT-V	**PARTIAL DIFFERENTIAL EQUATIONS:** solutions to partial differential equations using separation of variables - Laplace's equation in problems of rectangular – cylindrical and spherical symmetry – conducting and dielectric sphere in an external uniform electric field – wave equation and its solution for vibrational modes of a stretched string		
TEXT BOOKS	1. Mathematical Physics, B.D. Gupta-Vikas Publishing House, 4 th Edition (2006) 2. Mathematical Physics, SatyaPrakash (Sultan Chand)		
REFERENCE BOOKS	1. Mathematical Methodsor Physicists,G.B.Arfken,H.J.Weber,F.E.Harris (2013, 7th Edn., Elsevier) 2. Mathematical Physics–H. K. Dass, Dr. Rama Verma (S. Chand		

	Publishing) 3. Advanced Engineering Mathematics, Erwin Kreyszig (Wiley India) 4. Mathematical Physics and Special Relativity, M. Das, P.K. Jena and B.K. Dash (SrikrishnaPrakashan)

COURSE OUTCOMES:

On completion of the Course the student will be able to,

CO	Statement	Blooms Taxonomy level
CO1	Learn the learn advanced topics and theorems in mathematics based on the fundamentals of matrices and vector calculus learnt in earlier course	**K1 & K2**
CO2	Acquire the advanced knowledge in vector calculus and apply them in real time cases	**K2 & K3**
CO3	Understand the various special functions	**K1 & K2**
CO4	Apply the special functions in different problems	**K3**
CO5	Apply the knowledge of partial differential equations for different geometrical objects which will be of use in research at a later stage	**K3**

K1 - Remembering K2-Understanding K3-Applying

Mapping of Course Outcome with POs:

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

S- Strong M-Medium L-Low

K1 - Remembering K2-Understanding K3-Applying

Mapping of Course Outcome with POs:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	2	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	14	15	15

Weighted percentage of course contributin to POS	3	3	3	3	3

S- Strong M-Medium L-Low
K1 - Remembering K2-Understanding K3-Applying

SIXTH SEMESTER – CORE PRACTICAL- 6

COURSE	SIXTH SEMESTER – CORE PAPER XV - (PRACTICAL)		
COURSE TITLE	PRACTICAL 6		
CREDITS - 3	Hours - 4	CIA 25	CE 75
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.		

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. Characteristics of a transistor – (CE mode)
5. Characteristics of a transistor – (CB mode).
6. RC coupled CE transistor amplifier - single stage.
7. Transistor Emitter follower.
8. Colpitt's oscillator -transistor.
9. Hartley oscillator - transistor.
10. Astable multivibrator - transistor.
11. Bistable multivibrator - transistor.
12. FET - characteristics.
13. FET - amplifier (common drain)
14. UJT -characteristics
15. AC circuits with L.C.R -Series resonance.
16. AC circuits with L.C.R - Parallel resonance.
17. Operational amplifier - inverting amplifier and summing.
18. Operational amplifier - non-inverting amplifier and summing.
19. Operational amplifier – differential amplifier
20. Operational amplifier - differentiator and integrator.
21. Operational amplifier - D/A converter by binary resistor method.
22. 5V, IC Regulated power supply.
23. Construction of seven segment display.
24. Study of gate ICs – NOT, OR, AND, NOR, NAND, XOR, XNOR
25. Verification of De Morgan's theorem using ICs –NOT, OR, AND
26. NAND as universal building block.
27. NOR as universal building block.
28. Half adder / Half subtractor using basic logic gate ICs
29. Microprocessor 8085 – addition (8 bit only)
30. Microprocessor 8085 – subtraction (8 bit only)
31. Microprocessor 8085 – multiplication (8 bit only)
32. Microprocessor 8085 – division (8 bit only)
33. Microprocessor 8085 – square (8 bit only)
34. Microprocessor 8085 – square root (8 bit only)
35. Microprocessor 8085 – largest/smallest of numbers (8 bit only)
36. Microprocessor 8085 –ascending/descending order
37. Microprocessor 8085 – Fibonacci series

COURSE OUTCOMES:

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

CO	Statement	Blooms Taxonomy level
CO1	Acquire practical skills in using electronic devices.	**K2**
CO2	Provide a hands-on learning in digital electronic circuits	**K3**
CO3	Apply the knowledge to make various circuits in digital electronics using ICs.	**K3**
CO4	Gain adequate knowledge about fundamental experiments on microprocessor 8085.	**K3**
CO5	Apply the knowledge to write programs by themselves.	**K3**

K1 - Remembering K2-Understanding K3-Applying

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**).

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of course contributin to POS	3	3	3	3	3

COURSE	SIXTH SEMESTER – SKILL ENHANCEMENT COURSE VIII		
COURSE TITLE	COMPUTER PROGRAMMING 'C' PRACTICALS		
CREDITS - 2	Hours - 2	CIA 25	CE 75
COURSE OBJECTIVES	To write C program for simple applications of real life using using function. To make the students to write C programs using conical statements. To train the students to write C programs using Arrays		

List of Programmes :

1. Arranging data in ascending / descending order.
2. Finding area of a triangle.
3. Finding standard deviation of a collection of data.
4. Fahrenheit to Celsius conversion.
5. Upper and lowercase conversion.
6. Sum of the digits.
7. Sum of the given series. Sum = $x+x^2+x^3+\ldots+x^{15}$.
8. Reversing the numbers.
9. Reversing the string.
10. Compound interest calculation.
11. Simple interest calculation using function.
12. Factorial of a number.

Course Outcome :

On completion of the Course the student will be able to,

CO	Statement	Blooms Taxonomy level
CO1	write simple programme in 'C'	K2
CO2	use control statements and simple if else statements in writing programmes	K3
CO3	write programs using switch case	K3
CO4	write programe using for loop	K3
CO5	write programe using functions	K3

K1 - Remembering K2-Understanding K3-Applying

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

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	2	3	3
CO5	3	2	3	3	3
WEITAGE	15	13	14	15	15
Weighted percentage of course contribution to POS	3.0	2.6	2.8	3.0	3.0

COURSE	**SIXTHE SEMESTER - Part IV**		
COURSE TITLE	**EXTENSION ACTIVITY**		
CREDITS - 1	**Hours NIL**	**CIA 25**	**CE 75**
COURSE OBJECTIVES	To make the students understand and then practice their knowledge and skills to society oriented activites.		

CO1.	To arouse social consciousness of the students by providing them opportunities to work with and among the people.	Knowledge (Level K1)
CO2.	To develop an awareness and knowledge of social realities to have concern for the well being of the community and engage in creative and constructive social action.	Application (Level K3)
CO3.	To provide with rich and meaningful educational experiences to them in order to make their education complete and meaningful.	Synthesis (Level K6)
CO4.	To develop skill needed in the exercise of democratic leadership and programme development to help them get self-employed.	Synthesis (Level K6)
CO5.	To give them the opportunities for their personality development	Synthesis (Level K6)

MAPPING WITH PROGRAM OUTCOMES:

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

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	2	3	3
CO5	3	3	3	3	3
WEITAGE	15	14	14	15	15
Weighted percentage of course contribution to POS	3.0	2.8	2.8	3.0	3.0

Semester I – Extra Credit Course I
ENERGY HARVESTING - I

COURSE OBJECTIVES: To make the students understand the basic principles and applications of different forms of energy.

UNITS AND COURSE DETAILS

UNIT-I ELECTRICAL ENERGY

Application of heating effect of electricity: Electric heater– Electric radiation and Electric Iron – Electric welding and electric furnace –Carbon arc – Electric Lamp – Efficiency of a Lamp – Measurement of Electric Power - Principle of production of A.C. – A.C generators – D.C generators -D.C Motors.

UNIT – II MAGNETIC ENERGY

Magnetic field (B), magnetization (M), magnetic field intensity H, Magnetic flux and flux density, magnetic materials and magnetization, Induction heater-magnetic hysteresis.

UNIT- III PHOTOVOLTAICS & MICROWAVES

The photovoltaic effect -analysis of photovoltaic cells-efficiency of solar cells-design of photovoltaic system-single crystal and polycrystalline cells-Reflex Klystron- Magnetron - Microwave oven.

UNIT - IV THERMAL ENERGY

Distribution of Energy in the thermal spectrum – Lummer and Pringsheim Experiment and its Results – Wien's Displacement Law and Radiation Law – Rayleigh Jean's Law -Planck's Radiation Law – Deduction of Wien's Law and Rayleigh – Jean's Law from Planck's law-Kirchoff's Law of radiation and its proof.

UNIT - V MOLECULAR ENERGY & NUCLEAR ENERGY

Maxwell's **l**aw of equipartition of Energy – Molar Specific heat capacity at constant volume and constant pressure – Total Internal Energy and Ratio of Heat capacities in monoatomic gas, Diatomic gas. Chain reaction-Controlled & uncontrolled Nuclear fission, energy released in atom bomb . Nuclear fusion-Thermo nuclear reactors- Hydrogen bomb.

BOOKS FOR STUDY:

1. Heat & Thermodynamics Units I, &II Brijlal Subramaniam, Heat & Thermodynamics, Heat & Thermodynamics, Units I, & II, 2012, 16th edition.
2. Dennis Roddy &John Coolen, Electronic Communication, (Unit III), Prentice Hall India, 1995, 4th Edition.
3. Subir Kumar Sarkar, Optical Fibre and Fibre optic communication systems (Unit III) S Chand & Co, 2001, 2nd edition.

4. Singhal.S.S, Agarwal. J.P. and Sathya prakash, Heat, Thermodynamics and Statistical Physics, Units I, &II, Pragati Prakashan, 1985, 9th Edition.
5. Subrahmaniam. N & Brijlal S, Atomic & Nuclear Physics, Unit V, Chand & Company Ltd, 2008, 3rd Edition

CO1.	Understand how electrical energy can be used in day today appliances. Acquire knowledge of the Ac currents and generators	Understand (Level K1) & Knowledge (Level K2)
CO2.	Develop an awareness and knowledge of magnetic fields, flux and other magnetic vectors.	Application (Level K3)
CO3.	Provide with useful educational experiences to them in the concept of photovoltaic effects.	Knowledge (Level K2) Analyze (Level K4)
CO4.	Understand and appreciate the use of thermal energy and to develop skill needed in using it.	Application (Level K3)
CO5.	Give them the opportunities to study the concepts nuclear energy and energy generation.	Analyze (Level K4)

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

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	2	3	3
CO5	3	3	3	3	3
WEITAGE	15	14	14	15	15
Weighted percentage of course contribution to POS	3.0	2.8	2.8	3.0	3.0

Semester III – Extra Credit Course II

Electrical Appliances

Objective: To enable the students to apply the principles of Physics in electrical appliances.

UNITS AND COURSE DETAILS

UNIT I

1. Electric oven
2. Washing machine

UNIT II

1. Refrigerators
2. Air conditioner – general principles and working

UNIT III

1. Electrical bell
2. Room heater

UNIT IV

1. Induction stove
2. Lightning conductor

UNIT V

Introduction – Wiring Materals and accessories – types of wiring – Basic principles of earthing – types of earthing

BOOKS FOR STUDY

1. Instrumentation – K.Arumugam
2. Electricity and magnetism – R.murugesan
3. How things work –the universal encyclopedia of mechines.

CO1.	Understand how day today appliances are functioning. Acquire knowledge of the Ac currents and generators	Understand (Level K1) & K2 Knowledge
CO2.	Acquire the knowledge of working of Refrigerators and Air conditioner.	Application (Level K3)
CO3.	Provide with useful educational experiences to understand the of the basic idea of Electrical bell and Room heater.	Analyze (Level K4)
CO4.	Understand and appreciate the use of thermal energy and to develop skill needed in using it.	Application (Level K3)
CO5.	Get the opportunities to study the concepts Induction stove and Lightning conductor	Analyze (Level K4)

MAPPING WITH PROGRAM OUTCOMES:

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

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
WEITAGE	15	14	15	15	15
Weighted percentage of course contribution to POS	3.0	2.8	3.0	3.0	3.0

Semester - V
Extra Credit Course III
ENERGY HARVESTING - II

Objective: This Course aims to introduce the different nonconventional energy sources and the methods of harnessing energy from them.

UNITS AND COURSE DETAILS

UNIT I SOLAR ENERGY

Solar radiation – Solar radiation outside the earth's atmosphere Solar radiation at the earth's surface – Solar Thermal Energy – Solar Thermal devices and systems: Solar water heater – Sub components of solar water heater – Solar Cooker and its merits and demerits.

UNIT II WIND ENERGY

Power in the wind – Types of wind energy systems –Horizontal axis wind Turbine – Vertical axis wind Turbine.

UNIT III OCEAN ENERGY

Tidal Energy – Ocean Thermal Energy Conversion (OTEC) – Closed Cycle OTEC system – Open Cycle OTEC System.

UNIT IV ENERGY FROM BIOMASS

Biomass feedstock-water material-energy crops-important properties of biomass-conversion of biomass to gaseous fuels-anaerobic digestion-thermal gasification.

UNIT V GEOTHERMAL ENERGY

Introduction- Estimates of Geothermal power – Nature of Geothermal fields – Geothermal sources – Advantages and Disadvantages of geothermal energy - Applications of geothermal energy.

BOOKS FOR STUDY

1. Sukhatme S.P, Solar Energy, (Unit I), Wiley publications, 1975, 1st edition.
2. Rai. G.D, Non Conventional Sources of Energy, Khanna Publishers, 2009, 1st edition.
3. Rai. G.D, Non Conventional Sources of Energy, Khanna Publishers, 1987, 1st edition.
4. Yogi.D Goswami, Frank Krieth and Jan F. Krelder, Principles of Solar Engineering (Units IV & V), Tailor & Francis, 2003, 1st edition.

CO1.	Acquire knowledge of the working different thermal devices Understand how solar energy can be used in day today appliances..	Understand (Level K1) & Knowledge K2
CO2.	Get the concept of power in the wind types of wind energy systems horizontal axis wind Turbine – Vertical axis wind Turbine.	Understand (Level K1) & Knowledge K2
CO3.	Provide with useful educational experiences to them in the concept of Tidal Energy, Ocean Thermal Energy Conversion.	Analyze (Level K4)
CO4.	Appreciate the use of Energy from Biomass.	Analyze (Level K4)
CO5.	Able to estimates of Geothermal power understand the nature of Geothermal fields and Geothermal sources.	Analyze (Level K4) Application (Level K3)

MAPPING WITH PROGRAM OUTCOMES:

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

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	3	3	3
WEITAGE	15	15	14	15	15
Weighted percentage of course contribution to POS	3.0	3.0	2.8	3.0	3.0

VALUE ADDED COURSES

Programme: UG **Sem: II**

Course Type: Value Added Course - I **Course: Laboratory Equipment Training**

Contact Hours: 30 Hours **CIA:** 100

Course Objectives:

- To understand basic concepts of measuring instruments.
- To discuss the working principles of electrical and electronic instruments.
- To give the basic principles of power supplies.
- To discuss the theory, types and uses of transformers.
- To give the basic concepts of oscillators.

Course Outcome:

On completion of the Course the student will be able to,

S.No	Description	Blooms' Taxonomy Level
COI	Gaining knowledge of the basic concepts of measurement of physical quantities.	K2
CO2	Gaining knowledge of the basic principles of transformers	K2
CO3	Applying the principles of power supplies in various circuits.	K3
CO4	Designing and analyzing electrical and electronic instruments	K4
CO5	Analyzing the frequency responses in various circuits using oscillators	K4

K2-Understanding **K3-Applying** **K4-Analysing**

COURSE CONTENT

UNIT – I: MEASURING INSTRUMENTS

Vernier Calipers –Least Count – Zero Error and Zero correction –Positive & Negative Zero Errors - Screw Gauge –Least Count – Zero Error and Zero correction - Travelling Microscope – Design & Working - Telescope – Design & Working - Spectrometer – Design & Working – Initial Adjustments.

UNIT – II: ELECTRICAL & ELECTRONIC INSTRUMENTS

DC Ammeter – DC Voltmeter –AC Voltmeter- AC Ammeter – Multimeters: Analog and Digital – Digital Frequency Meter – Galvanometers: Table & Spot Reflecting Galvanometer .

UNIT – III: POWER SUPPLY

Introduction – Regulated power supply – Three Terminal Regulated Power Supply – Fixed Positive Voltage Regulators - Fixed Negative Voltage Regulators – Adjustable Voltage regulators –Dual Power Supply.

UNIT – IV: TRANSFORMERS

Introduction –Step down transformers – Step up Transformers -Construction – Theory – Energy Losses – Uses.

UNIT – V: OSCILLATORS

Introduction – Basic Principles –Sine, Square and Triangular Wave Generator – Principle and working – Fixed Frequency Oscillator.

LIST OF EXPERIMENTS:

- Estimation of errors
- Young's modulus – Scale & Telescope
- Young's modulus – Microscope
- Calibration of low range voltmeter
- Calibration of ammeter
- Adder / Subtractor –Op Amp
- Minimum Deviation - Spectrometer
- Bridge Rectifier
- LCR circuit

BOOKS FOR REFERENCE:

1. J.Gnanavadivel, C.Senthil Kumar, P.Priyalatha, P.Manikandan, DR.C.Nagarajan. Measurements and Instrumentation. Anuradha Publications, Chennai.
2. Albert D.Helfrick, William D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India Pvt. Limited, New Delhi, 2004.
3. G.Senthil Kumar, "Physics Laboratory Manual".
4. G. Jose Robin, A.Ubald Raj, Basic Electronics and Applied Electronics, Indira Publications.

Mapping of Course Outcome with POs:

Laboratory Equipment Training

CO	PO1	PO2	PO3	PO4	PO5	Blooms Taxonomy level
CO1	H	H	M	M	M	K2
CO2	H	H	H	M	M	K2
CO3	H	H	H	H	H	K3
CO4	H	H	M	H	H	K4
CO5	H	H	H	H	H	K4

H-High M-Medium L-Low

K2-Understanding, K3-Applying K4 -Analysing

VALUE ADDED COURSES

Programme: UG **Sem : IV**

Course Type: Value Added Course - II **Course: Designing & Fabrication of PCB**

Contact Hours: 30 Hours **CIA:** 100

Course Objectives:

- To provide foundational knowledge of PCB, parts and materials used.
- To make the students acquire an understanding the types of PCB.
- To enable the student to explore the field of Layout and Artwork.
- To comprehend the principles of Lamination and Photoprinting.
- To help them understand the concept of Etching and Soldering.

COURSE CONTENT

UNIT – I: PRINTED CIRCUIT BOARD (PCB)

Introduction – Different parts of PCB-Pad-Trace-Layers-different types of Layer-PCB materials- classification according to reinforced materials and types of resin - PCB Material Properties

UNIT – II: TYPES OF PCB

Single sided, double sided, Multilayer - through holes technology- Benefits of Surface Mount Technology (SMT)- Limitation of SMT-Surface mount components: Resistors, Capacitor, Inductor, Diode and IC's.

UNIT – III: LAYOUT AND ARTWORK

Layout Planning: General rules of Layout, Resistance, Capacitance and Inductance, Conductor Spacing, Supply and Ground Conductors, Component Placing and mounting, Cooling requirement and package density, Layout check. Basic artwork approaches, Artwork taping guidelines-General artwork rules: Artwork check and Inspection.

UNIT – IV: LAMINATION AND PHOTO PRINTING

Properties of laminates, Types of Laminates, Manual cleaning process, Basic printing process for double sided PCB's, Photo resists, wet film resists, Coating process for wet film resists, Exposure and further process for wet film resists, Dry film resists.

UNIT – V: ETCHING AND SOLDERING

Introduction, Etching machine, Etchant system. Principles of Solder connection, Solder joints, Solder alloys, Soldering fluxes. Soldering, Desoldering tools and Techniques.

BOOKS FOR REFERENCE:

1. Robert Boylstead and Louis Nashelsky, Electronic Devices and Circuit Theory, IX Ed, 2013.
2. Paul B. Zbar, Electronics Text Lab Manual.
3. Joeseph Edminister, Electric Circuits, Schaum Series.
4. N.N. Bhargava, D.C. Kulshresta and D.C Gupta, Basic Electronics and Linear Circuits, TMH.
5. David A Bell, Electronic Devices, Reston Publishing Company/DB Tarapurwala Publ.
6. Walter C.Bosshart, PCB Design and Technology, Tata McGraw Hill Publications, Delhi, 1983. Clyde F.Coombs, Printed circuits Handbook III Ed, McGraw Hill.

COURSE OUTCOME:

On completion of the Course the student will be able to,

S.No	Description	Blooms' Taxonomy Level
CO1	Gaining knowledge of the basics of PCB	K2
CO2	Comprehending the different types of PCB	K2
CO3	Applying the gained knowledge to develop Layout	K3
CO4	Applying the gained knowledge and developing Etching and Soldering	K4
CO5	Analyzing the concept of laminates and printing	K4

K2-Understanding K3-Applying K4-Analysing

Mapping of Course Outcome with POs:

CO	PO1	PO2	PO3	PO4	PO5	Blooms Taxonomy level
CO1	H	M	H	M	H	K2
CO2	H	H	H	M	H	K2
CO3	M	H	H	H	M	K3
CO4	H	H	H	H	M	K4
CO5	H	H	H	H	H	K4

H-High M-Medium L-Low

K2-Understanding, K3-Applying K4 -Analysing

VALUE ADDED COURSE - III

Programme : UG **Sem : VI**

Course Type: Value Added Course - III **Course : Optoelectronic Devices**
CIA : 100 **Contact Hours: 30 Hours**

Course Objectives:

- To learn about the concepts of LEDs their working, advantages and Applications.
- To cover the concepts of LCDs their working, advantages and Applications.
- Understand the function of different semiconductor opto devices.
- To discuss the concept of different photo detecting devices.
- To learn about the working of CRO and its applications.

COURSE CONTENT

UNIT- I - LIGHT-EMITTING DIODES - LED

Introduction – types of Light-emitting diodes – construction – working principle - I-V characteristics – different coloured LEDs – advantages – disadvantages - applications of LED.

UNIT – II - LIQUID CRYSTAL DISPLAY - LCD

Introduction – construction – working principle - types of liquid crystal display and their working - characteristics – advantages - disadvantages– applications of LCD.

UNIT-III - LIGHT DETECTING DEVICES I

Photodiodes - introduction – construction – principle of working – working modes - critical performance parameters of photodiodes – advantages – disadvantages - applications - phototransistors- introduction – construction – working- advantages – disadvantages - applications - photomultipliers – introduction – construction – working - applications.

UNIT –IV - LIGHT DETECTING DEVICES II

Photodetector or photoresistor or light dependent resistor (LDR) –- introduction – construction – working - types of LDR - advantages – disadvantages – applications.

UNIT –V - CATHODE-RAY OSCILLOSCOPE - CRO

Cathode-ray oscilloscope (CRO) – introduction –block diagram – construction - principle of working – types of CRO – applications.

BOOKS FOR STUDY

1. Elements of solid-state electronics – Ambrose and Devaraj
2. Electronics – G.Jose Robin & Ubald Raj
3. Electronics I – M.Palaniappan
4. Optoelectronic Devices and Systems: Volume 1 – S.C.Gupta.
5. Semiconductor Optoelectronic Devices 2nd Editionn – Pallab Bhattacharya

BOOKS FOR REFERENCE

1. Electronics – Gupta Kumar
2. Electronics – B.L. Theraja
3. Optoelectronics and Photonics: Principles and Practices - Safa Kasap

COURSE OUTCOME:

On completion of the Course the student will be able to,

CO	Statement	Blooms Taxonomy level
CO1	To understand LEDs their working, advantages and applications	K2
CO2	To know about LCD, their working and uses	K3
CO3	Understand the function of different semiconductor opto devices	K2
CO4	To discuss the concept of different photo detecting devices	K2
CO5	To learn about the working of CRO	K3

K2-Understanding K3-Applying

Mapping of Course Outcome with POs:

CO	PO1	PO2	PO3	PO4	PO5	Blooms Taxonomy level
CO1	H	H	H	H	H	K2
CO2	M	H	H	M	H	K3
CO3	H	H	H	H	M	K2
CO4	H	H	M	H	H	K2
CO5	M	H	H	H	H	K3

H-High M-Medium L-Low

K2-Understanding K3-Applying

B.Sc Physics Degree Course *(Semester)*

Pattern of question Course for Physics Core, Core Elective and Ancillary subjects for the Academic Years 2022-25

SUMMATIVE EXAMINATION

Time: 3hrs **Max.Mark:75**

Section – A - 10 x 1 = 10 ---------- No Choice

Section – B - 5 x 5 = 25 ---------- 5 Questions (either or type)
Section – C - 4 x 10 = 40 ---------- 4 Out of 6 Questions(open choice)

INTERNAL (Theory)

Test	:	15marks
Seminar	:	5marks
Assignment	:	5marks
Total	:	25marks

INTERNAL - PATTERN OF QUESTION PAPER

Duration – 2 hour **Total Marks - 30**

Section – A - 6 x 1 = 6 ---------- No Choice

Section – B - 2 x 4 = 8 ---------- 2 either or type Questions
Section – C - 2 x 8 = 16 ---------- 2 Out of 4 Questions – Open choice questions

CORE COURSE XVI - PROJECT

Allocation of Marks:

CIA – 25 marks

The project supervisor will award the marks assessing the performance of the student through out the process of the project.

Viva-voce – 75 marks

The student will appear for Vive-voce examination. The examiner will assess the quality of the project, subject knowledge and the presentation of the learner.

Part – IV – SBC & NME

SUMMATIVE EXAMINATION

Time: 3hrs **Total.Mark:75**

Section – A - 5 x 3 = 15 ---------- 5 Out of 8 Questions

Section – B - 5 x 6 = 30 ---------- 5 Out of 8 Questions

Section – C -3 x 10 =30 ---------- 3 Out of 5 Questions

INTERNAL - PATTERN OF QUESTION PAPER

Duration – 1 hour **Total Marks - 15**

Section – A - 2 x 2 = 4 ---------- 2 out of 3 Questions

Section – B - 1 x 4 = 4 ---------- 1 out of 2 Questions

Section – C - 1 x 7 = 7 ---------- 1 out of 2 Questions

Part – IV – ENVIRONMENTAL SCIENCE

SUMMATIVE EXAMINATION **Max marks 75**

Section – A: (10X1=10)

Ten questions are to be given, testing K1. All questions are to be answered. Each question carries one mark. Questions must be taken from all units.

Section – B: (5X7=35)

Five questions are to be given in the internal choice (Either-or) pattern, testing K2 and K3. Questions must be taken from all units. Each question carries seven marks.

Q.No-11 (A and B) from Unit – I
Q. No -12 (A and B) from Unit – II
Q. No -13 (A and B)from Unit – III
Q.No-14(A and B) from Unit - IV
Q.No-15(A and B) from Unit - V

Section – C: (3X10=30)

Five questions are to be given, testing K4 and K5. Three questions are to be answered. Each question carries Ten Marks. Questions must be taken in this order.

Q.No-16(A and B) from Unit - I
Q.No-17(A and B) from Unit - II
Q.No-18(A and B) from Unit - III
Q.No-19(A and B) from Unit - IV
Q.No-20(A and B) from Unit - V

INTERNAL (Theory) **Max marks 25**

Test : 15marks
Seminar : 5marks
Assignment : 5marks

Total : 25marks

INTERNAL - PATTERN OF QUESTION PAPER

Duration – 2 hour **Total Marks - 30**

Section – A - 6 x 1 = 6 ---------- No Choice
Section – B - 2 x 4 = 8 ---------- 2 either or type Questions
Section – C - 2 x 8 = 16 ---------- 2 Out of 4 Questions – Open choice questions

Part IV - VALUE EDUCATION – (VE)

SUMMATIVE EXAMINATION

Time: 3 hrs **Max Mark: 75**

Theory [End-Semester Examination] – **75 marks**

Section – A:
Ten objective type questions with multiple answers are to be given. **(10X1=10)**
Section – B:
Five short essay type questions in 'Either – or' pattern are to be given. **(5X7=35)**
Section – C:
Five long descriptive type questions are to be given. Three questions are to be answered. **(3X10=30)**

Internal

Practical [Performing Yoga & Meditation] – **25 marks**

EXTRA CREDIT COURSE

SUMMATIVE EXAMINATION

Time: 3 hrs **Total Mark: 100**

Section – A - 5 x 20 = 100 ---------- 5 Out of 9 Questions.

VALUE ADDED COURSE – (VAC)

SUMMATIVE EXAMINATION

Time: 3 hrs Total Mark: 100

Section – A - 4 x 20 = 80 ---------- 4 Out of 8 Questions

Section – B - 1 x 20 = 20 ---------- 1 Out of 2 Questions

(based on practical Knowledge)