A.D.M. COLLEGE FOR WOMEN (AUTONOMOUS)

(Accredited With 'A' Grade by NAAC 4th Cycle)

(Affiliated to Bharathidasan University, Tiruchirappalli)

NAGAPATTINAM – 611 001

PG DEPARTMENT OF PHYSICS

SYLLABUS

B.Sc. PHYSICS

(2024-2025 Batch)

B.Sc., PHYSICS SYLLABUS

Preamble:

Physics is one of the basic and fundamental sciences. The curriculum for the graduate 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.

Programme Educational Objectives (PEO):

PEO1:	To acquire and maintain standards of achievement interms of knowledge, Understanding and skills in Physics and their applications to the natural phenomenon as well as the development of scientific attitudes.
PEO2:	Promote Analytical Thinking and research skills in the minds of students To acquire fundamental/systematic or coherent understanding of the academic field of Physics and its different learning areas with applications in basic Physics.
PEO3:	Mould the students to face the multi-faceted with a Broad conceptual background in the Biological sciences / Computing sciences/ Physical sciences
PEO4:	Acquire practical skills together information, assess, create and execute new ideas To develop entrepreneurial skills are trained to take up higher learning programmes.
PEO5:	Apply knowledge and skill in the design and development to technical, analytical and creative skills. Ability to use modern instrumentation and laboratory Techniques to design and perform experiments in almost all the fields of Physics.

Programme	**B.Sc., Physics**
Programme Code	

Duration	**3 years [UG]**
Programme Outcomes:	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study. **PO2: 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. **PO3: Problem solvingand Analytical reasoning**: 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. 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. **PO4: 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 **PO5: Scientific reasoningand Reflective thinking**: 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. Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.
Programme Specific Outcomes:	**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

CURRICULUM STRUCTURE – UG (SCIENCE)
(For I Year 2024 Batch onwards)

Part	Category of Courses	No. of Courses	Hrs	Total Credits
Part I	**Language Courses (Tamil/Hindi/French/Arabic/ Sanskrit)**	**4**	**24**	**12**
Part II	**English Language Courses**	**4**	**24**	**12**
Part III	**Core Courses (CC) (T – 9, P – 5)**	**14**	**70**	**60**
	Minor Course (T – 4 / 5 , P – 2/1)	**6**	**24**	**16**
	Discipline Specific Courses (DSC)	**3**	**10**	**9**
	Project	**1**	**3**	**3**
Part IV	**Skill Enhancement Courses (SEC)**	**4**	**8**	**8**
	Ability Enhancement Courses (AEC)	**3**	**6**	**6**
	Multi Disciplinary Courses (NME)	**2**	**4**	**4**
	Environmental Studies	**1**	**2**	**2**
	Value Education	**1**	**2**	**2**
	Soft Skill Development	**1**	**2**	**2**
	Summer Internship/Industrial Activity	**0**	**0**	**2**
Part V	**Gender Studies**	**1**	**1**	**1**
	Extension Activity (NCC/NSS/Sports/Any Other Activities)	**0**	**0**	**1**
	Total	**45**	**180**	**140**

EXTRA CREDIT SCHEME STRUCTURE – 2024 - 2027

Courses	Credits	Semester	Marks
Extra Credit Courses I(Professional English) ECPEA - ECC I - PROFESSIONAL ENGLISH FOR ARTS AND SOCIAL SCIENCES **(Tamil, English, History, Economics, Mathematics, CS, IT, BCA)** ECPEB - ECC I - PROFESSIONAL ENGLISH FOR COMMERCE AND MANAGEMENT **(Commerce & BBA)** ECPEC - ECC I - PROFESSIONAL ENGLISH FOR LIFE SCIENCES **(Zoology, Botany, Biochemistry & Marine)** ECPED - ECC I - PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCES **(Physics, Chemistry & Geology)**	2	I	100
Extra Credit Courses II (Skill Course I – Add on)	2	II	100
Extra Credit Courses III(Skill Course II- Add on)	2	III	100
Extra Credit Courses IV(Skill Course III- Add on)	2	IV	100
Value added course I (Multidisciplinary)	2	V	100
Value added Course II (Same disciplinary)	2	VI	100
Total	**12**		

SCHEME OF EXAMINATIONS – 2024 Batch
(For UG Science)

SEMESTER – I							
PART	**COURSE TYPE**	**COURSES**	**HOURS**	**CREDITS**	**EXAM DURATION**	**MAX. MARKS**	
						CIA	**EXT**
Part I	Language Course I	LC I - Tamil I	6	3	3	25	75
Part II	English Course I	ELC I - English I	6	3	3	25	75
Part III	Core Course I	CC I-Properties of Matter & Sound	5	4	3	25	75
	Core Practical I	CP I- Practical I	3	-	-	-	-
	First Minor Course I(Maths)	FMC I - Mathematics –I	4	3	3	25	75
	First Minor Course II(Maths)	FMC II - Mathematics -II	2	-	-	-	-
Part IV	Skill Enhancement Course I	SEC I - Programming in Python (Theory)	2	2	3	25	75
	VE	Value Education	2	2	3	25	75
*Extra Credit 1	Extra Credit I	Extra Credit Course I - Professional English	-	2	-	0	100
		No. of Courses –	**30**	**17+2**	-	-	-

SEMESTER – II							
PART	**COURSE TYPE**	**COURSES**	**HOURS**	**CREDITS**	**EXAM DURATION**	**MAX. MARKS**	
						CIA	**EXT**
Part I	Language Course II	LC II - Tamil II	6	3	3	25	75
Part II	English Course II	ELC I - English II	6	3	3	25	75
Part III	Core Course II	CC II- Heat Thermodynamics and Statistical Physics	6	5	3	25	75
	Core Practical I	CP I- Practical	2	3	3	40	60
	First Minor Course II(Maths)	FMC II - Mathematics -II	2	2	3	40/25	60/75
	First Minor Course III(Maths)	FMC III - Mathematics -III	4	3	3	25	75
Part IV	Skill Enhancement Course II	SEC II - Programming in Python (Practical)	2	2	3	25	75
	EVS	Environmental Studies	2	2	3	25	75
*Extra Credit II	Extra Credit II	Extra Credit Courses II (Skill Course I – Add on)	-	2	-	0	100
		No. of Courses –	**30**	**23+2**	-	-	-

SEMESTER – III							
PART	**COURSE TYPE**	**COURSES**	**HOURS**	**CREDITS**	**EXAM DURATION**	**MAX. MARKS**	
						CIA	**EXT**
Part I	Language Course II	LC II - Tamil III	6	3	3	25	75
Part II	English Course II	ELC I - - English III	6	3	3	25	75
Part III	Core Course III	CC III- General Mechanics and Classical Mechanics	6	6	3	25	75
	Core Practical II	CP II- Practical II	2	-	-	-	-
	Second Minor Course I	SMC I - Chemistry -I	4	3	3	25	75
	Second Minor Practical I	SMP I - Practical II	2	-	-	-	-
Part IV	Multi Disciplinary Course I	NME I - Everyday Physics	2	2	3	25	75
	Skill Enhancement Course III	SEC III - Fundamentals of Physics–II	2	2	3	25	75
*Extra Credit III	Extra Credit III	Extra Credit Courses III(Skill Course II- Add on)	-	2	-	0	100
		No. of Courses –	**30**	**19+2**	-	-	-

SEMESTER – IV							
PART	**COURSE TYPE**	**COURSES**	**HOURS**	**CREDITS**	**EXAM DURATION**	**MAX. MARKS**	
						CIA	**EXT**
Part I	Language Course IV	LC IV - Tamil IV	6	3	3	25	75
Part II	English Course IV	ELC IV - English IV	6	3	3	25	75
Part III	Core Course IV	CC IV - Optics and Spectroscopy	5	5	3	25	75
	Core Practical II	CP II - Practical II	3	3	3	40	60
	Second Minor Practical I	SMP I - Practical II	2	2	3	40	60
	Second Minor Course II	SMC II - Chemistry -II	4	3	3	25	75
Part IV	Multi Disciplinary Course II	NME II - Energy Physics	2	2	3	25	75
	Ability Enhancement Course I	AEC I - Electrical Workshop	2	2	3	25	75
*Extra Credit IV	Extra Credit IV	Extra Credit Courses IV(Skill Course III- Add on)	-	2	-	0	100
		No. of Courses –	**30**	**23+2**	-	-	-

SEMESTER – V							
PART	**COURSE TYPE**	**COURSES**	**HOURS**	**CREDITS**	**EXAM DURATION**	**MAX. MARKS**	
						CIA	**EXT**
Part III	Core Course V	CC V - Atomic Physics and Lasers	6	5	3	25	75
	Core Course VI	CC VI - Relativity and Quantum Mechanics	5	5	3	25	75
	Core Course VII	CC VII - Communication Physics	5	4	3	25	75
	Core Course VIII	CC VIII - Electronics	4	4	3	25	75
	Core Practical III	CP IV - Practical III	3	3	3	40	60
	Discipline Specific Elective I	DSE I - Medical Physics	3	3	3	25	75
	Ability Enhancement Course II	AEC II - Domestic Electrical Appliances	2	2	3	25	75
	SSD	Soft Skill Development	2	2	3	25	75
	Summer Internship/Ind. Training	Internship	-	2			
*Extra Credit V	Extra Credit Courses V	Value added course I (Multidisciplinary)	-	2	-	0	100
		No. of Courses –	**30+2**	**30+2**	-	-	-

SEMESTER – VI							
PART	**COURSE TYPE**	**COURSES**	**HOURS**	**CREDITS**	**EXAM DURATION**	**MAX. MARKS**	
						CIA	**EXT**
	Core Course IX	CC IX - Nuclear and Particle Physics	6	5	3	25	75
	Core Course X	CP V - Solid State Physics	6	5	3	25	75
	Core Practical IV	CP IV - Practical IV	3	3	3	40	60
	Core Course XI	CC X - Project	3	3	3	25	75
	Discipline Specific Elective II	DSE II - Nanoscience and Nano Technology	3	3	3	25	75
	Discipline Specific Elective III	DSE III - Astrophysics	4	3	3	25	75
Part IV	Skill Enhancement Course IV	SEC IV- Electrical Wiring Fundamentals	2	2	3	25	75
	Ability Enhancement Course III	AEC III - Physics for Everyday Life	2	2	3	25	75
Part V	GS	Gender Studies	1	1	3	25	75
	Extension Activities	(NCC/NSS/Sports/Any Other Activities)	-	1	-	-	-
*Extra Credit VI	Extra Credit Courses VI	Value added Course II (Same disciplinary)		2	-	0	100
		No. of Courses –	**30**	**28+2**			

Grand Total – Credit 140 & Extra Credit 12

SEMESTER-I

Semester-I	**Properties of Matter and Sound**	Course Code:
Instruction Hours: 5	Credits: 4	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
COURSE OBJECTIVES	• To Know the elastic behavior of substance • To Examine how bending moment various at the cut position of the beam for various loading condition • To learn about the fluid property of the surface tension whenever there is an interfacialbetween a liquid, solid or a gas. • To measure the viscosity of a sample liquid. • To learn the basic principles of Acoustics.	

UNITS	**COURSE DETAILS**	
UNIT-I	**ELASTICITY:** Hooke's law – stress-strain diagram – elastic constants – Poisson's ratio – relation between elastic constants and Poisson's ratio – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion– torsional pendulum (with and without masses).	**15 Hrs**
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.	**15 Hrs**
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.	**15 Hrs**
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	**15 Hrs**

	figures- free, damped, forced vibrations –resonance and Sharpness of resonance. Laws of transverse vibration in strings –sonometer – determination of AC frequency using sonometer –determination of frequency using Melde's string apparatus.	
UNIT-V	**ACOUSTICS OF BUILDINGS AND ULTRASONICS:** Intensity of sound – decibel – loudness of sound –reverberation – Sabine's reverberation formula – acoustic intensity – factors affecting the acoustics of buildings. *Ultrasonic waves*: production of ultrasonic waves – Piezoelectric crystal method – magnetostriction effect – application of ultrasonic waves.	**15 Hrs**

TEXT BOOKS	1. BrijLal & N. Subrahmanyam, 2003, Properties of Matter, S.Chand & Co 2. BrijLal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition, Vikas Publishing House. 3. R.Murugesan,2012, Properties of Matter, S.Chand & Co.
REFERENCE BOOKS	1. C.J. Smith, 1960, General Properties of Matter, Orient Longman Publishers 2. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition. Chand & Co. 3. A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.
WEBLINKS	1. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html 2. https://www.youtube.com/watch?v=gT8Nth9NWPM 3. https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s 4. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work 5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/ 6. http://www.sound-physics.com/ 7. http://nptel.ac.in/courses/112104026/

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

COURSE OUTCOMES:

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

COURSE OUTCOMES	**CO1**	Relate elastic behavior in terms of three moduli of elasticity and working of torsion pendulum.
	CO2	Able to appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.
	CO3	Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface, soap films provide an analogue solution to many engineering problems.
	CO4	Analyze simple harmonic motions mathematically and apply them. Understand the concept of resonance and use it to evaluate the frequency of vibration. Set up experiment to evaluate frequency of ac mains.

	CO5	Understand the concept of acoustics, importance of constructing buildings with good acoustics. Able to apply their knowledge of ultrasonics in real life, especially in medical field and assimilate different methods of production of ultrasonic waves.

MAPPING OF COs WITH POs& PSOs:

CO/PO	**PO**					**PSO**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
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

Semester-I	**Core Practical-I**	**Course Code:**
Instruction Hours: 5	**Credits: 3**	**Exam Hours: 3**
Internal Marks -40	**External Marks-60**	**Total Marks: 100**
Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
COURSE OBJECTIVES	• To motivate and educate the students to acquire skill in physics Experiments. • Experimental determination of Young's modulus. • To Measure of length using Vernier calipers, Screw gauge and travelling microscope. • To understand the principle and carry out the experiments systematically. • In the laboratory course, the hands-on experience of using surface tension, Coefficientof viscosity liquid in Poiseuille's flow method, Melde's method.	

1. Determination of rigidity modulus with masses using Torsional pendulum.
2. Determination of Young's modulus by uniform bending – load depression graph.
3. Determination of Young's modulus by non-uniform bending – scale & telescope.
4. Determination of Young's modulus by cantilever – load depression graph.
5. Determination of rigidity modulus by static torsion.
6. Determination of surface tension & interfacial surface tension by drop weight method.
7. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
8. Determination of viscosity by Poiseullie's flow method.
9. Determination of g using compound pendulum.
10. Sonometer Verification of law determination of C and AC frequency.
11. Melde's Experiment traverse and longitudinal.

Course outcomes:	CO 1:	• Motivate and educate the students to acquire skill in physics Experiments.
	CO 2:	• Experimental determination of Young's modulus.

	CO 3:	• Measure of length using Vernier calipers, Screw gauge and travelling microscope.
	CO 4:	• Understand the principle and carry out the experiments systematically.
	CO 5:	• In the laboratory course, the hands-on experience of using surface tension, Coefficientof viscosity liquid in Poiseuille's flow method, Melde's method.

MAPPING OF COs WITH POs & PSOs:

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

Semester-I	**Programming in Python (Theory)**	Course Code:
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
COURSE OBJECTIVES	• To introduce core programming basics required for science using Python language. • To read and write simple Python programs • To develop Python programs with conditionals and loops • To introduce the input / output with files in Python and Statistical processing of a data. • Essential skills to make them employable.	

UNITS	COURSE DETAILS	
Unit-I – Algorithmic Problem Solving	Algorithms - building blocks of Algorithm – (Statement, control flow, functions) - Algorithmic Problem Solving – iteration, recursion, illustrative problems: floe start, fining minimum in a list, factorial of a number.	**4Hrs**
Unit-II – Data, Expressions, statements in Python	Python strength and weakness- installing Python- IDLE – spider – jupyter - mutable and immutable data types , naming convention.	**4Hrs**
Unit-III - Strings	string values – string operations – string slices- string operators –string functions- numeric data types – arithmetic operators and expressions – comments in the program.	**4Hrs**
Unit-IV- Data Collections and Language component of Python	List, Tuples –Sets – dictionaries – operation on list –Tuple – Set – dictionary - control flow and syntax –indenting – IF statement – relational operators -Logical operators.	**4Hrs**
Unit-V	Bit wise operators- while loop- the break and continue statements- the FOR loop – List comprehension- Local and	**4Hrs**

	Global Scope.	
Text Books	Course Material Prepared by Department of Physics	
Reference Book	1. Jeeva Jose and P. Sojan Lal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Book Publishing Co, 2016	
Web links	1. https://www.mheducation.co.in> 2. https://books.google.com>	

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSEOUTCOMES:

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

COURSEOUTCOMES	**CO1**	• Read, Write , execute simple Python programs
	CO2	• Decompose a Python program to functions.
	CO3	• Data visualizing using Python
	CO4	• Read and write data from /to files in Python programs
	CO5	• Develop Algorithmic solutions to Science related problems.

MAPPING OF COs WITH POs & PSOs:

CO/PO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

PROFESSIONAL ENGLISH

Semester-I Extra Credit Course I	Professional English for Physical Sciences I & II	Course Code: ECPED
Instruction Hours: 6	**Credits: 2**	**Exam Hours: 3**
Internal Marks - 25	**External Marks-75**	**Total Marks: 100**

Course Objectives	**The Course aims** • To develop the language skills of students by offering adequate practice in professional contexts. • To focus on developing students' knowledge of domain specific registers and the required language skills. • To develop strategic competence that will help in efficient communication. • To develop their competence in the use of English with particular reference to the workplace situation. • To enhance the creativity of the students, which will enable them to think of innovative ways to solve issues in the workplace.	
Unit	**Content**	**No. of Hours**
Unit I	• Listening to instructions • Question Tag • Prefixes and Suffixes • Writing sentence / Description of Picture / Natural calamities and their impact on people/ Cultures and cultural practices	18 Hours
Unit II	• Collocations –Phrasal verbs • Reading a written speech by eminent personalities in the relevant field /Short poems / Short biography. • Letter Writing (Formal / Informal) • Dialogue writing	18 Hours

Unit III	• Single word substitution • Writing Recommendations Interpreting visuals - charts / tables/flow diagrams/charts • Motivational stories on Professional Competence, Professional Ethics and Life Skills • Hints development	18 Hours
Unit IV	• Brainstorming • Two subject-based reading texts followed by comprehension activities/exercises Writing: Summary writing based on the reading passages. • Comprehension	18 Hours
Unit V	• Punctuation(period, question mark, exclamation point, comma, semicolon, colon, dash, hyphen, parentheses, brackets, braces, apostrophe, quotation marks, and ellipsis) Capitalization (use of upper case) • Essay Writing	18 Hours

Text Books:

Professional English for Physical Sciences I & II, Tamil Nadu State Council for Higher Education(TANSCHE)

Course Outcomes:

On completion of the course the learner will be able to

- Recognise their own ability to improve their own competence in using the language
- Use language for speaking with confidence in an intelligible and acceptable manner Understand the importance of writing in academic life.
- Write simple sentences without committing error of spelling or grammar.
- Adapt easily into the workplace context, having become communicatively competent.

SEMESTER-II

Semester-II	Heat, Thermodynamics and Statistical Physics	Course Code:
Instruction Hours: 6	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
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. • Student learns the different laws of thermodynamics. • To learn thermo-dynamical functions and there relations.	

UNITS	COURSE DETAILS	
UNIT-I	**CALORIMETRY:** specific heat capacity – specific heat capacity of gases C_P& C_V– Meyer's relation – Joly's method for determination of C_V – Regnault's methodfor determination of C_P **LOW TEMPERATURE PHYSICS:** Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect –Boyletemperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetisation.	**15 Hrs**
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.	**15 Hrs**
UNIT-III	**THERMODYNAMICS-II:** second law of thermodynamics –entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram –thermodynamicalscale of temperature – Maxwell's thermodynamical relations –Clasius-Clapeyron's equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.	**15 Hrs**
UNIT-IV	**HEAT TRANSFER:** modes of heat transfer: conduction, convection and radiation. *Conduction*: thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination ofthermal 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.	**15 Hrs**

UNIT-V	**STATISTICAL MECHANICS:** definition of phase-space – micro and macro states – ensembles –different types of ensembles – classical and quantum Statistics – Maxwell-Boltzmann statistics – expression for distribution function – Bose-Einstein statistics – expression for distribution function – Fermi-Dirac statistics –expression for distribution function – comparison of three statistics.	**15 Hrs**
TEXT BOOKS	1. Brijlal&N. Subramaniam, 2000, Heat and Thermodynamics, S.Chand& Co. 2. Narayanamoorthy&KrishnaRao, 1969,Heat,Triveni Publishers, Chennai. 3. Brijlal and N. Subramanyam, 2001, Waves and Oscillations,Vikas Publishing House, New Delhi. 4. R.Murugeshan& Kiruthiga Sivaprasath, Thermal Physics, S.Chand& Co.	
REFERENCE BOOKS	1. J.B.Rajam&C.L.Arora, 1976, Heat and Thermodynamics, 8th edition, S.Chand& Co. Ltd. 2. D.S.Mathur, Heat and Thermodynamics, Sultan Chand & Sons. 3. Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand & Co. 4. Resnick, Halliday&Walker,2010, Fundamentals of Physics, 6th Edition. 5. Sears, Zemansky, Hugh D. Young,Roger A. Freedman, 2021 University Physics with Modern Physics 15th Edition, Pearson.	
WEB RESOURCE	1. https://youtu.be/M_5KYncYNyc 2. https://www.youtube.com/watch?v=4M72kQulGKk&vl=en	

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

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

COURSEOUTCOMES	**CO1**	Acquires knowledge on how to distinguish between temperature and heat. Introduce him/her to the field of thermometry and explain practical measurements of high temperature as well as low temperature physics. Student identifies the relationship between heat capacity, specific heat capacity. The study of Low temperature Physics sets the basis for the students to understand cryogenics, superconductivity, superfluidity and Condensed Matter Physics
	CO2	Derive the efficiency of Carnot's engine. Discuss the implications of the laws of Thermodynamics in diesel and petrol engines
	CO3	Able to analyze performance of thermodynamic systems viz efficiency by problems. Gets an insight into thermodynamic properties like enthalpy, entropy
	CO4	Study the process of thermal conductivity and apply it to good and bad conductors. Quantify different parameters related to heat, relate them with various physical parameters and analyse them
	CO5	Interpret classical statistics concepts such as phase space, ensemble, Maxwell-Boltzmann distribution law. Develop the statistical interpretation of Bose-Einstein and Fermi-Dirac . Apply to quantum particles such as photon and electron

MAPPING OF COs WITH POs & PSOs:

CO/PO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
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

Semester-II	Practical-II	Course Code:
Instruction Hours: 5	Credits: 3	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
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. • To understand the principle and carry out the experiments systematically. • In the laboratory course, the hands-on experience of using surface tension. • Coefficientof viscosity liquid in Poiseuille's flow method, transverse and longitudinal Vibrations.	

1. Determination of rigidity modulus with masses using Torsional pendulum.
2. Determination of Young's modulus by uniform bending – load depression graph.
3. Determination of Young's modulus by non-uniform bending – scale & telescope.
4. Determination of Young's modulus by cantilever – load depression graph.
5. Determination of rigidity modulus by static torsion.
6. Determination of surface tension & interfacial surface tension by drop weight method.
7. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
8. Determination of viscosity by Poiseullie'sflow method.
9. Determination of g using compound pendulum.
10. Sonometer Verification of law determination of C and AC frequency.
11. Melde's Experiment traverse and longitudinal.

COURSE OUTCOMES:

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

COURSE OUTCOMES	CO1	• Use the measuring instruments for accurate measurement ofphysical quantities required for the experiment.
	CO2	• Know the elastic properties of structural materials from theexperimental results.
	CO3	• Realize practically the properties of liquids such as surface tensionand viscosity.
	CO4	• Acquire the experimental skill of verifying laws in Physics.
	CO5	• Understand experimentally the vibrations of stretched strings.

MAPPING OF COs WITH POs & PSOs:

CO/PO		PO				PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	S	S	S	S	S	M	S	M
CO2	S	S	S	M	M	S	S	M	M	M
CO3	S	S	S	M	M	M	S	M	S	M
CO4	S	M	M	S	S	S	S	M	S	S
CO5	S	M	S	S	S	S	S	M	M	M

Semester-II	SEC-II Python Programming (Practical)	Course Code:
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -40	External Marks-60	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• To write, test, and debug simple Python programs. • To implement Python programs with conditionals and loops. • To represent compound data using Python lists, tuples, and Dictionaries.	
	COURSE DETAILS (Any Five)	
	Write Python programs for the following: (using Basics of Python) 1. Purposefully raise Indentation Error and correct it. 2. Compute distance between two points taking input from the user (use Euclidean distance formula). 3. To takes numbers as command line arguments and print its sum Write Python programs for implementing the following: (using Control Flow) 4. Finding the factorial of a number. 5. Print the prime numbers below 100 Write Python programs for implementing the following: (using Strings) 6. Count the numbers of characters in the string and store them in a dictionary data structure 7. Using split and joins methods in the strain	

COURSE OUTCOMES:

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

COURSE OUTCOMES	CO1	Write simple programs using control structures, functions and strings
	CO2	Develop programs using tuples, lists, sets and dictionary
	CO3	Write simple programs using Constructors, Method overloading and inheritance
	CO4	Develop programs using files and regular expressions
	CO5	Write simple programs using packages and exception handling

MAPPING OF COs WITH POs & PSOs:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	S	S	S	M	S	S	S	M
CO2	M	S	M	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	S	M	S
CO5	S	M	S	M	S	S	S	S	M	S

SEMESTER-III

Semester-III	General Mechanics and Classical Mechanics	Course Code:
Instruction Hours: 6	**Credits: 6**	**Exam Hours: 3**
Internal Marks -25	**External Marks-75**	**Total Marks: 100**
CognitiveLevel	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
COURSE OBJECTIVES	• To have a basic understanding of the laws and principles of mechanics; • To apply the concepts of forces existing in the system; • To understand the forces of physics in everyday life; • To visualize conservation laws; • To apply Lagrangian equation to solve complex problems.	

UNITS	COURSE DETAILS	
UNIT-I	**LAWS OF MOTION:** Newton's Laws– forces – equations of motion – frictional force – motion of a particle in a uniform gravitational field – types of everyday forces in Physics. *Gravitation*: Classical theory of gravitation**–**Kepler's laws, Newton's law of gravitation – Determination of G by Boy's method – Earth-moon system – weightlessness – earth satellites – parking orbit – earth density – mass of the Sun – gravitational potential – velocity of escape – satellite potential and kinetic energy –Einstein's theory of gravitation – introduction –principle of equivalence – experimental tests of general theory of relativity.	**18 Hrs**
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.	**18 Hrs**
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.	**18 Hrs**

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.	**18 Hrs**
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.	**18 Hrs**
TEXT BOOKS	1. P.DuraiPandian, LaxmiDuraiPandian, MuthamizhJayapragasam,2005, Mechanics, 6th revised edition, S.Chand& Co. 2. D. S. Mathur & P. S. Hemne, 2000, Mechanics, Revised Edition, S.Chand& Co. 3. Narayanamurthi, M.&Nagarathnam. N, 1998, Dynamics. The National Publishing,Chennai.	
REFERENCE BOOKS	1. Goldstein Herbert, 1980, Classical Mechanics. U.S.A: Addison and Wesely. 2. Halliday, David & Robert, Resnick, 1995, Physics Vol.I. New Age, International, Chennai. 3. Halliday, David Robert Resnick and Walker Jearl, 2001, Fundamentals of Physics, John Wiley, New Delhi	
WEBLINKS	1. https://youtu.be/X4_K-XLUIB4 2. https://nptel.ac.in/courses/115103115 3. https://www.youtube.com/watch?v=p075LPq3Eas 4. https://www.youtube.com/watch?v=mH_pS6fruyg 5. https://onlinecourses.nptel.ac.in/noc22_me96/preview 6. https://www.youtube.com/watch?v=tdkFc88Fw-M 7. https://onlinecourses.nptel.ac.in/noc21_me70/preview	

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

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

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

MAPPING OF COs WITH POs & PSOs:

CO/PO		PO				PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	S	M	S	S	M	S	M
CO2	S	S	S	M	M	S	S	M	M	M
CO3	S	S	S	M	M	M	S	S	S	M
CO4	S	M	M	S	S	S	S	S	S	S
CO5	S	M	S	S	S	S	S	M	M	S

Semester-III	Practical-II	Course Code:
Instruction Hours: 5	Credits: 3	Exam Hours: 3
Internal Marks -40	External Marks-60	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• Construct circuits to learn above the concept of electricity current, resistance in the path of current, different parameters that effect a circuits. • Set up experiments, observe, analyse and assimilate the concept. • Have a deep knowledge of fundamentals of optics, electric circuits. • To provide the knowledge on utilization of electrical devices • To determinesome electrical parameters by executing experiments.	
	ELECTRICITY (any eight experiments)	

1. Calibration of low range and high range voltmeter using potentiometer
2. Calibration of ammeter using potentiometer.
3. Measurement of low resistances using potentiometer.
4. Determination of field along the axis of a current carrying circular coil.
5. Determination of specific resistance of the material of the wire using PO box.
6. Determination of resistance and specific resistance using Carey Foster's bridge.
7. Determination of internal resistance of a cell using potentiometer.
8. Determination of e.m.f of thermo couple using potentiometer
9. Determination of figure of merit of BG or spot galvanometer.
10. Comparison of capacitance using BG.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

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

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

MAPPING OF COs WITH POs & PSOs:

CO/PO		PO				PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	M	S	S	S	S	S	S	S	M
CO2	S	S	S	M	M	S	S	M	M	M
CO3	S	S	S	M	M	M	S	M	S	M
CO4	M	M	M	M	S	S	S	M	M	S
CO5	S	M	S	S	M	S	S	M	M	M

Semester-III	NME-I Everyday Physics	Course Code:
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• To know where all physics principles have been put to use in daily life. • To appreciate the concepts with a better understanding. • To know about Indian scientists who have made significant contributions to Physics. • Equipped to take up related job by gaining industry exposure. • To illustrate the application of lasers in various fields.	

UNITS	COURSE DETAILS	
UNIT-I	**MECHANICAL OBJECTS: s**pring scales – bouncing balls – roller coasters – bicycles –rockets and space travel.	4 Hrs
UNIT-II	**OPTICAL INSTRUMENTS AND LASER:** vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – colour photography – holography and laser.	4 Hrs
UNIT-III	**PHYSICS OF HOME APPLIANCES:** bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners	4 Hrs
UNIT-IV	**SOLAR ENERGY:** Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells.	4 Hrs
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.	4 Hrs
TEXT BOOKS	1. The Physics in our Daily Lives, Umme Ammara, Gugucool Publishing, Hyderabad, 2019. 2. For the love of physics, Walter Lawin, Free Press, New York, 2011.	
WEB RESOURCES	1. https://youtu.be/Hu-JL2J6ncE 2. https://studiousguy.com/10-examples-of-physics-in-everyday-life/	

COURSE OUTCOMES:

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

COURSE OUTCOMES	**CO1**	• The students knows where all physics principles have been put to use in daily life
	CO2	• The concepts with a better understanding.
	CO3	• knowing about Indian scientists who have made significant contributions to Physics.
	CO4	• Equipped to take up related job by gaining industry exposure
	CO5	• Illustrated the application of lasers in various fields.

MAPPING OF COs WITH POs & PSOs:

CO/PO		**PO**				**PSO**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	S	S	S	M	S	S	M
CO2	M	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	M	S	S	M	M
CO4	S	M	M	M	M	S	M	S	M	M
CO5	M	M	S	M	S	M	S	M	S	S

Semester-III	SEC-III Fundamentals of Physics –II	Course Code:
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks - 25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• To introduce some basic concept of Physics like measurement of physical quantities, states of matter, kinds of energies and energy sources. • To students studying other than Physics. • Apply conservation law and calculate energy of various systems. • To understand and differentiate conservative and non-conservative forces • To gain knowledge on rigid body dynamics and solve problems based on this concept	
UNITS	COURSE DETAILS	
UNIT-I	Electric current- voltage and resistance- Ohm's law- Kirchhoff's law- Resistances in series and in parallel.	4 Hrs
UNIT-II	DC Source – Primary cells – Leclanche and Daniel cell – Secondary cells – Lead Acid Accumulator – DC generator.	4 Hrs
UNIT-III	Alternating current generation by hydro, thermal and atomic power stations– RMS value – Peak value (Quantitative) – AC generator – no derivation.	4 Hrs
UNIT-IV	Measurement of Electric power by Wattmeter- simple calculations- Induction coil- Wattless current- Power factor.	4 Hrs
UNIT-V	Simple electrical circuits – resistor, capacitor and inductor connected to AC source (independently) – Relationship between emf and current in each case. Diode – Bridge Rectifier.	4 Hrs
TEXT BOOKS	First Year B. Sc Physics – B.V. Narayan Rao, New Age International (P) Lt, 1998	
Reference Books:	1.Electricity and Magnetism – R. Murugesan – S. Chand & Co 2004.	
WEB RESOURCES	1. https://youtu.be/au2RUHu-HpE 2.https://youtu.be/34hWklTgzbI	

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

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

MAPPING OF COs WITH POs & PSOs:

CO/PO		**PO**				**PSO**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	S	S	S	S	S	S	S	M
CO2	S	S	S	M	M	S	S	M	M	M
CO3	S	S	M	M	M	M	S	M	S	M
CO4	S	M	M	S	S	S	S	M	S	S
CO5	M	M	S	S	S	S	S	M	S	M

SEMESTER-IV

Semester-IV	Optics and Spectroscopy	Course Code:
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics; • To explain the behavior of light in different mediums; • To understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life; • To understand the design of optical systems and methods to minims aberrations; • To solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations.	

UNITS	COURSE DETAILS	
UNIT-I	**LENS AND PRISMS:** *Lens*: lens makers formula (no derivation) – aberrations: spherical aberration,chromatic aberrations, coma,and astigmatism– curvature of the field – distortion – chromatic aberrations methods. *Prism*: dispersion, deviation, aberrations - applications rainbows and halos. *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	**15 Hrs**
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,Thin Sheets. *Interferometers* : Michelson's interferometer – applications, (i) determination of the wavelength of a monochromatic source of light, (ii) determination of the wavelength and separation of two waves in sodium light	**15 Hrs**
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.	**15 Hrs**
UNIT-IV	**POLARISATION:** optical activity – optically active crystals –polarizer and analyser–double refraction – optic axis, principal plane – Huygens's explanation	**15 Hrs**

	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.	
UNIT-V	**SPECTROSCOPY:** infra-red spectroscopy near infra-red and far infra-red – properties –origin of IRspectra – IR spectrophotometer – applications interpretation of IR spectra – CH, CO, CN bending and stretching vibrational modes only – scattering of light – Raman effect –classical theory –quantum theory –mutual exclusion principle – Raman spectrometer-	**15 Hrs**
TEXT BOOKS	1. Subramaniam. N & Brijlal, 2014,Optics, 25th edition,S.Chand &Co. 2. S.L.Gupta,V.Kumar & R.C.Sharma,1997,Elements of Spectroscopy, 13th Edition, Pragati Prakashan, Meerut. 3. G.Aruldhass,2000,Molecular Structure and Spectroscopy,II Edition.PHIPvt Ltd, New Delhi. 4. P.R.Sasikumar, 2012, Photonics, PHIPvt Ltd, New Delhi.	
REFERENC EBOOKS	1. Agarwal B.S, 2011,Optics, KedernathRamnath Publishers, Meerut. 2. Sathyaprakash, 1990,Optics,VII edition, RatanPrakashanMandhir, New Delhi. 3. C.N.Banewell, 2006, Introduction to Molecular Spectroscopy,IV edition,TMH Publishing Co,New Delhi. 5. 4. AjoyGhatak, 2009,Optics, 4thedition, PHIPvt Ltd, New Delhi. 5. Singh &Agarwal,2002,Optics and Atomic Physics, 9thedition, PragatiPrakashan Meerut. 6. D.Halliday,R.Resnick and J. Walker, 2001, Fundamentals of Physics,6th edition, Willey, New York. 7. JenkinsA.Francis & White, 2011, Fundamentals of Optics, 4th edition, McGraw Hill Inc., NewDelhi.	
WEBLINKS	1. https://science.nasa.gov/ems/ 2. https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472 3. https://science.nasa.gov/ems/ 3. https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472 4. https://imagine.gsfc.nasa.gov/educators/gammarabursts/imagine/index.html 6. http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/ 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:

COURSEOUTCOMES	**CO1**	• To understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life;
	CO2	• To solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations.
	CO3	• To understand the design of optical systems and methods to minims aberrations;
	CO4	• To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics; •
	CO5	• To explain the behavior of light in different mediums;

MAPPING OF COs WITH POs & PSOs:

CO/PO		**PO**				**PSO**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	M	M	S	M	S	S	S	S	M
CO2	S	S	S	M	M	S	S	M	M	M
CO3	M	S	M	M	M	M	S	S	S	M
CO4	S	M	S	S	M	S	S	S	S	S
CO5	M	M	S	M	S	S	S	S	S	M

METHOD OF EVALUATION:

Continuous Internal Assessment	**End Semester Examination**	**Total**	**Grade**
25	**75**	**100**	

Semester-IV	NME-II - Energy Physics	Course Code:
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• To impart fundamental aspects of solar energy utilization. • To give adequate exposure to solar energy related industries • To harness entrepreneurship skills • To understand the different types of solar cells and channelizing them to the different sectors of society • To develop an industrialist mindset by utilizing renewable source of energy	

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.	4 Hrs
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.	4 Hrs
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	4 Hrs
UNIT-IV	**BIOMASS ENERGY:** Introduction – classification – biomass conversion technologies –photosynthesis – fermentation - biogas generation – classification of biogas plants – anaerobic digestion for biogas – wood gasification – advantages & disadvantages.	4 Hrs
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.	4 Hrs
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 Twidell& Tony Weir, Renewable Energy Resources, Taylor & 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 & Co. Ltd., New Delhi,1982 4. H. C. Jain, Non-Conventional Sources of Energy, Sterling Publishers,1986.
WEB RESOURCES	1. https://ocw.mit.edu/courses/8-21-the-physics-of-energy-fall-2009/resources/mit8_21s09_lec01/ 2. https://ocw.mit.edu/courses/8-21-the-physics-of-energy-fall-2009/resources/mit8_21s09_lec02/

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

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

COURSEOUTCOMES	**CO1**	• Gained knowledge in fundamental aspects of solar energy utilization
	CO2	• Equipped to take up related job by gaining industry exposure
	CO3	• Develop entrepreneurial skills
	CO4	• Skilled to approach the needy society with different types of solar cells
	CO5	• Gained industrialist mindset by utilizing renewable source of energy

MAPPING OF COs WITH POs & PSOs:

CO/PO		PO				PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	S	M	S	M	S	S	M
CO2	M	M	S	M	M	S	M	S	M	M
CO3	M	S	M	M	M	M	S	S	S	M
CO4	S	M	M	M	S	S	S	M	S	S
CO5	M	M	S	M	S	M	S	S	S	M

Semester-IV	ACE-I- Electrical Workshop	Course Code:
Instruction Hours:2	Credits: 2	Exam Hours: 3
Internal Marks -40	External Marks-60	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• Understanding the concept of electrical engineering. • To development and implementation of electrical systems. • Impart knowledge and skill in wiring and its standards. • Facilitate, comprehend and identify appropriate measuring devices for and electric circuit. • To provide training on measuring instruments.	
Indicative Experiments		
1.	Study of conventional symbols for electrical installation, wiring tools & accessories and cable joints	
2.	Wiring circuit for electrical appliances(eg. a single lamp and a fan with regulator)	
3.	Staircase wiring circuit layout for multi-storey buildings	
4.	Hospital wiring with buzzer and lamps	
5.	Warehouse / tunnel wiring circuit	
6.	Fluorescent lamp, LED lamp connections	
7.	Soldering and testing of a rectifier circuit	
8.	Study of earthing and measurement of earth pit resistance	
9.	Measurement of single-phase power and energy consumed by a given AC load	
10.	Types, Procedure for operation, maintenance and application of fire extinguishers	
11.	Earth continuity test	
12.	Study of fuse, MCBs and ELCB	
13.	Multi-meter and its testing of different components	
14.	Electrical appliances: kettle, fan, iron box, refrigerator, grinder, water heater	
15.	Insulation resistance measurement of motors and cables	
Text Books	1.K.B. Raina and S.K.Bhattacharya, Electrical Design Estimating and Costing,2010,Wiley Eastern Limited 2.Electricity Rules, 2005 along with allied Rules and orders, 2021, Reprint	
WEB RESOURCES	1. https://youtu.be/aIUbkihOo90 2. https://youtu.be/vIQNXZ_uKMk 3. https://youtube.com/shorts/NBFTTv9PvCU?feature=share	

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

COURSEOUTCOMES	**CO1**	• Students Understanding the concept of electrical engineering. •
	CO2	• Students development and implementation of electrical systems.
	CO3	• Impart knowledge and skill in wiring and its standards.
	CO4	• Facilitate, comprehend and identify appropriate measuring devices for and electric circuit.
	CO5	• Provide training on measuring instruments

MAPPING OF COs WITH POs & PSOs:

CO/PO		**PO**				**PSO**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	M	S	S	M	S	S	S	S	M
CO2	S	S	S	M	M	S	M	S	M	M
CO3	M	S	M	M	M	M	S	S	S	M
CO4	S	M	S	S	M	S	S	S	S	S
CO5	M	M	S	M	S	S	S	M	S	M

SEMESTER-V

Semester-V	Atomic Physics and Lasers	Course Code:
Instruction Hours: 6	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• To study about electric charges, their properties through experiments; To gain knowledge on photoelectric effect; • To solve problems based on Einstein's photoelectric equation; • To make students understand the development of atom models, quantum numbers, coupling schemes and analysis of magnetic moments of an electrons; • To gain knowledge on excitation and ionization potentials, splitting of spectral lines in magnetic and electric fields; • To understand the principle, production and applications of lasers.	

UNITS	COURSE DETAILS	
UNIT-I	**THE ELECTRON AND POSITIVE RAYS:** e/m of electronby Dunnington's method –charge of electron by Millikan's oil drop method – properties of positive rays –e/m of positive rays by Thomson's parabola method (*problems calculation of e/m ratio of positive rays*)–mass spectrographs and uses– Bainbridge	**15 Hrs**
UNIT-II	**PHOTOELECTRIC EFFECT:** photoelectric emission – Leonard's experiment – Richardson and Compton experiment –laws of photoelectric emission – Einstein's photoelectric equation (*problems using Einstein's photoelectric equation*) –experimental verification by Millikan's method – photoelectric cell– photo emissive cell –photovoltaic cell – photo conducting cell – applications of photoelectric cells.	**15 Hrs**
UNIT-III	**ATOMIC STRUCTURE:** Sommerfield's relativistic atom model –vector atom model –various quantum numbers – L-S and J-J coupling – Pauli's exclusion principle –magnetic dipole moment of an electron due to orbital and spin motion –- Stern and Gerlach experiment.	**15 Hrs**
UNIT-IV	**SPLITTING OF SPECTRAL LINES:** excitation, ionisation and critical potentials – optical spectra – spectral notation and selection rules – fine structure of sodium D-line – Zeeman effect – experimental arrangement and classical theory of normal Zeeman effect – Larmor's theorem –quantum theory of normal Zeeman effect –anomalous Zeeman effect –explanation of splitting of D_1 and D_2lines of sodium – Paschen Back effect - Stark effect (Qualitative only).	**15 Hrs**
UNIT-V	**LASERS: g**eneral principles of lasers – properties of lasers action – spontaneous and stimulated emission – population inversion – optical pumping – He-Ne laser (principle and working) – semiconductor laser – laser applications–holography.	**15 Hrs**
TEXT BOOKS	1. R. Murugesan, Modern Physics, S. Chand & Co**. (**All units**)** (Units I&II-Problems)	

	2. Brijlal & N. Subrahmanyam, Atomic & Nuclear Physics, S. Chand & Co. (All units) 3. J. B. Rajam, Modern Physics, S. Chand & Co. 4. Sehgal&Chopra, Modern Physics, Sultan Chand, New Delhi 5. Avadhahnulu, An Introduction to Lasers - Theory and Applications, M.N., S.Chand& Co., New Delhi, 2001.
REFERENCE BOOKS	1. Perspective of Modern Physics, Arthur Beiser, McGraw Hill. 2. Modern Physics, S. Ramamoorthy, National Publishing & Co. 3. Laser and Non-Linear Optics by B.B.Laud, Wiley Easter Ltd.,New York,1985.
WEBLINKS	1. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html 2. https://makingphysicsfun.files.wordpress.com/2015/01/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

METHOD OF EVALUATION:

Continuous InternalAssessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

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

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

MAPPING OF COs WITH POs & PSOs:

CO/PO		PO				PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	S	M	S	M	S	S	M
CO2	S	M	S	M	M	S	M	S	M	M
CO3	M	S	M	M	M	M	S	S	S	M
CO4	S	M	M	S	S	S	S	M	S	S
CO5	M	M	S	M	S	S	S	M	S	S

Semester-V	Relativity and Quantum Mechanics	Course Code:
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• To understand the theory of relativity, its postulates and the consequences. • To learn the importance of transformation equations and also to differentiate between special and general theory of relativity. • To interpret the wave theory of matter with various theoretical and experimental evidences. • To derive and use Schrodinger's wave equation and also learn about various operators. • To solve Schrodinger's wave equation for simple problems and analyse to understand the solutions.	

UNITS	COURSE DETAILS	
UNIT-I	**SPECIAL THEORY OF RELATIVITY:** Michelson-Morley experiment–frames of reference – Galilean Relativity – postulates of special theory of relativity – Lorentz transformation – consequences – time dilation–concept of simultaneity – Doppler effect – length contraction–variation of mass with velocity – Einstein's mass-energy relation– relativistic momentum – energy relation	15 Hrs
UNIT-II	**TRANSFORMATION RELATIONS:**transformation of velocity, mass, energy and momentum – four vector – invariance under transformation – Lorentz transformation and velocity addition equations in terms of hyperbolic functions. **GENERAL THEORY OF RELATIVITY:** Inertial and Gravitational mass – Principle of equivalence – Experimental evidences for General theory of Relativity	15 Hrs
UNIT-III	**PHOTONS AND MATTER WAVES:**difficulties of classical physics and origin of quantum theory –black body radiation – Planck's law – Einstein's photoelectric equation –Compton effect – pair production – De Broglie waves – phase velocity and group velocity– Davisson and Germer's experiment –uncertainty principle.	15 Hrs
UNIT-IV	**OPERATORS AND SCHRÖDINGER EQUATION:**postulates of quantum mechanics – Wave function and its interpretation – Schrödinger's equation – linear operators – Eigenvalue – Hermitian operator – properties of Hermitian operator– observable – operators for position, linear Momentum, angular momentum components – commutator algebra.	15 Hrs

UNIT-V	**SOLVING SCHRÖDINGER EQUATION FOR SIMPLE PROBLEMS:** *one-dimensional problems*: (i) particle in a box, (ii) barrier penetration problem – (iii) linear harmonic oscillator. *higher dimensional problems*: (i) Rigid rotator (qualitative),(ii) Hydrogen atom (qualitative).	**15 Hrs**
TEXT BOOKS	1. *Special Theory of Relativity,S. P. Puri,* Pearson Education, India, 2013. 2. Concepts of Modern Physics, A.Beiser, 6th Ed., McGraw-Hill, 2003. 3. Modern Physics, R. Murugeshan, KiruthigaSivaprasath,S. Chand & Co.,17th Revised Edition, 2014. 4. Modern Physics, R. Murugesan, S.Chand& Co., New Delhi. **(**Quantum Mechanics,Gupta, Kumar and Sharma. Jai PrakashNath&Co Meerut 5. Quantum mechanics – Satyaprakash and Swati Saluja. KedarNath Ram Nath& Co.	
REFERENCE BOOKS	1. Fundamentals of Modern Physics, Peter J. Nolan, 1stEdition, 2014, by Physics 2. Quantum Mechanics,V.Murugan, Pearson Education, India, 2014. 3. Quantum Mechanics, Alastair I. M. Rae and Jim Napolitano, 6th Edition, CRC Press:Taylor& Francis, 2010. 4. Quantum Physics:A Fundamental Approach to Modern Physics, John S. Townsend, University Science Books, Sausalito, California, 2010. 5. Quantum Mechanics: Theory and Applications, AjoyGhatak and S. Lokanathan, Springer ScienceBusiness Media, Dordrecht, Netherlands, 2004. 6. Physics of the Atom,Editor(s): M. R. Wehr, J. A. Richards, T. W. Adair, 4th Edition, Narosa, 2013. 7. Quantum Mechanics, V.Devanathan, Narosa Pub. House, Chennai, 2005. 8. Quantum Mechanics, V.K. Thangappan, New Age International, New Delhi. 9. A Text Book of Quantum Mechanics, Mathews &Venkatesan, Tata McGraw Hill, New Delhi. 10. Quantum Mechanics, Ghatak&Loganathan, Macmillan Publications. 11. Introduction to Quantum Mechanics, Pauling & Wilson, McGraw Hill Co., NewYork. 12. Quantum Mechanics, Gupta, Kumar and Sharma. Jai PrakashNath&Co Meerut	
WEBLINKS	1. http://hyperphysics.phy-astr.gsu.edu/hbase/qapp.html 2. https://swayam.gov.in/nd2_arp19_ap83/preview 3. https://swayam.gov.in/nd1_noc20_ph05/preview 4. https://www.khanacademy.org/science/physics/special-relativity/minkowski-spacetime/v/introduction-to-special-relativity-and-minkowski-spacetime-diagrams	

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

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

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

MAPPING OF COs WITH POs & PSOs:

CO/PO		PO				PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	S	M	S	M	S	S	M
CO2	S	M	S	M	M	S	M	S	M	M
CO3	M	S	M	M	M	M	S	S	S	M
CO4	M	S	M	S	M	S	S	M	S	S
CO5	M	M	S	M	S	S	M	M	S	M

Semester-V	Communication Physics	Course Code:
Instruction Hours: 5	Credits: 4	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

CognitiveLevel	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
COURSE OBJECTIVES	• To comprehend the transmission of electromagnetic waves thorough different types of antenna and also to acquire knowledge about the propagation of waves through earth's atmosphere and along the surface of the earth • To gain knowledge in the generation and propagation of microwaves • To acquire knowledge about radar systems and its applications and also the working principle of colour television • To learn the working principle of fiber optics and its use in telecommunication	
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 superheterodyne radio receiver, advantages – FM receiver – difference between FM and AM receivers.	**12Hrs**
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	**12 Hrs**
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	**12 Hrs**
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	**12 Hrs**
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)	**12 Hrs**

TEXT BOOKS	1. V.K.Metha, Principles of Electronics, S. Chand & CoLtd., 2013 2. Anokh Singh and Chopra A.K., Principles of communication Engineering, S.Chand& Co, 2013
REFERENCE BOOKS	1. J.S. Chitode, Digital Communications, 2020, Unicorn publications 2. Senior John. M, Optical Fiber Communications: Principles and Practice, 2009, Pearson Education.
WEB RESOURCES	1. https://egyankosh.ac.in/bitstream/123456789/19497/1/Unit-1.pdf 2. https://egyankosh.ac.in/bitstream/123456789/19500/1/Unit-2.pdf 3. https://egyankosh.ac.in/bitstream/123456789/19502/1/Unit-3.pdf

METHOD OF EVALUATION:

Continuous InternalAssessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

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

COURSE OUTCOMES	**CO1**	Discuss and compare the propagation of electromagnetic waves through sky and on earth's surface Evaluate the energy and power radiated by the different types of antenna
	CO2	Compare and differentiate the methods of generation of microwaves analyze the propagation of microwaves through wave guides- discuss and compare the different methods of generation of microwaves
	CO3	Classify and compare the working of different radar systems- apply the principle of radar in detecting locating, tracking, and recognizing objects of various kinds at considerable distances – discuss the importance of radar in military- elaborate and compare the working of different picture tube
	CO4	Classify, discuss and compare the different types of optical fiber and also to justify the need of it-discover the use of optical fiber as wave guide
	CO5	Explain the importance of satellite communication in our daily life-distinguish between orbital and geostationary satellites elaborate the linking of satellites with ground station on the earth

MAPPING OF COs WITH POs & PSOs:

CO/PO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	S	S	M	S	M	S	M	M
CO2	S	M	S	M	M	S	M	S	M	M
CO3	M	S	M	M	M	M	S	M	S	M
CO4	S	M	M	S	S	S	S	M	S	S
CO5	M	M	S	S	S	S	S	M	S	M

Semester-V	**CC VIII - Electronics**	Course Code:
Instruction Hours: 4	Credits: 4	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 –Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 – Creating**	
Course Objectives:	• To enable the students to understand all aspects of electronics in a lucid and comprehensive manner. • This course is familiarize the students about the transistor, operational amplifier and Digital electronics Circuit • Acquire the fundamental knowledge and application of the semiconductor Device • Knowledge of the basic principles of electronic circuits operation Performance Analysis of electronic circuit	
Unit I	**Semiconductors, diodes and Bipolar Transistors** Intrinsic and extrinsic semi -conductors –PN junction diode – Biasing–V-I Characteristics– Rectifiers – Half wave – full wave and Bridge rectifiers – Break down mechanisms – Zener diode- characteristics of Zener diode – Zener diode as voltage regulator-Bipolar junction transistor – Basic configurations -Relation between α and β – Characteristic curves of transistor – CB, CE mode – DC load line – DC bias and stabilization – fixed bias – voltage divider bias.	**12 Hrs**
Unit II	**Amplifiers and Oscillators** Single stage CE amplifier – Analysis of hybrid equivalent circuit – Power amplifiers – Efficiency of class A,B& C Power amplifier - General theory of feedback – Properties of negative feedback – Criterion for oscillations – Hartley oscillator – Colpitt's oscillator.	**12 Hrs**
Unit III	**Operational amplifier** Operational amplifier - Characteristics – Inverting and Non-inverting amplifier – Voltage follower – Adder, Subtractor, Integrator and Differentiator circuits – Log & antilog amplifiers – Op- amp as Comparator – Filters-low, bandpass, high pass filters -A/D conversion – Successive approximation method – D/A conversion – R-2R ladder network.	**12 Hrs**

Unit IV	**Number Systems, Logic Gates and Boolean Algebra** Introduction to decimal, binary, octal, hexadecimal number systems – Inter conversions– 1's and 2's complements –Logic gates, Symbols and their truth tables – AND, OR, NOT, NAND, NOR, XOR, and XNOR – Universality of NAND and NOR gates. Boolean algebra – De-Morgan's theorems -Reducing Boolean expressions using Boolean laws – SOP forms of expressions (minterms) – Karnaugh map simplification(Four variables). **(Content- 15 Hrs, Assessment -3 Hrs)**	**12 Hrs**
Unit V	**Combinational and Sequential Digital Systems** Half and full adders – Half and full subtractors – Decoder(2:4 line) – Encoder (4:2 line)– Multiplexer(4:1 line) – Demultiplexer (1:4 line) - Flip flop – RS – clocked RS – T and D flip flops – JK and master slave flip flops – Counters – Four bit asynchronous ripple counter – Mod-10 counter — Synchronous counter – Ring counter - Shift registers – SISO and SIPO shift registers. **(Content- 15 Hrs, Assessment -3 Hrs)**	**12 Hrs**
Unit VI	**ANY THREE:** Analysis and Comparison of CC, CB and CE modes Principle and working of Phase Shift Oscillator Study of Counter type method in A/D and D/A conversion Simplification of Boolean Algebra using circuit analysis Analysis of Multiplexer(16:1) and Demultiplexer(1:16) Study of Up/Down Counter	**Group Discussion**
Text Books:	1. Mehta V.K., *Principles of Electronics*, S. Chand and company Ltd, 2014. 2. A.P. Malvino, D.P. Leach, *Digital Principles and Application*, IV Edition, Tata McGraw Hill, New Delhi, 2011. 3. V. Vijayendran, *Digital Fundamentals*, S.Viswanathan, Printers & Publishers Private Ltd, Chennai, 2004.	
Reference Books :	1. Theraja. B.L, *Basic electronics - Solid State*, S.Chand and Company Ltd 2002. 2. Sedha R.S., *A text book of applied Electronics*, S.Chand& company Ltd 2002. 3. W.H.Gothmann, *Digital Electronics*, Prentice Hall of India, Pvt. Ltd., New Delhi 1996. 4. V. Vijayendran, *Digital Fundamentals*, S.Viswanathan, Printers & Publishers Private Ltd, Chennai, 2004.	
E-Resources:	1. https://www.electronics-tutorials.ws/ 2. https://www.altair.com/electronics/	

Course Outcomes:	On completion of the course the learner will be able	
	CO 1:	Explain the theoretical principles essential for understanding the operation of electronic circuit
	CO 2:	Measure the characteristics of electronic circuit and present experiment result
	CO 3:	Analyze electrical circuit and calculate the main parameters
	CO 4:	Develop Design and create simple analogue and digital electronics circuit
	CO 5:	Know about the multistage amplifier using BJT and FET various configuration

Mapping of COs with POs & PSOs:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	M	S	S	S	S	M	M	S
CO2	S	S	M	S	S	S	S	S	S	S
CO3	S	S	M	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	S	S	M	S	S	S	S	S	S	S

Semester-V	Practical-III	Course Code:
Instruction Hours: 3	Credits: 3	Exam Hours: 3
Internal Marks -40	External Marks-60	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results. • To enhance the experimental skills of students. • To make the students realize the optical properties of certain materials by doingexperiments. • Know the techniques of handling laboratory instruments. • Evaluate a process based on the results obtained from the experiments quantitativelyand qualitatively.	

1. Bi-prism – Determination of μ.
2. Dispersive power of plane diffraction grating.
3. Forbe's method – Thermal conductivity of a metal rod.
4. Spectrometer– Grating - Normal incidence - Wave length of Mercury spectral lines.
5. Spectrometer – Grating - Minimum deviation - Wave length of Mercury spectral lines.
6. Spectrometer – (i-d) curve.
7. Spectrometer – (i-i′) curve.
8. Rydberg's constant
9. Potentiometer –Resistance and Specific resistance of the coil.
10. Potentiometer – E.M.F of a thermocouple.
11. Carey Foster's bridge - Temperature coefficient of resistance of the coil.
12. Deflection Magnetometer – Determination of Magnetic moment of a bar magnet and $B_H$using circular coil carrying current.
13. Vibration magnetometer - Determination of B_H using circular coil carrying current– Tan B position.
14. B.G – Figure of Merit – Charge Sensitivity

METHOD OF EVALUATION:

Continuous InternalAssessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

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

COURSEOUTCOMES	**CO1**	• Students demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.
	CO2	• Enhance the experimental skills of students.
	CO3	• students realize the optical properties of certain materials by doingexperiments.
	CO4	• Students able to the techniques of handling laboratory instruments.
	CO5	• Evaluate a process based on the results obtained from the experiments quantitativelyand qualitatively.

MAPPING OF COs WITH POs & PSOs:

CO/PO		PO				PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	M	S	S	M	M	S	M	S	S	M
CO2	S	M	S	M	S	S	M	S	M	M
CO3	M	S	M	M	M	M	S	M	S	M
CO4	S	M	M	S	S	S	M	S	S	S
CO5	M	M	S	S	M	S	S	M	S	M

Semester-V	**Discipline Specific Elective-I Medical Physics**	Course Code:
Instruction Hours: 3	Credits: 3	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
Cognitive Level	**K-1** Acquire/Remember **K-2** Understand **K-3** Apply **K-4** Analyze **K-5** Evaluate **K-6** Create	

Course Objectives:

- To understand the basics about the biological systems in our body, their behavior, and the diagnostic devices.
- To give basic ideas about how multimedia evidences are useful in crime investigation
- To Understand the knowledge in recent trends of measuring bio-signals
- To provide knowledge on preparation, Characterization and use of biocompatible metals and non metals for bio implant application.
- Designed to provide the knowledge for use of different laser spectroscopic methods in bioanalysis.

Unit I	Basic Anatomical Terminology- Modeling and Measurement – Forces on and in the Body – Physics of the Skeleton – Heat and Cold in Medicine- Energy work and Power of the Body
Unit II	Pressure system of the body- Physics of Cardiovascular system- Electricity within the Body – Applications of Electricity and Magnetism in Medicine
Unit III	Sound in medicine- Physics of the Ear and Hearing- Light in medicine- Physics of eyes and vision.
Unit IV	X-rays- Production of X-rays- X-ray spectra- continues spectra and characteristic spectra- Coolidge tube- Electro Cardio Graph (ECG) - Block diagram- ECG Leads- Unipolar and bipolar-ECG recording set up. 1982
Unit V	Electro Encephalo Graph (EEG) - origin- Block diagram- Electro Myogragh (EMG) – Block diagram- EMG recorder- Computer Tomography (CT) principle- Block diagram of CT scanner.

Text Books	1. Medical Physics –John R. Cameron and James G.Skofronick, 1978, John Willy & Sons.	
Reference Book	1. Bio medical instrumentation – E D II, Dr M. Arumugam, Anuradha Agencies 1997.	
E-Resources:	1. https://aapm.onlinelibrary.wiley.com/journal/24734209 2. https://www.medicalphysics.org/	
Course Outcomes:	On completion of the course the learner will be able	
	CO 1:	To learn the internal architecture and working principle of various instruments used in medical field.
	CO 2:	Students will be able to use Laser, Ultra sound and microwaves for different diagnosis and Therapeutic applications
	CO 3:	To design and develop a new abutments that may be comparable to currently available esthetic implant abutments.
	CO 4:	To make the students to familiarize physical design , Maintenance of different biomedical instrument used in medical field
	CO 5:	The student can able to design different laser spectrometers and devices for spectroscopic analysis and imaging of cells and tissues.

Mapping of COs with POs & PSOs:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	M	S	S	S	M	S	S	S
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	S	S	M	S	S	S	S	M	S	S

Semester-V	AEC-II Domestic Electrical Appliances	Course Code:
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• The students will get knowledge on electrical instruments. • To installations and domestic wiring techniques with safety precautions and servicing. • To inculcate the knowledge of resistors, capacitors and electrical appliances • To provide training on measuring instruments • To provide knowledge of the working principles and constructions of houseappliances.	

UNITS	COURSE DETAILS
UNIT-I	**SIMPLE ELECTRICAL CIRCUITS: c**harge, current, potential difference, resistance – simple electrical circuits – DC ammeter, voltmeter, ohmmeter – Ohm's law – difference between DC and AC – advantages of AC over DC – electromagnetic induction - transformers – inductors/chokes – capacitors/condensers – impedance – AC ammeter, voltmeter –symbols and nomenclature
UNIT-II	**TRANSMISSION OF ELECTRICITY:** production and transmission of electricity – concept of power grid – Series and parallel connections – technicalities of junctions and loops in circuits –transmission losses (qualitative).
UNIT-III	**ELECTRICAL WIRING:** different types of switches – installation of two way switch – role of sockets, plugs, sockets - installation of meters – basic switch board –fixing of tube lights and fans.
UNIT-IV	**POWER RATING AND POWER DELIVERED:** conversion of electrical energy in to different forms – work done by electrical energy – power rating of electrical appliances – energy consumption – electrical energy unit in kWh – calculation of EB bill –single and three phase connections – Measures to save electrical energy.
UNIT-V	**SAFETY MEASURES:** insulation for wires – colour specification for mains, return and earth – Understanding of fuse and circuit breakers – types of fuse: kit-kat, HRC, cartridge, MCB, ELCB – purpose of earth line – lighting arrestors – short circuiting and over loading – electrical safety – tips to avoid electrical shock – first aid for electrical shock – fire safety for electric current

TEXT BOOKS	1.Wiring a House: 5th Edition by Rex Cauldwell, (2014). 2.Black & Decker Advanced Home Wiring, 5th Edition: Backup Power - Panel Upgrades - AFCI Protection - "Smart" Thermostats, by Editors of Cool Springs Press, (2018).3.Complete Beginners Guide to Rough in Electrical Wiring: by Kevin Ryan (2022).
REFERENCE	1. Home appliances GT Publications, Jaipur. 2. Electrical power – Dr. S. L. Uppal. **3.** Basic Electrical Engineering – M. L. Anwani, Dhanapat Rai and Co. New Delhi.
WEB RESOURCES	1. https://chseodisha.nic.in/sites/default/files/SYllabus/Electrical%20Domestic%20Appliances.pdf 2. https://fep.if.usp.br/~profis/arquivo/projetos/SATW/11268-DOMESTIC_ELE

METHOD OF EVALUATION:

Continuous InternalAssessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

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

COURSEOUTCOMES	**CO1**	Recall the concepts of resistors, inductors and capacitors
	CO2	Apply their skills on connecting various components like resistors, capacitorsetc.
	CO3	Identify the defects in electrical appliances
	CO4	Rectify the defects in the parts of electrical appliances.
	CO5	Able to design prototypes of simple electrical appliances.

MAPPING OF COs WITH POs & PSOs:

CO/PO		PO				PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	M	M	S	M	S	S	M
CO2	M	M	S	M	M	S	M	M	M	S
CO3	S	S	M	S	M	M	S	S	M	M
CO4	S	M	M	M	S	S	S	M	S	S
CO5	M	M	S	M	M	S	S	M	M	M

SEMESTER-VI

Semester-VI	**Nuclear and Particle Physics**	**Course Code:**
Instruction Hours: 6	**Credits: 5**	**Exam Hours: 3**
Internal Marks -25	**External Marks-75**	**Total Marks: 100**
CognitiveLevel	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
COURSE OBJECTIVES	• To understand constituents, properties and models of nucleus. • To give reason for radioactivity and study their properties. • To learn about the principles of various particle detectors and accelerators. • To acquire knowledge on different types of nuclear reactions and their applications. To know the reason for cosmic rays and their effect on the surface of earth and also understand the classification of elementary particles.	

UNITS	**COURSE DETAILS**	
UNIT-I	**PROPERTIES OF NUCLEUS:** constituents of nucleus – isotopes, isobars, isotones – nuclear size, mass, density, charge, spin, angular momentum, magnetic dipole moment, electric quadrupole moment (qualitative) – binding energy – mass defect – packing fraction – nuclear stability – binding energy per nucleon graph – properties of nuclear force – meson theory of nuclear forces – Yukawa potential. **NUCLEAR MODELS:** liquid drop model –Weizacker's semi-empirical mass formula – shell model – magic numbers.	**15 Hrs**
UNIT-II	**RADIO ACTIVITY:** radio activity – laws of radioactivity – radioactive disintegration, decay constant, half-life, mean-life (only final formulae) **–** units of radioactivity**–**successive disintegration – transient and secular equilibrium– properties of alpha, beta and gamma rays – Geiger-Nuttal law –α-ray spectra –Gammow's theory of α-decay (qualitative) –β-ray spectrum – neutrino theory of β-decay – nuclear isomerism – K-shell capture – internal conversion – non-conservation of parity in weak interactions.	**15 Hrs**
UNIT-III	**PARTICLE DETECTORS AND ACCELERATORS** **DETECTORS:** gas detectors –ionization chamber – G-M counter – scintillation counter – photo multiplier tube (PMT) – semiconductor detectors – neutron detector. **ACCELERATORS:** l**inear accelerators – cyclotron – synchrotron – betatron– electron synchrotron – protonsynchrotron (bevatron)**	**15 Hrs**

UNIT-IV	**NUCLEAR REACTIONS:** types of nuclear reactions – conservation laws in nuclear reaction – Q-value– threshold energy – nuclear fission – energy released in fission – chain reaction – critical mass – nuclear reactor – nuclearfusion – sources of stellar energy – proton-proton cycle – Carbon-Nitrogen cycle – thermonuclear reactions – controlled thermonuclear reactions.	**15 Hrs**
UNIT-V	**COSMIC RAYS AND ELEMENTARY PARTICLES** **COSMIC RAYS:**discovery of cosmic rays – primary and secondary cosmic rays – cascade theory of cosmic ray showers – discovery of positron – pair production – annihilation of matter – Van-Allen radiation belts – big-bang theory (elementary ideas only). **ELEMENTARY PARTICLES:**particles and antiparticles – classification of elementary particles – types of fundamental interactions – quantum numbers of elementary particles – conservation laws and symmetry – quarks and types – quark model (elementary ideas only).	**15 Hrs**
TEXT BOOKS	1.R Murugeshan & Kiruthiga Sivaprasath, Modern Physics, S. Chand & Co. (2013) 2. Brijlal& N. Subramaniyan, Atomic and Nuclear Physics S.Chand& Co 3. J.B. Rajam, Modern Physics, S Chand &Co.Publishing Co. 4. D.C. Tayal, Nuclear Physics, Himalayan Publishing House 5. Atomic and Nuclear Physics, Brijlal& N. Subramaniyan, S.Chand& Co	
REFERENCE BOOKS	1. Basic ideas and concepts in Nuclear Physics, K.Heyde, 3rd Edn., Institute of Physics Pub. 2. Introductory nuclear Physics by Kenneth S. Krane (Wiley India Pvt. Ltd., 2008) 3. Concepts of nuclear physics by Bernard L. Cohen. (Tata Mcgraw Hill, 1998). 4. Introduction to the physics of nuclei & particles, R.A. Dunlap. (Thomson Asia, 2004). 5. Introduction to High Energy Physics, D.H. Perkins, Cambridge Univ. Press 6. Introduction to Elementary Particles, D. Griffith, John Wiley & Son 7. Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi 8. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000). 9. Theoretical Nuclear Physics, J.M. Blatt &V.F.Weisskopf (Dover Pub.Inc., 1991) 10. Physics and Engineering of Radiation Detection, Syed Naeem Ahmed (Academic Press, Elsevier, 2007). 11. 13. Nuclear Physics, S. N. Ghoshal, S Chand & Co. Edition 2003 15. Elements of Nuclear Physics, M. L.Pandya& R. P. S.Yadav, KedarNath& Ram Nath	

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

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

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

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

MAPPING OF COs WITH POs & PSOs:

CO/PO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	M	M	S	M	S	S	M
CO2	M	M	S	M	M	S	M	M	M	S
CO3	S	S	M	S	M	M	S	S	M	M
CO4	S	M	M	M	S	S	S	M	S	S
CO5	S	M	S	M	S	M	S	S	S	M

Semester-VI	Solid State Physics	Course Code:
Instruction Hours: 6	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• To understand constituents, properties of solids and crystal structure. • To learn specific heat capacity • To understand the lattice dynamics and thus learn the electrical and thermal properties of materials. • To classify the bonding &crystal structure also learn about the crystal structure analysis using X ray diffraction. • To learn the dielectric behavior of materials.	

UNITS	COURSE DETAILS	
UNIT-I	**BONDING IN SOLIDS, CRYSTAL STRUCTURE:** types of bonding –ionic bonding – bond energy of NaCl molecule –covalent bonding – metallic bonding – hydrogen bonding – Van-der-Waals bonding – crystal lattice – lattice translational vectors – lattice with basis – unit cell – Bravais' lattices – Miller indices – procedure for finding them –packing of BCC and FCC structures – structures of NaCl and diamond crystals –reciprocal lattice – reciprocal lattice vectors – properties – reciprocal lattices to SC, BCC and FCC structures – Brillouin zones – X-rays – Bragg's law(simple problems) – experimental methods: Laue method, powder method and rotating crystal method	15 Hrs
UNIT-II	**ELEMENTARY LATTICE DYNAMICS:** lattice vibrations and phonons: linear monoatomicand diatomic chains. acoustical and optical phonons –qualitative description of the phonon spectrum in solids – Dulong and Petit's Law – Einstein and Debye theories of specific heat of solids –Ohm's law – electrical and thermal conductivities –Sommerfeld's quantum free electron theory (qualitative only) – Einstein's theory of specific heat capacity.	15 Hrs
UNIT-III	**MAGNETIC PROPERTIES OF SOLIDS:** permeability, susceptibility, relation between them – classification of magnetic materials – properties of dia, para,ferro, ferri and antiferromagnetism – Langevin'stheory of diamagnetism – Langevin's theory of paramagnetism – Curie-Weiss law – Weiss theory of ferromagnetism(qualitative only) – Heisenberg's quantum theory of ferromagnetism – domains – discussion of B-H curve –hysteresis and energy loss – soft and hard magnets – magnetic alloys.	15 Hrs

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, 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 – Cauchy and Sellmeir relations – Langevin-Debye equation – complex dielectric constant.	**15 Hrs**
UNIT-V	**FERROELECTRIC & SUPERCONDUCTING PROPERTIES OF MATERIALS:** *ferroelectric effect*: Curie-Weiss Law – ferroelectric domains, P-E hysteresis loop – *elementary band theory:*Kronig-Penny model – band gap(no derivation) – conductor, semiconductor (P and N type) and insulator –conductivity of semiconductor – mobility – Hall effect – measurement of conductivity (four probe method) - Hall coefficient. *Superconductivity:*experimental results –critical temperature – critical magnetic field – Meissner effect –type-I and type-II superconductors – London's equation and penetration depth – isotope effect – idea of BCS theory (no derivation)	**15 Hrs**
TEXT BOOKS	1. Introduction to Solid State Physics,Kittel, Willey Eastern Ltd (2003). 2. Solid state Physics, Rita John,1st edition, TataMcGraw Hill publishers (2014). 3. Solid State Physics , R L Singhal, Kedarnath Ram Nath& Co., Meerut (2003)	
REFERENCE BOOKS	1. Puri&Babber – Solid State Physics – S.Chand&Co. New Delhi. 2. Kittel - Introduction to solid state physics, Wiley and Sons, 7th edition. 3. Raghavan - Materials science and Engineering, PHI 4. Azaroff - Introduction to solids, TMH 5. S. O. Pillai - Solid State Physics, Narosa publication 6. A.J. Dekker - Solid State Physics, McMillan India Ltd. 7. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India	
WEB LINKS	1. https://nptel.ac.in/courses/115105099/ 2. https://nptel.ac.in/courses/115106061/	

METHOD OF EVALUATION:

Continuous InternalAssessment	End Semester Examination	Total	Grade
25	**75**	**100**	

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

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

MAPPING OF COs WITH POs & PSOs:

CO/PO		PO				PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	M	M	S	M	S	S	M
CO2	M	M	S	M	M	S	M	S	M	S
CO3	S	S	S	S	M	M	S	S	S	M
CO4	S	M	M	M	M	S	S	M	S	S
CO5	M	M	S	M	S	M	S	M	S	M

Semester-VI	Practical-IV	Course Code:
Instruction Hours: 3	Credits: 3	Exam Hours: 3
Internal Marks -40	External Marks-60	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• To perform basic experiments on characteristics of electronic devices To get into the applications such as amplifiers, Bride rectifier, Transistor Emitter follower. • Use the results of an experiment to describe a phenomenon. • To Develop the capacity of experimenting collaboratively and ethically. • To Acquire the skill of analyzing the properties of materials. • To develop the knowledge of laws and theorems in Physics through experimental study.	

Electronics

1. Zener diode – voltage regulations
2. Bride rectifier using diodes
3. Characteristics of a transistor –(CE mode)
4. Characteristics of a transistor –(CB mode).
5. RC coupled CE transistor amplifier - single stage.
6. Transistor Emitter follower.
7. FET - characteristics.
8. FET - amplifier (common drain)
9. AC circuits with L,C,R -Series resonance.
10. AC circuits with L,C,R - Parallel resonance.
11. Operational amplifier - inverting amplifier and summing.
12. Operational amplifier – differential amplifier
13. Operational amplifier - differentiator & integrator.
14. Construction of seven segment display.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

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

COURSE OUTCOMES	**CO1**	• Understand the diode and transistor characteristics.
	CO2	• Verify the rectifier circuits using diodes and implement them using hardware.
	CO3	• Design the biasing circuits like self biasing.
	CO4	• Design various amplifiers like CE, CC, common source amplifiers and implement
	CO5	• Remember the concepts of Operational amplifier and its applications.

MAPPING OF COs WITH POs & PSOs:

CO/PO		**PO**				**PSO**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	M	M	S	M	S	S	M
CO2	S	M	S	S	S	S	M	S	M	S
CO3	S	S	S	S	M	S	S	S	S	M
CO4	S	M	M	M	M	S	M	S	M	S
CO5	M	M	S	S	S	M	S	M	S	M

Semester-VI	DSE-II NANO SCIENCE and NANO TECHNOLOGY	Course Code:
Instruction Hours: 3	Credits: 3	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• This course aims to provide an overall understanding of Nanoscience and Nanotechnology. • To fabrication methods, characterization techniques and a range of applications. • To introduce basics of nanoscience, nanomaterials and nanotechnology. • To impart the knowledge of nanomaterials preparation methods • To make the students learn the characterization techniques for analysing the properties of nanomaterials and applications of nanomaterials.	

UNITS	COURSE DETAILS	
UNIT-I	**NANOSCIENCE AND NANOTECHNOLOGY:** nanoscale– nature and nanostructures – nanostructures: 0D, 1D,2D– surface to volume ratio– size effect – excitons – quantum confinement– metal based nanoparticles (metal and metal oxide) – nanocomposites (non-polymer based) – carbon nanostructures – fullerene –SWCNT and MWCNT	**9Hrs**
UNIT-II	**PROPERTIES OF NANOMATERIALS:**introduction –mechanical behavior –elastic properties – hardness and strength – ductility and toughness –superplastic behavior – optical properties – surface plasmon resonance – electrical properties – dielectric materials and properties – magnetic properties – super paramagnetism – electrochemical properties – properties of CNTs.	**9Hrs**
UNIT-III	**FABRICATION METHODS AND VACUUM TECHNIQUES:**top-down and bottom-up approaches – electrochemical method – chemical & physical vapour depositions (CVD & PVD) – plasma arc discharge – sputtering – thermal evaporation – pulsed laser deposition – ball milling – lithography: photolithography – e-beam lithography – sol-gel methods – synthesis of CNT.	**9 Hrs**
UNIT-IV	**CHARACTERIZATION TECHNIQUES:**scanning probe microscopy – scanning tunneling microscopy – atomic force microscopy – scanning electron microscopy – transmission electron microscopy –powder XRD method: determination of structure and grain size analysis – UV-visible and photoluminescence spectroscopy.	**9 Hrs**
UNIT-V	**APPLICATIONS OF NANOMATERIALS:**medicine: drug delivery – photodynamic therapy – molecular motors –energy: fuel cells –rechargeable	**9 Hrs**

	batteries – supercapacitors– photovoltaics. sensors: nanosensors based on optical and physical properties – electrochemical sensors – nanobiosensors. nanoelectronics: CNTFET – display screens – GMR read/write heads – nanorobots –applications of CNTs	
TEXT BOOKS	1. K.K.Chattopadhyay and A.N.Banerjee, (2012), Introduction to Nanoscience and Nanotechnology, PHI Learning Pvt. Ltd., 2. M.A. Shah, Tokeer Ahmad (2010), Principles of Nanoscience and Nanotechnology, Narosa Publishing House Pvt Ltd. 3. Mick Wilson, et al (2005) Nanotechnology, Overseas Press.	
REFERENCE BOOKS	1. Richard Booker and Earl Boysen, (2005) Nanotechnology, Wiley Publishing Inc. USA 2. J.H.Fendler (2007) Nano particles and nano structured films; Preparation, Characterization and Applications, John Wiley & Sons 3. B.S.Murty, et al (2012) Textbook of Nanoscience and Nanotechnology, Universities Press.	
WEB RESOURCE	1. https://web.pdx.edu/~pmoeck/phy381/workbook%20nanoscience.pdf 2. https://youtu.be/oDmaQCMwQKM	

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

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

COURSE OUTCOMES	**CO1**	To provide an overall understanding of Nanoscience and Nanotechnology
	CO2	Introduces different types of nanomaterials, their properties
	CO3	Student impart the knowledge of nanomaterials preparation methods
	CO4	Students learn the characterization techniques for analysing the properties of nanomaterials and applications of nanomaterials
	CO5	Students understand the basics of nanoscience, nanomaterials and nanotechnology.

MAPPING OF COs WITH POs & PSOs:

CO/PO		PO				PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	S	M	S	M	S	S	M
CO2	M	S	S	S	M	S	M	S	M	S
CO3	S	S	S	S	M	S	S	S	S	M
CO4	S	M	M	M	M	S	M	S	M	M
CO5	M	M	S	M	S	M	S	M	S	S

Semester-VI	DSE-III Astrophysics	Course Code:
Instruction Hours: 4	Credits: 3	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• This course intends to introduce principles of astrophysics. • To describing the science of formation and evolution of stars and interpretation of various heavenly phenomena • To provide an understanding of the physical nature of celestial bodies along with the instrumentation. • To provide techniques used in astronomical research. • To Understand the evolving of universe.	

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.	**9Hrs**
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.	**9 Hrs**
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.	**9 Hrs**
UNIT-IV	**STELLAR EVOLUTION:** H-R diagram – birth & death of low mass, intermediate mass and massive stars – Chandrasekar limit – white dwarfs – neutron stars – pulsars – black holes – supernovae. **GALAXIES:** classification of galaxies – galaxy clusters –interactions of galaxies, dark matter and super clusters – evolving universe.	**9 Hrs**
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.	**9 Hrs**

TEXT BOOKS	1. BaidyanathBasu, (2001). An introduction to Astrophysics, Second printing, Prentice – Hall of India (P) Ltd, New Delhi 2. K.S.Krishnaswamy, (2002), Astrophysics – a modern perspective, New Age International (P) Ltd, New Delhi. 3. Shylaja, B.S. &Madhusudan, H.R.,(1999), Eclipse: A Celestial Shadow Play, Orient BlackSwan,
REFERENCE	1. S. I. Gupta, V. Kumar and Hv. Sharma, Classical Mechanics 2.(Pragati Prakashan,Meerut, 2019). 3. J. C. Upadhyaya, *Classical Mechanics* (Himalaya Publishing 4. House, Bangaluru,2019). 5. G. Aruldas, *Quantum Mechanics* (PHI Learning Pvt. Ltd., New Delhi, 2008). 6. A. K. Saxena, *Principle of modern physics* (Narosa, New Delhi, 2014). 7. R. Murugesan, KiruthigaSivaprasath, *Modern Physics* (S. Chand, 2006). 8. H. Goldstein, C. P. Poole and J. Safko, *Classical Mechanics* (Pearson, London,UK, 2019). 9. N. C. Rana and P. S. Joag, *Classical Mechanics* (Tata McGraw-Hill, New Delhi,2017).
WEB RESOURCES	1. https://www.slac.stanford.edu/econf/C0307073/papers/LNEA_complete.pdf 2. https://ocw.mit.edu/courses/8-902-astrophysics-ii-fall-2004/resources/lec4/

METHOD OF EVALUATION:

Continuous InternalAssessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

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

COURSEOUTCOMES	**CO1**	• Learn this course intends to introduce principles of astrophysics.
	CO2	• Students describing the science of formation and evolution of stars and interpretation of various heavenly phenomena
	CO3	• Students understanding of the physical nature of celestial bodies along with the instrumentation.
	CO4	• Students able to provide techniques used in astronomical research.
	CO5	• Understand the evolving of universe.

MAPPING OF COs WITH POs & PSOs:

CO/PO		PO				PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	S	M	S	M	S	S	M
CO2	M	M	S	M	M	S	M	S	M	S
CO3	M	S	M	M	M	M	S	S	M	M
CO4	S	M	M	M	S	S	S	M	S	S
CO5	M	M	S	M	M	M	S	M	S	S

Semester-VI	SEC-1V - Electrical Wiring Fundamentals	Course Code:
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
COURSE OBJECTIVES	• To know the skills of basic tools • To get adequate knowledge of different types of wires • To study the different types of switches.	
UNITS	COURSE DETAILS	
UNIT-I	**UNIT-I Basic Tools:** Tools-Screw Drivers-pliers-packet knife-hammers-wooden saw-scratch awl-Hand drill-Ratchet bit brace-Auger bits- Raw plug tool-Hacksaw-centre punch-Twist drill-Putty knife-Blow lamp.	4 Hrs
UNIT-II	**UNIT-II: Wires:** Sizes of wire-Standard wire-Types of wires-Rubber covered, tapped, braided, compounded wires-Lead alloy sheathed wires-tough rubber-sheathed wires-weather proof wires.	4 Hrs
UNIT-III	**UNIT-III Switches:** Switches-surface switch-Flush switches-pull switches-Grid switches-Architrave switch- Rotary snap switches-Push button switches-Wiring system	4 Hrs
UNIT-IV	**UNIT-IV** Flexible wire-Method of installing wiring – cleat wiring-Tough rubber sheathed wiring-Lead sheathed wiring-Installation of conduit wiring.	4 Hrs
UNIT-V	**UNIT-V** Looping in system-wiring of building- tree system-ring system-Lamp circuits - Simple circuits-series, parallel circuits-Master switch circuits.	4 Hrs
TEXT BOOKS	Course Materials Prepared by Department of Physics	
REFERENCE BOOKS	1.B.L Theraja,Basic Electronics,S.Chand & CO.,(2008) 2.V.Ramasamy Basic Instrumentation, Sowmi Publications	
Course Outcomes:	On completion of the course the learner will be able	
	CO 1:	To know the skills of basic tools
	CO 2:	To get adequate knowledge of different types of wires
	CO 3:	To study the different types of switches

MAPPING OF COs with POs & PSOs:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	M	S	M	M	S	S	S	M
CO2	M	S	M	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	S	M	S
CO5	S	S	S	S	S	M	S	S	S	M

Semester-VI	AEC-III - Physics for Everyday Life	Course Code:
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100
CognitiveLevel	K1-Recalling K2-Understanding K3-Applying K4-Analyzing K5-Evaluating K6-Creating	
COURSE OBJECTIVES	• To know where all physics principles have been put to use in daily life and appreciate the concepts with a better. • To understanding also to know about Indian scientists who have made significant contributions to Physics • To enriches the study beyond the course. • To developing a research framework • Presenting their independent and Intellectual ideas effectively	

UNITS	COURSE DETAILS	
UNIT-I	**MECHANICAL OBJECTS: s**pring scales – bouncing balls –roller coasters – bicycles –rockets and space travel.	4 Hrs
UNIT-II	**OPTICAL INSTRUMENTS AND LASER:** vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – colour photography – holography and laser.	4 Hrs
UNIT-III	**PHYSICS OF HOME APPLIANCES:** bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners	4 Hrs
UNIT-IV	**SOLAR ENERGY:** Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells.	4 Hrs
UNIT-V	**INDIAN PHYSICIST ANDTHEIR CONTRIBUTIONS:**C.V.Raman, HomiJehangirBhabha, Vikram Sarabhai, Subrahmanyan Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology.	4 Hrs
TEXT BOOKS	1. The Physics in our Daily Lives, Umme Ammara, Gugucool Publishing, Hyderabad, 2019. 2. For the love of physics, Walter Lawin, Free Press, New York, 2011.	
WEB RESOURCES	https://youtu.be/MU3PCau7X_k https://youtu.be/SddBPTcmqOk	

COURSE OUTCOMES:

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

COURSEOUTCOMES	**CO1**	• All physics principles have been put to use in daily life and appreciate the concepts with a better.
	CO2	• Understanding also to know about Indian scientists who have made significant contributions to Physics
	CO3	• Enriches the study beyond the course.
	CO4	• Developing a research framework
	CO5	• Presenting their independent and Intellectual ideas effectively

MAPPING OF COs WITH POs & PSOs:

CO/PO	**PO**					**PSO**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	S	M	M	S	S	S	M
CO2	M	S	M	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	S	M	S
CO5	S	S	S	S	S	M	S	S	S	M