Department of Physics (Day)

ACADEMIC YEAR 2020-2021

I to VI Semesters

SCHEME AND SYLLABUS

CONTENTS **PAGE NO.**

SCHEME

SYLLABUS

11. Syllabus of First Semester:

12. Syllabus of Second Semester:

13. Non Major Electives

14. Syllabus of Third Semester:

15. Syllabus of Fourth Semester:

16. Syllabus of Fifth Semester:

17. Syllabus of Sixth Semester:

Institution

VISION

To impart value based quality academia; to empower students with wisdom and to charge them with rich Indian traditions and culture; to invoke the self, to broaden the same towards nation building, harmony and Universal brotherhood.

MISSION

To ensure sustained progress and development in imparting quality education, to pioneer new avenues of teaching and research and to emerge as an institution with potential for excellence.

DEPARTMENT OF PHYSICS

VISION

To train the students to develop the scientific temper, achieve excellence in education in the field of Physics and related areas and equip them with skills, knowledge and become life- long learners.

MISSION

M1	To create an academic base that responds to the need of the students to understand the basics of Physics and it's ever evolving nature of applications in explaining all observed natural phenomenon as well as predicting the future applications to the new phenomenon with a global perspective.
M2	Apply one's knowledge and understanding relating to physics and skills to new/unfamiliar contexts and to identify and analyze problems and issues and seek solutions to real-life problems.
M3	To be a tool for transformation marching in the toad map of our country's vision towards Higher Education.

PROGRAME EDUCATION OBJECTIVES (PEOs)

PEO1	Create the facilities and environment in all the educational institutions to consolidate the knowledge acquired at +2 and to motivate and inspire the

	students to create deep interest in Physics, to develop broad and understanding of physical concepts, principles and theories of Physics.
PE02	Emphasize the discipline of Physics to be the most important branch of science for pursuing the interdisciplinary higher educations and/or research in interdisciplinary and multidisciplinary.
PEO3	Succeed in obtaining job opportunities appropriate to their interests, as well aspire for higher education and cultivate abilities.
PE04	Imparting fundamental and 21st century skills and training to be life – long learners and demonstrate analytical skills and global competency.
PE05	Improve leadership qualities in creating successful citizens with rational thinking and scientific temper.

PEO TO MISSION STATEMENT MAPPING

MISSION STATEMENTS	PEO1	PEO2	PEO3	PEO4	PEO5
M1	2	3	3	3	3
M2	2	3	3	3	2
M3	3	3	3	3	3

CORRELATION: 3- STRONG 2- MEDIUM 1- LOW

PROGRAM OUTCOMES (PO) IN RELATION TO GRADUATE ATTRIBUTES

PROGRAMME OUTCOMES

On completion of B.Sc. Physics program, the students of our Department will be able to:

S.No.	GRADUATE ATTRIBUTES	PROGRAMME OUTCOMES
1.	**Disciplinary knowledge and skills**	Acquire a fundamental, systematic, coherent understanding of the academic field of Physics, its different learning areas applications in basic Physics as well its linkages with related disciplinary areas. **(PO1)**

2.	**Skilled communicator**	Demonstrate relevant problem-solving skills that are required to solve different types of Physics-related problems with well-defined solutions, to develop communication skills involving the ability to listen carefully, to read texts and research papers analytically and to present complex information in a concise manner, to improve analytical skills, to construct logical arguments using correct technical language related to Physics, to develop ICT skills and personal skills such as the ability to work both independently and in a group. Gain necessary skills to communicate various concepts and applications of STEM to peer group and common man. **(PO2)**
3.	**Critical thinker and problem solver**	Plan and execute Physics-related experiments, analyze and interpret the acquired data using appropriate software and report the findings of the experiments while relating the findings to relevant theories of Physics. Develop systematic analysis by deduction analogy, argument and reasoning.**(PO3)**
4.	**Sense of inquiry**	Analyze Nature and laws of Physics by asking relevant questions in a sequential manner by inductive method. **(PO4)**
5.	**Team player/worker**	Collaborate effectively and gain the ability to work both independently and in group. **(PO5)**
6.	**Skilled project manager**	Understand the flow of Project/experimentation; gather men, method and means for its implementation. **(PO6)**
7.	**Digitally Efficient**	Seek e-resources and update Scientific information and skills through ICT tools. **(PO7)**
8.	**Ethical awareness / reasoning**	Demonstrate professional behavior such as being objective, unbiased and truthful in all aspects of work and avoiding unethical,

		irrational behavior such as fabricating, falsifying or misrepresenting data or committing plagiarism; the ability to identify the potential ethical issues in work-related situations; appreciation of intellectual property, environmental and sustainability issues; and promoting safe learning and working environment. **(PO8)**
9.	**National and International perspective**	Participate in global citizen science projects using e-learning materials as well execute proposals of National and International importance. **(PO9)**
10.	**Lifelong learners**	Learn, Unlearn, Relearn as well seeks solution to real life problems. **(PO10)**

Mapping of POs TO PEOs

PEO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
PEO 1	3	3	3	3	3	3	3	3	3	3
PEO 2	3	3	2	3	3	3	2	3	3	3
PEO 3	3	3	3	3	3	3	3	3	3	3
PEO 4	3	3	3	3	3	2	3	3	3	3
PEO 5	3	3	3	3	3	3	2	3	3	3

3-Strong Correlation 2- Medium Correlation 1- Low Correlation

PROGRAM SPECIFIC OUTCOMES

PSO1 - Understand, identify basic principles and concepts of various branches of Physics, correlate and solve the problems in the field of core and applied Physics.

PSO2 - Demonstrate the acquired knowledge of Physics on various scientific issues.

PSO3 - Design various experiments, electronic circuits investigate and become capable problem solver, using mathematical, conceptual and hands on skills.

PSO4 - Apply analytical abilities acquired from the class room / laboratory and promote scientific ideas, harness renewable and nonconventional energy resources.

PSO5 - Appreciate their experimental learning beyond the classroom; construct logical arguments, using technical language, develop programming skills, approach open-ended problems and innovate solutions.

Above 1 to 3 goals are foundational goals leading to fundamental understanding of Physics. All the courses and various modules on the courses are built on the foresaid goals. The goals 3 to 5 are realized through laboratory experiments, projects and e- learning resources.

DEPARTMENT OF PHYSICS

ELIGIBILITY FOR ADMISSION

A pass in the Higher Secondary Examination by the Govt. of Tamil Nadu or an Examination accepted as equivalent thereof by the Syndicate of the University of Madras with Physics and Mathematics as major subjects of study.

DURATION OF THE COURSE

Duration of the course is three academic years consisting of six semesters. And each semester comprises of not less than 90 working days.

B.Sc. Physics Curriculum

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 education

criteria course framework and integrated common regulations under CBCS of University of Madras. The learner-centric courses let the student progressively develop a deeper understanding of various aspects of physics. 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, students also learn Physics Laboratory methods for different branches of physics, specialized measurement techniques, analysis of observational data, including error estimation. Students will have deeper understanding of laws of nature through the subjects like classical Mechanics, quantum mechanics, statistical physics etc. Students' ability of problem Solving will be enhanced. Students can apply principles in physics to real life problems. Subjects like integrated electronics and microprocessors will enhance the logical skills as well as employability skills. Numerical methods and mathematical Physics provides analytical thinking and provides a better platform for higher level Physics and research. The restructured courses with well defined objectives and learning outcomes, provides guidance to prospective students in choosing the elective courses to broaden their skills in the field of physics and interdisciplinary areas. Elective modules of the framework offer students choice to gain knowledge and expertise in specialized domains of physics like astrophysics, medical physics, etc.

ELIGIBILITY FOR THE AWARD OF DEGREE

A candidate shall be eligible for the award of the degree only if she/he has undergone prescribed course of study for a period of not less than three academic years and passed the examination of all the six semesters prescribed earning a minimum of 140 credits as per the distribution given for Part I, II, III, IV & V and also fulfilled such other conditions as have been prescribed thereof.

SCHEME OF EXAMINATIONS

As per the university regulation the following split up of marks for theory and practical are to be followed.

(i) SPLIT UP FOR INTERNAL AND EXTERNAL MARKS FOR THEORY AND PRATICAL PAPER:

S.No.	Paper	Internal	External	Total
1.	Theory	40	60	100
2.	Practical	40	60	100

(ii) SPLIT UP FOR INTERNAL ASSESSMENT MARKS (40) FOR THEORY:

CIE- Continuous Internal Evaluation (40 Marks)

Bloom's Category	Tests	Attendance	Quizzes, Assignments, Seminars, etc	Current Affairs, Hands-on activities, etc
Marks (out of 50)	**20**	**5**	**5**	**10**
Remember			5	
Understand		5		
Apply	10			10
Analyze	5			
Evaluate	5			
Create				

(iii) SPLIT UP FOR INTERNAL ASSESSMENT MARKS (40) FOR PRACTICALS:

CIE- Continuous Internal Evaluation (40 Marks)

Bloom's Category	Tests	Attendance	Record
Marks (out of 50)	**20**	**5**	**5**
Remember			5
Understand		5	
Apply	5		
Analyze			
Evaluate	5		
Create	10		

iv) ESE- Semester End Examination - THEORY (Exam for 100 Marks; weightage 60%)

Bloom's Category	Weightage %
Remember	20
Understand	20
Apply	30
Analyse	15

Evaluate	10
Create	5

v) ESE- Semester End Examination – PRACTICALS (Exam for 100 Marks; weightage 60%)

Bloom's Category	Weightage %
Remember	5
Understand	20
Apply	15
Analyse	20
Evaluate	15
Create	20

COURSE STRUCTRURE

Scheme of First Semester

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART I	Language Paper I	4	3	3	60	40	100
2	PART II	English Paper I	4	3	3	60	40	100
3	PART III	**Core Paper I** Mechanics and Properties of Matter	6	5	3	60	40	100
		Core Practical I	3	Practical examination at the end of Semester II				

4		Allied Mathematics 1	9	5	3	60	40	100
5	Part IV	Non-Major Elective NME / Basic Tamil	2	2	3	60	40	100
6		Soft Skill I	2	2	3	60	40	100
	Total		30	20		360	240	600

Scheme of Second Semester

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART I	Language Paper II	4	3	3	60	40	100
2	PART II	English Paper II	4	3	3	60	40	100
3	PART III	**Core Paper II** Thermal Physics and Acoustics	6	5	3	60	40	100
		Core Practical I	3	4	3	60	40	100
4		Allied Mathematics II	9	5	3	60	40	100
5	Part IV	Non-Major Elective/ Basic Tamil	2	2	3	60	40	100
6		Soft Skill II	2	2	3	60	40	100
	Total		30	24		420	280	700

Scheme of Third Semester

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART I	Language Paper III	6	3	3	60	40	100
2	PART II	English Paper III	4	3	3	60	40	100
3	PART III	**Core Paper III** Optics	6	5	3	60	40	100
		Core Practical II	3			Practical examination at the end of Semester IV		
4		Allied Chemsitry I	6	5	3	60	40	100
5		Allied Chemistry Practicals	3	Practical examination at the end of Even Semester				
6	Part IV	Environmental Studies EVS	2	Examination at the end of Even Semester				
7		Soft Skill III	2	2	3	60	40	100
	Total		30	18		300	200	500

Scheme of Fourth Semester

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART I	Language Paper IV	6	3	3	60	40	100
2	PART II	English Paper IV	4	3	3	60	40	100

3	PART III	**Core Paper IV** Atomic Physics	6	5	3	60	40	100
		Core Practical II	3	4	3	60	40	100
4		Allied Chemistry II	6	5	3	60	40	100
5		Allied chemistry Practicals	3	5	3	60	40	100
6	Part IV	Environmental Studies EVS	2	2	3	60	40	100
7		Soft Skill III	2	2	3	60	40	100
	Total		30	29		480	320	800

Scheme of Fifth Semester

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART III	**Core Paper V** Electricity and Electromagnetism	5	5	3	60	40	100
2		**Core Paper VI** Mathematical methods in Physics	5	5	3	60	40	100
3		**Core Paper VII** Solid State Physics	4	5	3	60	40	100
4		**Core Paper VIII** Basic Electronics	4	5	3	60	40	100

5		**Elective I** ffffff. Applied Electronics **or** ggggggg. Problem Solving in Physics **or** hhhhhh. Numerical Methods	4	4	3	60	40	100
6		Core Practical III	3	Practical examination at the end of Semester VI				
7		Core Practical IV	3					
8		Core Practical V	2					
9	PART IV	Value Education	-	2				100
	Total		30	26				600

Scheme of Sixth Semester

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART III	**Core Paper IX** Relativity and Quantum Mechanics	6	5	3	60	40	100
2		**Core Paper X** Nuclear and Particle Physics	6	5	3	60	40	100
3		**Elective II** vv. Digital Electronics **or**	5	4	3	60	40	100

		ww. Medical Physics **or** xx. Geo Physics						
4		**Elective III** rrrr. Microprocessor Fundamentals or ssss. Astrophysics or tttt. Fiber Optics or uuuu. Weather Forecasting	5	4	3	60	40	100
6		Core Practical III	3	4	3	60	40	100
7		Core Practical IV	3	4	3	60	40	100
8		Core Practical V	2	3	3	60	40	100
9	PART IV	Extension activities	-	1				
	Total		30	30		480	220	700

ALLIED PHYSICS

S.No.	Semester	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	Odd Semester	Allied Physics I	6	5	3	60	40	100
2		Allied Practicals	3	Practical Examination at the end of Even semester				
3	Even Semester	Allied Physics II	5	5	3	60	40	100
4		Allied Physics Practicals	3	4	3	60	40	100

Question Paper Pattern for B.Sc Physics Degree Course based on CBCS Pattern

(except non-major elective)

THEORY

Maximum Ext. Marks: 100
Duration: 3 hours

PART A (50 words)

To answer 10 questions
out of 12 questions (at least two questions from each unit) 10x2marks=20 marks

PART B (200 words)

To answer 5 questions
out of 7 question (at least one question from each unit) 5X7 marks=35 marks

PART C (500 words)

To answer 3 questions
out of 5 question (at least one question from each unit) 3X15marks=45 marks

Total 100 marks

PRACTICALS

Maximum Ext. Marks: 60
Duration: 3 hours

The external examiner will prepare a question paper on the spot with the help of the Question Bank supplied by the controller's office.

Practical Exam will be conducted ONLY at the end of even semester of every academic year

SEMESTER – I

(SYLLABUS)

MECHANICS AND PROPERTIES OF MATTER

Course Code : 09101	**Credits : 5**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

Mechanics is a branch of Physics dealing with study of motion which is a fundamental idea in all of Science. A study of the properties of Matter leads to information which is of practical value to both the physicist and the engineers and also gives us some information about the internal forces which act between the Constituent parts of the substance. The students who undergo this course are successfully bound to get a better insight and understanding of the subject Mechanics and Properties of Matter.

Course Outcomes: At the end of the Course, the Student will be able to:

Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) , K6(Creating)

CO1	To Discuss and use Laws of impact, study the behavior of rigid body dynamics.	**K2,K3**
CO2	Examine the definition for centre of gravity in hemisphere, hollow hemisphere, etc.	**K3,K4**
CO3	Study the elastic behavior in terms of three modulii of elasticity and working of torsion Pendulum. Study of bending of beams and analyze the expression for Young's Modulus.	**K3,K4**
CO4	Analyze the performance of hydrostatic and hydrodynamics.	**K3**
CO5	Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface. Soap films provide an analogue solution to many engineering problems.	**K2,K3**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**

CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**

S.No.	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Unit 1: Impulse and Impact** Impulse – impact – Laws of impact – direct impact and oblique impact between two smooth spheres – loss of kinetic energy – conservation of linear momentum –- motion of two interacting bodies – reduced mass- reduction of two body problem into single body problem. **Gravitation** Moment of inertia – Parallel axes theorem – moment of inertia of hollow sphere, solid cone - Compound pendulum – theory – equivalent simple pendulum – reversibility of centre of oscillation and suspension –determination of g and k– Newton's law of gravitation(statement) - Determination of G by Cavendish method - Kepler's law (statement).	**1**	**CO1**
2	**Unit 2: Statics, hydrostatics** Centre of parallel forces – Centre of mass – Centre of gravity – Centre of gravity of uniform triangular lamina – Centre of gravity of uniform parallelogram lamina, solid and hollow hemisphere – Centre of pressure – vertical rectangular lamina – vertical triangular lamina – condition for equilibrium of a floating body	**1**	**CO2**

	Hydrodynamics Streamline and turbulent flow - equation of continuity of flow –Euler's equation of unidirectional flow – Torricelli's theorem – Bernoulli's theorem - applications – Venturimeter – Pitot's tube – atomizer pump – Bunsen burner		
4	**Unit 4: Bending of beams** Cantilever – expression for bending moment – expression for depression – cantilever oscillations – 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 pin and microscope by non uniform method – experiment to determine Young's modulus by optic lever method – I-form girders	**1**	**CO4**
5	**Unit 5: Fluid dynamics** Surface tension - definition – excess of pressure over curved surface – spherical drop – cylindrical drop – spherical bubble – cylindrical bubble - determination of surface tension by drop weight method – experiment to determine interfacial surface tension – surfactants – variation of surface tension with temperature – Jaegar's method. Viscosity - definition – Coefficient of viscosity of liquid – critical velocity – Rate of flow of liquid in a capillary tube – Poiseuille's formula –experimental determination by capillary flow method – variation of viscosity of a liquid with temperature – Viscosity of gases – Rankine's method – Application.	**1**	**CO5**

TEXT BOOKS:

1. M. Narayanamoorthy. Mechanics – Part I and II, National Publishing Company.

2. D.S. Mathur (2001). Mechanics (2nd Edition), S. Chand &Co.

3. M. Narayanamoorthy & N. Nagarathinam (1989). Statistics, Hydrostatics and Hydrodynamics, National Publishing Company, Chennai.

4. Brij Lal and N. Subramaniam (1994). Properties of Matter, S. Chand & Co., New Delhi.

5. D.S. Mathur (2001). Elements of Properties of Matter, S. Chand & Co., New Delhi.

REFERENCE BOOKS:

1. C.J. Smith (1960). General Properties of Matter, Orient Longman Publishers.

2. D. Halliday, R. Rensick and J.Walker (2001). Fundamentals of Physics (6th edition), Wiley New York.

3. P.K. Chakrabarthy (2001). Mechanics and General Properties of Matter, Books and Allied (P) Ltd.

4. H.R. Gulati (1982). Fundamentals of General Properties of Matter, S. Chand & Co., New Delhi.

WEB LINKS :

https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html

https://www.youtube.com/watch?v=gT8Nth9NWPM

https://www.youtube.com/watch?v=9mXOMzUruMQ&t=1s

https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s

https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

https://learningtechnologyofficial.com/category/fluid-mechanics-lab/

ALLIED PHYSICS PAPER – I

(For I B.Sc. Mathematics students)

Course Code : 09102	**Credits : 05**
L: T: P: S : 6:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives: *Demonstrate basic principles of physics and one's knowledge of physics relate theoretical concepts acquired at schooling level to do experiments.*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) ,K5(Evaluating) ,K6(Creating)

CO1	Explain SHM, Extend their knowledge in the study of various dynamic motions analyzes and it demonstrates mathematically.	**K2,K4**
CO2	Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life.	**K3**
CO3	Comprehend basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of flow temperature physics in the background o0f growth of this technology.	**K5**
CO4	Articulate the knowledge about electric current resistance, capacitance in terms of potential electric field and electric correlate the connection between electric field and magnetic field and analyze them mathematically verify circuits and apply the concepts to construct circuits and study them.	**K3,K4.K6**
CO5	Apply the basic knowledge of principles and theory about behaviors of light and explain several phenomena we observe in daily the using mathematically interpretation.	**K2,K3**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 moderately correlated – 2 weakly correlated –1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**

Sl NO	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Unit 1: Waves and Oscillations** Simple harmonic motion – composition of two simple harmonic motion at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of a.c frequency using sonometer (steel and brass wires) – ultrasonics – production – piezoelectric	**1**	**CO1**

	method – application of ultrasonics – reverberation – factors for good acoustics of hall and auditorium.		
2	**Unit 2: Properties of matter** Elasticity: Elastic constant – bending of beam – theory of non- uniform bending – determination of Young's modulus by non uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum – static torsion. Viscosity: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method Surface tension: definition – molecular theory of surface tension – excess of pressure inside a drop and bubble – drop weight method – interfacial surface tension.	**1**	**CO2**
3	**Unit 3: Thermal Physics** Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of gases – Linde's process – adiabatic demagnetization – Curie's law – thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle-efficiency – entropy – change of entropy in reversible and irreversible process.	**1**	**CO3**
4	**Unit 4: Electricity and Magnetism** Resistors – Ohm's law – series and parallel – potentiometer – principle – measurement of thermo emf using potentiometer – capacitor – energy of a charged capacitor – loss of energy due to sharing of charges – magnetic field due to a current carrying conductor – Biot Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an ac circuit – switches and its types – fuses.	**1**	**CO4**
5	**Unit 5: Geometrical optics** Refraction – laws of refraction – refractive index using a microscope – critical angle – air cell – refraction through a prism – angle of minimum	**1**	

	deviation – dispersion through a prism – spectrum – dispersive power – refraction at grazing incidence and grazing emergence in prisms – combination of two small angled prisms to produce dispersion without deviation and deviation without dispersion.		**CO5**

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Resnick Halliday and Walker (2018). Fundamentals of Physics (11th edition), John Willey and Sons, Asia Pvt. Ltd., Singapore.
2. V.R.Khanna and R.S.Bedi (1998). Text book of Sound (1st edition), Kedharnaath Publish & Co, Meerut.
3. N.S. Khare and S.S. Srivastava (1983). Electricity and Magnetism (10th Edition), Atma Ram & Sons, New Delhi.
4. D.R. Khanna and H.R. Gulati (1979). Optics, S. Chand & Co. Ltd., New Delhi.

WEB LINKS:

https://youtu.be/M_5KYncYNyc

https://youtu.be/ljJLJgIvaHY

https://youtu.be/7mGqd9HQ_AU

https://youtu.be/h5jOAw57OXM

http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html

https://www.youtube.com/watch?v=gT8Nth9NWPM

https://www.youtube.com/watch?v=9mXOMzUruMQ&t=1s

https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s

https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

https://learningtechnologyofficial.com/category/fluid-mechanics-lab/

SEMESTER II

THERMAL PHYSICS AND ACOUSTICS

Course Code : 09204	**Credits : 5**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

Thermal Physics forms one of the core foundations of Modern Physics and plays a significant role in understanding Condensed Matter Physics, Material Science, even to High Energy Physics and Astrophysics. The study of Acoustics helps the students to understand the significance of their field in the study of geologic, atmospheric phenomena, medicine. Thermal Physics and Acoustics serve as an introductory course to Statistical Mechanics.

Course Outcomes: At the end of the Course, the Student will be able to:

Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	To acquire 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	**K2**

	to understand cryogenics, superconductivity, superfluidity and Condensed Matter Physics	
CO2	Derive the efficiency of Carnot's engine. Draw the significance of first law and second law of thermodynamics. Discuss the implications of the laws of Thermodynamics in diesel and petrol engines and analyze their performance of thermodynamic systems viz efficiency by problems. An Insight into thermodynamic properties like enthalpy, entropy.	**K4**
CO3	Study the process of thermal conductivity and apply it to good and bad conductors.	**K3**
CO4	Understand physical characteristics of SHM and obtaining solution of the oscillator using differential equations. Use Lissajous figures to understand SHM vibrations of same frequencies and different frequencies.	**K3**
CO5	Familiarize with general terms in acoustics like intensity, loudness, reverberation, etc., and study in detail about production, detection, properties and uses of ultrasonic waves.	**K2**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**

Sl	**CONTENTS OF MODULE**	**Hrs**	**COs**

NO			
1	**Unit 1: Thermometry and Calorimetry** Platinum resistance thermometer – Calendar and Griffith's bridge – thermistor – specific heat capacity – specific heat capacity of solids – Dulong and Petit's law – specific heat capacity of liquid – method of mixtures –half time correction – specific heat capacity of gases – Meyers relation. **Low temperature physics** Joule-Kelvin effect – porous plug experiment - significance of Boyle temperature -temperature of inversion – liquefaction of gases – Linde's method of liquefying air.	**1**	**CO1**
2	**Unit 2: Thermodynamics** Thermodynamic equilibrium – zeroth law of thermodynamics – first law of thermodynamics – Reversible and irreversible processes – second law of thermodynamics-Heat engine – Carnot's engine – Carnot's theorem – Internal combustion engines – petrol and diesel engines – thermodynamic scale of temperature (No derivation) - Entropy – entropy and available energy – temperature – entropy diagram for Carnot's cycle - III Law of thermodynamics – Nernst's heat theorem.	**1**	**CO2**
3	**Unit 3: Conduction and Radiation** Prevost's theory of heat exchange – Kirchoff's Law - thermal conductivity – rectilinear flow of heat – thermal conductivity of a good conductor – Forbe's method – thermal conductivity of a bad conductor – Lee's disc method – radiation – blackbody radiation – Wien's law – Stefan's law – Rayleigh Jeans Law –Planck's law (no derivation), Newton's law of cooling	**1**	**CO3**

	from Stefan's law – Solar constant – Pyroheliometer – temperature of sun and other stellar objects.		
4	**Unit 4: Waves and Oscillations** Simple harmonic motion - combination of two SHMs in a straight line – at right angles – Lissajous figures - uses – free, damped, forced oscillations and resonance – examples and application of resonance – laws of transverse vibration – determination of frequency of a tuning fork using sonometer – determination of a.c. frequency using sonometer – steel wire – brass wire.	**1**	**CO4**
5	**Unit 5: Ultrasonics and Architectural acoustics** Ultrasonics – production – piezo electric crystal method – magnetostriction method – diffraction of ultrasonics waves – ultrasonic interferometer – ultrasonic grating applications. Acoustics of buildings – reverberation – absorption coefficient – Sabine's formula – acoustics aspects of halls and auditoriums – intensity and loudness of sound – intensity level – decibel – noise pollution.	**1**	**CO5**

TEXT BOOKS:

1. D.S. Mathur (1993). Heat and Thermodynamics, Sulthan Chand & Sons, New Delhi.

2. Brijlal and N. Subramanyam (2000). Heat and Thermodynamics S.Chand & Co, New Delhi.

3. Narayanamoorthy and KrishnaRao (1969). Heat, Triveni Publishers, Madras.

4. V.R.Khanna and R.S.Bedi (1998). Text book of Sound (1st edition), Kedharnaath Publish & Co, Meerut.

5. Brijlal and N. Subramanyam (2001). Waves and Oscillations, Vikas Publishing house, New Delhi.

6. Ghosh, (1996). Text book of Sound, S.Chand & Co, New Delhi.

REFERENCE BOOKS:

1. Zemansky (2011). Heat and Thermodynamics (8th edition), McGraw Hill Book Co. Inc., New York.

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

3. Carroll M. Leonard (1965). Fundamentals of Thermodynamics, Prentice-Hall of India (P) Ltd., New Delhi.

4. J.B. Rajam and C.L. Arora (1976). Heat and Thermodynamics (8th edition), S. Chand & Co. Ltd., New Delhi.

5. Jin Sheng Hieh (1975). Principles of Thermodynamics (1sedition), McGraw – Hill Kogakusha Ltd., Tokyo.

6. Warren Giedt (1971). Thermodynamics (1st edition), Van Nostrand Reinhold Company, New York.

WEB LINKS:

https://youtu.be/M_5KYncYNyc

https://youtu.be/ljJLJgIvaHY

https://youtu.be/7mGqd9HQ_AU

https://youtu.be/h5jOAw57OXM

https://www.youtube.com/watch?v=4M72kQulGKk&vl=en

CORE PRACTICAL-I

Course Code : 09207	**Credits : 4**
L: T: P: S : 0:0:3:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

This course opens the window to the students about

- *the methods of experimental physics*

- *the Emphasis to laboratory techniques as accuracy of measurements & data analyze*
- *Concept that is learnt in the classroom will be translated to the laboratory sessions thus providing a hands-on leaving experience.*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Apply the knowledge of mathematics physics fundamentals and using instrumentation, technics to arrive at solutions for various problems.	K3
CO2	Translate basics laws and theories to demonstrations to determine various preparations of materials given.	K2
CO3	Relate application of experiment in real life situation.	K3
CO4	Demonstrate experiments involving basic concept of properties of matter, sound, heat, optics and usage of KT tools.	K3

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**

LIST OF EXPERIMENTS:

1. Young's modulus – Non-uniform bending – Pin & microscope
2. Young's modulus – Uniform bending – Optic lever – scale and telescope
3. Rigidity modulus – Torsional pendulum (without identical masses)
4. Rigidity modulus and moment of inertia – Torsional pendulum (with identical masses)
5. Surface tension and interfacial surface tension – drop weight method

6. Coefficient of viscosity of liquid using graduated burette (radius of capillary tube by Mercury pellet method)
7. Comparison of viscosity of liquid by burette method – Hare's apparatus given
8. Sonometer – Verification of laws and frequency of tuning fork
9. Sonometer – Relative density of a solid and liquid
10. Specific heat capacity of a liquid – Newton's law of cooling
11. Specific heat capacity of liquid – Method of mixtures (Half-time correction)
12. Focal length, Power, R and refractive index of a long focus convex lens
13. Focal length, Power, R and refractive index of a concave lens
14. Spectrometer – refractive index of a liquid – hollow prism
15. P.O. Box – Temperature coefficient of resistance of a coil Note: Use of Digital balance is permitted
16. Error and statistical analysis of data
17. Plotting graphs using software for a given data
18. Learning to use software to detecting the values of electrical components and basics laws of physics

SEMESTER – II

Allied Physics – II

(For I B.Sc. Mathematics students)

Course Code : 09205	**Credits : 5**
L: T: P: S : 6:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

Understand the basic concepts of optics, modern physics, concepts of relativity and quantum physics, semiconductor physics, and digital electronics. Plan and execute experiments and appropriate methods.

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) ,K5(Evaluating) ,K6(Creating)

CO1	Explain the concepts of Interference diffraction using principles of superposition of waves, Interpret wave patterns,	K2
CO2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation. Appreciate interdisciplinary nature of science.	K3,K4
CO3	Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on delay rate half life and mean life. Interpret nucleus process like fission fusion and production of nuclear energy in nuclear reactors atom bombs and stars.	K3,K2
CO4	To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and translate the mathematical equation to physical concepts and vice versa.	
CO5	Summarize the working of semiconductor devices like junction diode, zener diode, transistors. Interpret the real life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and acquire elementary ideas of IC circuits.	K2
CO6	Construct circuits using semiconductor devices and ICs and analyze their working.	K3,K4

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**

CO3	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**
CO4	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO6	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

S. NO	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Unit 1: Physical Optics** Velocity of light – Michelson's method - Interference – interference in thin films - Colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – test for optical flatness – Diffraction – bending of light vs. bending of sound - theory of transmission grating – normal incidence – experimental determination of wavelength using diffraction grating - polarization – polarization by double reflection – Brewster's law – optical activity.	**1**	**CO1**
2	**Unit 2: Atomic Physics** Atom model – Bohr atom model – mass number – atomic number – nucleons- vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration of elements and periodic classification of elements - Bohr magneton – Stark effect –Zeeman effect (Elementary ideas only) – ionization potential - Frank and Hertz experiment.	**1**	**CO2** **CO3**
3	**Unit 3: Nuclear Physics** Nuclear model – liquid drop model – magic numbers - shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and its uses –controlled and uncontrolled chain reaction - nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor – breeder reactor	**1**	**CO4**

	– nuclear fusion - thermonuclear reactions – difference between fission and fusion.		
4	**Unit 4 : Elements of relativity** Frame of reference - postulates of special theory of relativity – Galilean transformation equations - Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox - mass energy equivalence	**1**	**CO5**
5	**Unit 5: Electronics** Basic Electronics: pn junction diode - forward and reverse biasing - characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – junction transistor – CE mode characteristics– LED – theory – Construction and working - uses. Digital Electronics: OR, AND, NOT, NAND and NOR logic gates – universal building blocks – Boolean algebra – De Morgan's theorem – verification – elementary ideas of ICs.	**1**	**CO6**

TEXT BOOKS:

1. R. Murugesan (2005). Allied Physics, S. Chand& Co, New Delhi.
2. K. Thangaraj and D. Jayaraman (2004). Allied Physics, Popular Book Depot, Chennai.
3. Brijlal and N. Subramanyam (2002). Text book of Optics, S. Chand & Co, New Delhi.
4. R. Murugesan (2005). Modern Physics, S.Chand& Co, New Delhi.
5. A. Subramaniyam Applied Electronics (2nd Edition), National Publishing Co., Chennai.

REFERENCE BOOKS:

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

WEB LINKS:

https://www.berkshire.com/learning-center/delta-p-facemask/

https://www.youtube.com/watch?v=QrhxU47gtj4

https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo

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

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

https://www.validyne.com/blog/basics-pneumotach-flow-measurement/

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

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

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

https://books.google.co.in/books?id=grqxTeY1z4oC&pg=PA897&lpg=PA897&dq=size+of+nitrogen+molecule+and+blue+light&source=bl&ots=hC0V9FvzP-&sig=ACfU3U270Hhk0SD3yXV10QDHjPrC1qGnDg&hl=en&sa=X&ved=2ahUKEwjKgrP6rvzpAhWNyDgGHRB_DGYQ6AEwDnoECA0QAQ#v=onepage&q=size%20of%20nitrogen%20molecule%20and%20blue%20light&f=false

https://youtu.be/JLz7qASICYU

https://youtu.be/u6m4lI-qZ58

https://youtu.be/C0HsQykDdKg

Allied Physics – Practical

(For I B.Sc. Mathematics students)

Course Code	**: 09208**	**Credits**	**: 5**
L: T: P: S	**: 0:0:3:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

Learning Objectives:

The aim of this course is to enable the students to gain practical knowledge of various basic concepts of physics.

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Relate scientific methods and recall the process of measuring different physical variables.	(K2)
CO2	Demonstrate the fundamentals of instrumentation data acquisition and interpretation of results.	(K2)
CO3	Apply the concepts of Physics to understand material properties.	(K3)
CO4	Experiment with fundamental of optics, acoustics, electricity and magnetism.	(K3)

Mapping of Course Outcomes to Program Outcomes:
Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**

LIST OF EXPERIMENTS:
(Any 15 experiments)

1. Young's Modulus by Non-uniform bending using Pin and Microscope
2. Young's Modulus by Non-uniform bending using Optic lever – Scale and telescope
3. Rigidity modulus by Static torsion method
4. Rigidity modulus by torsional oscillations without mass
5. Surface tension and interfacial tension – Drop Weight method – Hare's apparatus given.
6. Comparison of viscosities of two liquids – Burette method
7. Specific heat Capacity of a liquid – Half time correction
8. Sonometer – Determination of a.c frequency
9. Newton's rings - Radius of curvature
10. Air wedge – Thickness of a wire
11. Spectrometer – Grating – Wavelength of Mercury lines – Normal Incidence
12. Potentiometer – low range Voltmeter Calibration
13. P.O. Box – Specific resistance of a coil
14. Figure of merit – Table Galvanometer
15. Construction of AND, OR, NOT gates – using diodes and transistor

16. Zener Diode – Study of Characteristics
17. NAND gate as a Universal logic gate
18. NOR gate as a Universal logic gate
19. Verification of De Morgan's Theorems.
20. Deflection magnetometer – Field along the axis of the coil – Determination of BH.
21. Refraction order of liquid hollow prism – Spectrometer
22. Determination of latitude and longitude of a place
23. Junction diode - study of characteristics
24. Refraction order of solid prism – Spectrometer

Note: Use of digital balance is permitted

NON MAJOR ELECTIVE PAPERS

Learning Objectives:

By studying this course students will be able to

- *Demonstrate her/his understanding of facts and ideas on various facts of Physics.*
- *Relate the strong contribution to Laws of Nature and daily life.*

1. PHYSICS IN EVERYDAY LIFE - I

Course Code : 09103	**Credits : 2**
L: T: P: S : 2:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Extend the basic knowledge of workforce energy to understand real life happening.	K2,K3
CO2	Relate different forms of energy and interpret working of various appliances / concepts involving energy.	K2,K3
CO3	Demonstrate the application of heat energy in everyday life.	K2,K3
CO4	Build the concepts and understanding about light its proportion various phenomena.	K2,K3
CO5	Extend the knowledge of heat to understand the principle behind various happenings day to life.	K2,K3

Mapping of Course Outcomes to Program Outcomes:
Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**

CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Sl NO	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	Unit-1: Force- Newton's laws of motion- circular motion – centripetal force – centrifugal force. Principle Behind Centrifuge – washing machine. Reason Behind 1) We weigh less in moon. 2) Long jump athletes run a little before they jump. 3) Iron nails, safety pins which have sharp edge poke easily, polished knife cut easily. 4) While jumping around in a bike with high speed, if the rider loses his control, why is he thrown outside? 5) Speed increases when we slide.	**1**	**CO1**
2	**Unit-2:** Energy – different forms of energy – Law of conservation of energy. Principle Behind Electric bulb-tube light-CFL bulbs. Reason Behind 1) Electric bulb adds to global warming. 2) Electric bulbs are replaced by CFL. 3) TV flickers when cell phone nearby rings? 4) Why tube light does not give shadow unlike an electric bulb? 5) Why are LED arrays used for illuminating in these days instead of fluorescent tubes?	**1**	**CO2**
3	**Unit-3:** Boiling point – variation of boiling point with pressure – latent heat. Principle Behind Pressure cooker – microwave oven – milk boiler – fridge. Reason Behind 1) Metal vessels must not be used in microwave oven. 2) Salt is used to melt ice on roads during winter. 3) Cooking in a pressure cooker saves fuels and time. 4) While glucose is dissolved in water, water becomes cold. 5) When detergents dissolve in water it gives out heat.	**1**	**CO3**
4	**Unit-4:** Light – reflection. Principle Behind Traffic sticker – laws of reflection – total internal reflection – refraction – constructive interference – destructive interference - diamonds glow. Reason Behind 1) Why do stars twinkle? 2) Why do we get rainbow? 3) Deep swimming pools look shallow. 4) Peacock feathers, soap bubbles	**1**	**CO4**

	give beautiful colors. 5) We use black umbrellas to protect ourselves from sunlight.		
5	**Unit-5:** Expansion due to heat – evaporation. Principle Behind Mud pot - cool drink straw- why do we sweat. Why it is so? 1. Wet clothes that are spread out dry faster 2. Hot milk kept in big bowl cool faster 3. Why we are not able to open our closed wooden door easily during rainy season? 4. Why do rails have links in between? 5. Why does glass bottle with hot water breaks when we suddenly pour cold water on it?	**1**	**CO5**

TEXT BOOKS:

1. The Learner's series – Everyday science. Jean Lave, Published by Infinity Books, New Delhi
2. Sujatha (2007). Ean? Etharku? Eppadi? Vol I & II, Vikatan publishers Chennai.
3. Kasturi Ranga (2006). The Hindu speaks on Science, Vol I & II Publishers, Chennai.
4. Q-Series, How and Why-Popular Science books, NISCAIR, New Delhi.
5. P.Ayngaranesan (2007). Theriyuma?, Arumbu Publishers, Chennai.

2. PHYSICS IN EVERYDAY LIFE – II

Learning Objectives:

By studying this course students will be able to

- *Demonstrate her/his understanding of facts and ideas on various facts of Physics.*
- *Relate the strong contribution to Laws of Nature and daily life.*

Course Code : 09206	**Credits : 2**
L: T: P: S : 2:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Apply the idea of Bernoulli's theorem to interpret various important things around us.	K2,K3
CO2	Summarize principles of physics to understand the concept of real life situation.	K2,K3
CO3	Plan experiments to translate the learning into hands on activities.	K2,K3
CO4	Relate the optical phenomena in sky and space with knowledge of light.	K2,K3
CO5	Construct demonstration and build on the basic ideas on sound and acoustics.	K2,K3

Mapping of Course Outcomes to Program Outcomes:
Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Sl NO	CONTENTS OF MODULE	Hrs	COs
1	**Unit-1: Bernoulli's theorem.** Principle Behind Gas stove burner- room- spray- fan- atomizer- syringe. Reason Behind 1. We should not stand at the edge of the platform, when the express train crosses the station 2. LPG gas has peculiar odor 3. Blades in a fan are slightly curved 4. When wind blows strongly why roofs fly away not pushed down. 5. You get water in showers forcefully.	**1**	**CO1**
2	**Unit-2: surface tension – capillary rise – osmosis.** Principle Behind Wick in oil lamp – rain coat. Reason Behind 1. Soap removes dirt and detergents clean clothes. 2. Some insects are able to walk on water 3. Water from soil goes to plants 4. Pickle becomes saltier and smaller 5. Gulab jamun become sweeter and swell.	**1**	**CO2**
3	**Unit-3: Friction – lubrication – Newton's law of gravitation.** Principle Behind Speed breaker – walking stick and crutches. Reason Behind 1. We get high tide during new moon and full moon day 2. A snake cannot crawl on smooth surface and lizard cannot move on tiles 3. Why do not we get eclipse during every new moon and full moon? 4. Planets revolve round the sun. 5. We use oil along with fuel in vehicles	**1**	**CO3**
4	**Unit-4: Myopia – Hypermetropia – power of lens.** Principle Behind Contact lens - reading lens- spectacles correct short sightedness- spectacles corrects long sightedness. Reason Behind 1. Cotton kept under lens burnt in sunlight 2. Sky is blue 3. Sky appears reddish during sun rise and sunset 4. Dust particle in path of sunray passing through a small hole in a dark room becomes more visible. 5. Space above atmosphere is colorless.	**1**	**CO4**
5	**Unit-5: Sound waves – reverberation – echo – noise - earth quake – Ritcher scale.** Principle Behind Reason Behind 1) Sound is heard first in TV, before picture, while lightning is seen before thunder. 2) We get less noise outside, when people talk inside glass room and also we don't hear noise from outer space. 3) Bursting of balloon or electric bulb produce noise. 4) Building	**1**	**CO6**

	reverberates (or) glass panes crack sometimes when an aero plane passes. 5) Gravels are put in between the rails in railway tracks.		

TEXT BOOKS:

1. The Learner's series – Everyday science – Published by Infinity Books, New Delhi

2. Sujatha (2007). Ean? Etharku? Eppadi? Vol I & II, Vikatan publishers Chennai.

3. Kasturi Ranga (2006). The Hindu speaks on Science, Vol I & II Publishers, Chennai.

4. Q-Series, How and Why-Popular Science books, NISCAIR, New Delhi.

5. P.Ayngaranesan (2007). Theriyuma?, Arumbu Publishers, Chennai.

3. ASTROPHYSICS

Learning Objectives:

By studying this course students will be able to

- *Demonstrate her/his understanding of facts and ideas on various facts of AstroPhysics.*
- *Relate the strong contribution to astronomical instruments, solar system, universe , galaxies.*

Course Outcomes: At the end of the Course, the Student will be able to:

Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Extend the knowledge of optics to understand the working various astronomical instruments	K2,K3
CO2	Outline various physical concepts of Solar System	K2,K3
CO3	Interpret the Solar System based on various models	K2,K3
CO4	Rephrase the concept of Stellar revolution under white dwarf – Supernovae	K2,K3
CO5	Apply their knowledge and develop cognition about theories of universe and galaxies	K2,K3

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	PO										PSO				
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Sl NO	CONTENTS OF MODULE	Hrs	COs
1	**Unit 1: Astronomical instruments** Optical telescopes-refracting telescope-reflecting telescope- types of reflecting telescopes – detectors and image processing	1	CO1
2	**Unit 2: Solar system** The Sun- physical and orbital data-photosphere-chromosphere-corona-solar prominences – sunspot - solar flare- mass of the sun- solar constant- temperature of the sun- sources of solar energy-solar wind.	1	CO2 CO3
3	**Unit 3: Members of the solar system** Mercury – Venus- Earth – Mars – Jupiter- Saturn- Uranus- Neptune- Pluto- Moon – Bode's law – asteroids- comets – meteors.	1	CO4

4	**Unit 4: Stellar evolution** Birth and death of a star –brightness of a star – stellar distance- Chandrasekar limit- white dwarfs- Neutron stars – black holes- Supernovae.	**1**	**CO5**
5	**Unit 5: Theories of the Universe and Galaxies** Origin of the Universe - the big bang theory- the steady state theory- the oscillating universe theory – Hubble's law. Galaxies – types of galaxies- Milky way	**1**	**CO6**

TEXT BOOKS:

1. K.S.Krishnaswamy (2002). Astrophysics - a modern perspective, New Age International (P) Ltd, New Delhi

2. Baidyanath Basu (2001). An introduction to Astro physics, second printing, Prentice – Hall of India (P) Ltd, New Delhi.

3. Dr.P.Iyemperumal (2002).Vindaimigu paerandam(Tamil), Chennai.

4. Dr.P.Iyemperumal, Tamizhaga vaanaviyal sindanaigal (Tamil),World Tamil Research Centre, Chennai.

5. Mohan Sundar rajan (2003). Indriya Vinveli (Tamil), NBT New Delhi.

6. Dept.of.Physics, DGVC College (1977). Topics in Physics Compiled, Rochouse & Sons, Chennai.

REFERENCE BOOKS:

1. R. Murugeshan (2003). Modern Physics (11th edition), S. Chand & Company Ltd, New Delhi.
2. S. Kumaravelu (1993). Astronomy, Janki Calendar Corporation, Sivakasi.

4. NON CONVENTIONAL ENERGY SOURCES

Learning Objectives:

By studying this course students will be able to

- *Demonstrate her/his understanding of facts and ideas on various facts of non conventional energy*

Course Outcomes: At the end of the Course, the Student will be able to:

Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Extend the knowledge on conventional energy and renewable energy to understand Solar energy	K2,K3
CO2	Explain application of Solar energy for various purposes	K2,K3
CO3	Translate the idea of renewable energy resource to understand wind energy	K2,K3
CO4	Outline the concept of utilizing tidal energy and the process behind	K2,K3
CO5	Summarize the nature and application of chemical and nuclear energy	K2,K3

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Sl NO	**CONTENTS OF MODULE**	**Hrs**	**COs**

1	**Unit 1 : Solar energy** Conventional Energy sources – Renewable Energy sources- solar energy – solar radiation and its measurements- solar energy collectors- parabolic collector- storage of solar energy	**1**	**CO1**
2	**Unit 2 : Applications of solar energy** Solar water heater- solar driers- solar cells- solar electric power generation- solar distillation- solar pumping – solar cooking	**1**	**CO2** **CO3**
3	**Unit 3: Wind energy** Basic principles of wind energy conversion- power in the wind – forces in the Blades- wind energy conversion- Advantages and disadvantages of wind energy conversion systems (WECS) Energy storage- Applications of wind energy	**1**	**CO4**
4	**Unit 4: Oceanic energy** Energy from the oceans- Energy utilization- Energy from tides- Basic principle of tidal power – Utilization of tidal energy	**1**	**CO5**
5	**Unit 5 : Energy from other sources** Chemical energy – Nuclear energy - Energy storage and distribution	**1**	**CO6**

TEXT BOOKS:

1. G.D. Rai (1996). Non-conventional sources of energy (4th edition), Khanna Publishers, New Delhi.

2. S.P.Sukhatme (1997). Solar Energy, Principles of thermal collection and storage (2nd edition), Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

3. A.K.Bakhshi (2006). Energy, National Book Trust, New Delhi.

4. Dept.of.Physics, DGVC College (1977). Topics in Physics Compiled, Rochouse & Sons, Chennai.

REFERENCE BOOKS:

1. S. Rao and Dr. Parulekar (2015). Energy Technology, Khanna Publishers.
2. Jyoti Parikh (1997). Energy Models for 2000 and beyond, Tata McGrawHill Publishers, New Delhi.

5. BIOPHYSICS

Learning Objectives:

By studying this course students will be able to

- *Demonstrate her/his understanding of facts and ideas on various facts of biomechanics, connection between Physics and biology*

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Extend the knowledge on hydrodynamics to understand the fluid flow under various circumstances.	K2,K3
CO2	Explain the physiology of respiration using the concept of transport of gases.	K2,K3
CO3	Interpret having and the physics of audition.	K2,K3
CO4	Construct the ideas to understand vision, power of eye myopia and hypermetropia.	K2,K3
CO5	Rephrase various concept of biomechanics, locomotion in the background of laws of physics.	K2,K3

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 **moderately correlated - 2** **weakly correlated -1**

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Sl NO	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Unit 1: Fluid Flow** Steady laminar flow, turbulence, capillary rise, Poiseuille's formula, energetics of fluid flow, hemodynamics, fluid flow in plants	**1**	**CO1**
2	**Unit 2: Gas Transport** Ideal gas, convection and diffusion of gases, Physiology of respiration.	**1**	**CO2**
3	**Unit 3: Physics of Audition** Transverse and longitudinal waves, physiological characteristics of sound, human ear, Doppler Effect.	**1**	**CO3**
4	**Unit 4: Physics of Vision** Wave nature of light, lenses, focal length, refractive power, retina and photoreceptors, resolving power of eye, short sight and long sight, contact lenses	**1**	**CO4**
5	**Unit 5: Biomechanics** Introduction, biostatics, mechanical properties of muscle, biodynamic, locomotion on land, water and air.	**1**	**CO5**

TEXT BOOKS:

1. P. K. Srivastava (2005). Elementary Biophysics: An Introduction, Narosa Publishing House, New Delhi.

2. Vasantha Pattabhi and N. Gautham (2009). Biophysics (2nd edition), Narosa Publishing House, New Delhi.

REFERENCE BOOKS:

1. Rodney Cotterill (2005). Biophysics: An Introduction, Wiley and Sons, England

2. Philip Nelso (2003). Biological physics: Energy, Information and Life, W. H. Freema and Co., New York.

3. Daniel M (1992). Basic biophysics and biologists, Wiley International, New Delhi.

4. Sybesma C (1989). Biophysics: An Introduction, Kluwer Publishers, New York.

6. INTRODUCTION TO NUMERICAL METHODS

Learning Objectives:

By studying this course students will be able to

- *Demonstrate her/his skills to solve various numerica;s, able to apply various formulae and mathematical methods to solve Physics problems and everyday applications*
- *Will be able to apply various computational techniques*

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Apply the concept of statistics to solve problems in Physics	K2,K3

CO2	Extend the knowledge probability to compare error analysis	K2,K3
CO3	Solve various numerical problems having the idea of curve fitting	K2,K3
CO4	Demonstrate computational techniques for solving related problems	K2,K3
CO5	Solve numerical problems using Trapezoidal rule- Simpson's rule	K2,K3

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Sl NO	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Unit-1: Statistics** Mean, meridian, mode, standard deviation, variance, range, co-efficient of variation, covariance Related problems-role of Statistical methods in Physics	**1**	**CO1**
2	**Unit-2: Probability**	**1**	**CO2**

	Probability theory – application of probability in physics- Relation to randomness and errors- types of errors in physics-Theory of errors - errors analysis		**CO3**
3	**Unit-3 Curve fitting** Curve fitting, principle of least squares- Straight line fitting- numerical problems	**1**	**CO4**
4	**Unit-4 Computational techniques** Iteration – iteration techniques – Bisection method, Newton-Raphson method –numerical problems	**1**	**CO5**
5	**Unit-5 Numerical analysis** Trapezoidal rule- Simpson's 1/3rd Rule- Numerical problems	**1**	**CO6**

TEXT BOOKS:

1. Sathya Prakash (1996). Mathematical Physics, Sultan Chand and Sons, New Delhi.

2. M.K. Venkatraman (1990). Numerical method, National Publishing Company.

3. V. Rajaraman (2003). Numerical methods, Prentice - Hall India Pvt. Ltd.,

4. P. Kandasamy, K. Thilagavathy and K. Gunavathy (2002). Numerical methods, S. Chand & Co.

REFERENCE BOOKS:

1. B.D. Gupta (1996). Mathematical Physics, Vikas Publishing House Pvt. Ltd., New Delhi.

2. Jain Iyenger and Jain (2004). Numerical methods for Scientific and Engineering computation New Age International (P)Ltd.,

3. S.S.Sastry (2003). Numerical methods, Prentice Hall of India Pvt. Ltd., New Delhi

7. CONTRIBUTION OF INDIA TO MODERN SCIENCE

Learning Objectives:

By studying this course students will be able to

- *Get an overview of different views on Philosophy and Physics*

Appreciate contribution of our country to Modern Science

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Explain the view of world in the Greco- Roman perspective.	K2,K3
CO2	Compare and contrast Indian knowledge system with Western World view summarize contribution of our country to Mathematics and astronomy.	K2,K3
CO3	Outline the idea of cognition in plants impact of Swami Vivekanandha, J.C Bose, Schrodinger and Heisenberg. Interpret evolution of duality principle.	K2,K3
CO4	Relate the growth of science and Technology with great trignometrical survey of India	K2,K3
CO5	Interpret the importance of Triple helix Structure based on x-ray crystallography and outline the contribution of many Indian Physicist	K2,K3

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 **moderately correlated - 2** **weakly correlated -1**

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Sl. No.	CONTENTS OF MODULE	Hrs	COs
1	**Unit -1** Aristotle's view of world –Pythagorean view-Indian Philosophy and its impact on Greek Philosophers-Geocentric theory-Heliocentric theory-Newtonian view of world	**1**	**CO1**
2	**Unit -2** Contribution of Indians to Mathematics and Astronomy-Indian Mathematicians during 10th to 15th century-Almagest - Ptolemy-Mathematicians form Kerala- Value of Pi-Contributions of Ramanujan	**1**	**CO2** **CO3**
3	**Unit-3** Idea of Biosphere-Ecosystem-Pyramid & Oceanic circle-Cognition in plants-J.C.Bose-Impact of Vivekananda on J.C.Bose – Einstein-wave particle duality- Quantum theory-Double Slit experiment Heisenberg-Copenhagen scientist-Schrodinger – Impact of Indian philosophy in the evolution of duality principle- S.N. Bose –Saha	**1**	**CO4**
4	**Unit-4** The great trigonometrical survey of India –Sir C.V. Raman- Raman effect and his contributions- Prof. K.S. Krishnan- Swami Vivekananda and genesis of II Sc	**1**	**CO5**
5	**Unit-5**	**1**	**CO6**

	Prof. G.N. Ramachandran- Triple Helix Structure of collagen- Crik & Watson-Dorothy Hudkinson ECG. Sundarshan		

TEXT BOOKS:

1. Journey into light:Life and Science of C.V.Raman by G.Venkatraman : Some famous Indian Scientist by TIFR Booklet
2. Book series on History of Science & Technology, Government of India.
3. Arvind Gupta (2019), Bright Sparks
4. Vignettes in Physics by G.Venkatraman
5. Seeing and Believing by Richard Panek
6. Surely you're Joking Mr.Feynman by Feynman, Leighton et al
7. Uncommon wisdom by Fritj of Capra
8. Cosmos by Carl Sagan

SEMESTER – III

OPTICS

Course Code : 09309	**Credits : 05**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

In this course, students are exposed to

** Concept related to lens and prism*

** Working knowledge of optical physics including interference, diffraction, polarization, Spectroscopy & laser physics*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Outline basic knowledge of principles and theories about the behavior of light.	**K2**
CO2	Discus the principle of superposition of wave so thus, uses these ideas to understand the wave nature of light through working of interferometer.	**K2**
CO3	Extend the knowledge about nature of light through diffraction techniques; apply mathematical principles to analyze the optical instruments.	**K2,K3,K4**
CO4	Interpret basic formulation of polarization and gain knowledge about polarimeter .	**K3**
CO5	Relate the principles of optics to various fields such as spectroscopy and laser physics.	**K3**

Mapping of Course Outcomes to Program Outcomes:
Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
CO3	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**1**	**2**	**3**	**3**	**2**	**3**	**2**	**2**
CO5	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**2**	**3**

Sl NO	**CONTENTS OF MODULE**	**Hrs**	**COs**

1	**Unit 1: Geometrical Optics** Refraction – laws of refraction – refractive index using a microscope – critical angle – air cell – refraction through a prism – angle of minimum deviation – dispersion through a prism – spectrum – dispersive power - Combination of two small angled prisms to produce dispersion without deviation - deviation without dispersion - defects of images – coma – distortion - Spherical aberration in lenses - methods of minimizing spherical aberration - condition for minimum spherical aberration in the case of two lenses separated by a distance - Chromatic aberration in lenses - Condition for achromatism of two thin lenses (in and out of contact) – achromatic prisms.	**1**	**CO1**
2	**Unit 2: Interference** Interference- Young's double slit experiment-Analytical treatment of interference - expression for intensity - condition for maxima and minima in terms of phase and path difference – interference in thin films – reflected ray- transmitted ray – colors of thin films - Air wedge - determination of diameter of thin wire - test for optical flatness - Haidinger's fringes - Michelson's interferometer - theory - applications - determination of wavelength - thickness of thin transparent material.	**1**	**CO2**
3	**Unit 3: Diffraction** Fresnel diffraction - diffraction at a circular aperture – at a narrow wire - Fraunhofer diffraction - single slit - double slit , Plane transmission grating – theory – normal incidence – experimental determination of wavelength using grating - oblique incidence (theory) - Dispersive power of a grating - Rayleigh's criterion for resolution - limit of resolution of the eye - resolving power of telescope, microscope - Difference between resolving power and dispersive power.	**1**	**CO3**
4	**Unit 4: Polarization** Double refraction - Nicol prism -polarizer and analyzer - Huygen's explanation of double refraction in uniaxial crystals - dichroism - polaroids and their uses - quarter wave plate – half wave plate - plane, elliptically and circularly polarized light - production and detection - Babinet's compensator - optical activity - Fresnel's explanation of optical activity -	**1**	**CO4**

	specific rotatory power - determination using Laurent's half shade polarimeter.		
5	**Unit 5: Spectroscopy** Introduction to spectroscopy - Electromagnetic spectrum - characterization of electromagnetic radiation - quantization of energy - regions of the spectrum –- Brownian motion – Tyndall effect - scattering of light – blue of the sky – halo of the moon - - Raman effect - experimental set up - Characteristics of Raman lines - Lasers - ruby laser - He-Ne laser, CO_2 laser - construction and working - application of lasers.	**1**	**CO5**

TEXT BOOKS:

1. Subrahmanyam N., BrijLal and M.N. Avadhanulu (2006). A Text book of Optics S.Chand & Co., New Delhi.
2. Khanna D.R. & Gulati H.R (1979). Optics, S.Chand & Co., New Delhi.
3. R. Murugeshan and Kiruthiga Sivaprasath (2006). Optics and Spectroscopy, S. Chand & Co., New Delhi.
4. Aruldhas (2005). Molecular structure and spectroscopy, Prentice Hall of India Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. D. Halliday, R. Resnick and J. Walker (2001). Fundamentals of Physics (6th edition), Wiley, New York.
2. Ajay Ghatak (1998). Optics, Tata McGraw-Hill publishing Co. Ltd., New Delhi.
3. Gurdeep Chatwal and Sham Anand (1990). Spectroscopy, Himalaya Publishing House.

WEB LINKS:

https://science.nasa.gov/ems/

https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472
https://imagine.gsfc.nasa.gov/educators/gammarabursts/imagine/index.html

http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/

http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/

https://www.youtube.com/watch?v=DwD3HD6t5Vs

https://www.youtube.com/watch?v=E0Z8rn2dBmM

https://www.youtube.com/watch?v=PvYdgYq0_pc

https://www.youtube.com/watch?v=qxlR7ZdgV7w

https://www.youtube.com/watch?time_continue=135&v=0b1fqodmZJ0&feature=emb_logo

https://spaceplace.nasa.gov/blue-sky/en/

https://www.youtube.com/watch?v=xWMei1IUG7E

https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/

https://www.nrcan.gc.ca/maps-tools-publications/satellite-imagery-air-photos/remote-sensing-tutorials/introduction/interactions-atmosphere/14635

http://math.ucr.edu/home/baez/physics/General/BlueSky/blue_sky.html

https://www.rebresearch.com/blog/why-isnt-the-sky-green_/

https://sciencenotes.org/why-is-the-sky-green-before-a-tornado/

https://www.youtube.com/watch?v=ndXhTjMr1hk
https://www.bbvaopenmind.com/en/science/leading-figures/john-tyndall-the-man-who-explained-why-the-sky-is-blue/ r

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

https://www.validyne.com/blog/basics-pneumotach-flow-measurement/

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

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

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

https://books.google.co.in/books?id=grqxTeY1z4oC&pg=PA897&lpg=PA897&dq=size+of+nitrogen+molecule+and+blue+light&source=bl&ots=hC0V9FvzP-&sig=ACfU3U270Hhk0SD3yXV10QDHjPrC1qGnDg&hl=en&sa=X&ved=2ahUKEwjKgrP6rvzpAhWNyDgGHRB_DGYQ6AEwDnoECA0QAQ#v=onepage&q=size%20of%20nitrogen%20molecule%20and%20blue%20light&f=false

https://www.youtube.com/watch?v=71Rp-jG6Eek&list=RDCMUCPKnBhy8PqPLapWIZ7orlKQ&index=1

https://www.youtube.com/watch?v=MZktgCWvHlE
https://www.youtube.com/watch?time_continue=129&v=iMGvTYDC5MA&feature=emb_logo

https://www.youtube.com/watch?v=uohd0TtqOaw

https://www.youtube.com/watch?v=LAQ1m_1W5ys

https://www.youtube.com/watch?v=VyQAg4j-7K4

https://www.youtube.com/watch?v=KDaQhpYYo50

ALLIED PHYSICS PAPER – I

(For II B.Sc. Chemistry students)

Course Code : 09310	**Credits : 05**
L: T: P: S : 6:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives: *Demonstrate basic principles of physics and one's knowledge of physics relate theoretical concepts acquired at schooling level to do experiments.*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) ,K5(Evaluating) ,K6(Creating)

CO1	Explain SHM, Extend their knowledge in the study of various dynamic motions analyzes and it demonstrates mathematically.	**K2,K4**
CO2	Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life.	**K3**
CO3	Comprehend basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of flow temperature physics in the background o0f growth of this technology.	**K5**
CO4	Articulate the knowledge about electric current resistance, capacitance in terms of potential electric field and electric correlate the connection between electric field and magnetic field and analyze them mathematically verify circuits and apply the concepts to construct circuits and study them.	**K3,K4.K6**
CO5	Apply the basic knowledge of principles and theory about behaviors of light and explain several phenomena we observe in daily the using mathematically interpretation.	**K2,K3**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 moderately correlated – 2 weakly correlated –1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

CO3	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**

Sl NO	CONTENTS OF MODULE	Hrs	COs
1	**Unit 1: Waves and Oscillations** Simple harmonic motion – composition of two simple harmonic motion at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of a.c frequency using sonometer (steel and brass wires) – ultrasonics – production – piezoelectric method – application of ultrasonics – reverberation – factors for good acoustics of hall and auditorium.	**1**	**CO1**
2	**Unit 2: Properties of matter** Elasticity: Elastic constant – bending of beam – theory of non- uniform bending – determination of Young's modulus by non uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum – static torsion. Viscosity: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method Surface tension: definition – molecular theory of surface tension – excess of pressure inside a drop and bubble – drop weight method – interfacial surface tension.	**1**	**CO2**
3	**Unit 3: Thermal Physics** Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of gases – Linde's process – adiabatic demagnetization – Curie's law – thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle-efficiency – entropy – change of entropy in reversible and irreversible process.	**1**	**CO3**

4	**Unit 4: Electricity and Magnetism** Resistors – Ohm's law – series and parallel – potentiometer – principle – measurement of thermo emf using potentiometer – capacitor – energy of a charged capacitor – loss of energy due to sharing of charges – magnetic field due to a current carrying conductor – Biot Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an ac circuit – switches and its types – fuses.	**1**	**CO4**
5	**Unit 5: Geometrical optics** Refraction – laws of refraction – refractive index using a microscope – critical angle – air cell – refraction through a prism – angle of minimum deviation – dispersion through a prism – spectrum – dispersive power – refraction at grazing incidence and grazing emergence in prisms – combination of two small angled prisms to produce dispersion without deviation and deviation without dispersion.	**1**	**CO5**

TEXT BOOKS:

6. R. Murugesan (2001). Allied Physics, S. Chand & Co, New Delhi.
7. Brijlal and N. Subramanyam (1994). Waves and Oscillations, Vikas Publishing house, New Delhi.
8. Brij Lal and N.Subramaniam (1994). Properties of Matter, S. Chand & Co., New Delhi.
9. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8^{th} edition), S.Chand & Co., New Delhi.
10. R. Murugesan (2005). Optics and Spectroscopy, S.Chand & Co, New Delhi.

REFERENCE BOOKS:

5. Resnick Halliday and Walker (2018). Fundamentals of Physics (11^{th} edition), John Willey and Sons, Asia Pvt. Ltd., Singapore.
6. V.R.Khanna and R.S.Bedi (1998). Text book of Sound (1^{st} edition), Kedharnaath Publish & Co, Meerut.

7. N.S. Khare and S.S. Srivastava (1983). Electricity and Magnetism (10th Edition), Atma Ram & Sons, New Delhi.
8. D.R. Khanna and H.R. Gulati (1979). Optics, S. Chand & Co. Ltd., New Delhi.

WEB LINKS:

https://youtu.be/M_5KYncYNyc

https://youtu.be/ljJLJgIvaHY

https://youtu.be/7mGqd9HQ_AU

https://youtu.be/h5jOAw57OXM

http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html

https://www.youtube.com/watch?v=gT8Nth9NWPM

https://www.youtube.com/watch?v=9mXOMzUruMQ&t=1s

https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s

https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

https://learningtechnologyofficial.com/category/fluid-mechanics-lab/

SEMESTER – IV

ATOMIC PHYSICS

Course Code	**: 09411**	**Credits**	**: 5**
L: T: P: S	**: 5:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

Learning Objectives:

*This course provides a coherent and concise coverage of *evolution of atom models *atomic structure and its spectra.*

Course Outcomes: At the end of the Course, the Student will be able to:

Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) ,K5(Evaluating) ,K6(Creating)

CO1	Identify the properties of positive rays and explain various man spectrographs.	**K3**
CO2	Demonstrate a working, quantitative understanding of the photoelectric effect and list same photoelectric devices and explain performance.	**K2**
CO3	Develop semi classical model of the atom and show how these model lead to quantum mechanics.	**K4**
CO4	Apply selection ruler and analyze the fine structure of atomic spectra.	**K4**
CO5	Make use of the effect of magnetic field on atomic spectra and explain normal and anomalous Zeeman effect.	**K3**
CO6	Distinguish between continues and characteristic X-ray spectra and to input how the Compton established the particle nature of radiation.	**K4**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

	PO										**PSO**				
CO/PO/ PSO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	3	3	2	3	2	2	3	1	2	3	3	2	2	2	3
CO2	3	3	3	3	2	3	3	1	2	3	3	3	2	3	2
CO3	3	3	3	3	2	3	3	1	2	3	3	3	3	2	2
CO4	3	3	3	3	2	2	3	2	2	3	3	2	2	2	3
CO5	3	3	3	3	2	2	3	2	2	3	3	2	2	2	3
CO6	3	3	3	3	2	2	3	1	2	3	3	2	3	3	3

Sl. NO	CONTENTS OF MODULE	Hrs	COs
1	**Unit 1: Discharge phenomenon through gases** Movement of charge in transverse electric and magnetic fields - specific charge of an electron - Dunnington's method- positive rays – Dempster's mass spectrograph – Bainbridge mass spectrograph - critical potential – experimental determination of critical potential – Frank and Hertz experiment – Davis and Gaucher experiment.	**1**	**CO1**
2	**Unit 2: Photo-electric effect** Photo electric effect - Lenard's experiment - Richardson and Compton experiment - Laws of photoelectric emission – Einstein's photo electric equation – Experimental verification of Einstein's photo electric equation by Millikan's experiment - photo electric cell - photo emissive cell - photovoltaic cell - photo conducting cell – photomultiplier	**1**	**CO2** **CO3**
3	**Unit 3: Atomic structure** Bohr atom model - Sommerfield atom model – various quantum numbers - Vector atom model - Pauli's exclusion principle - electronic configuration of elements and periodic classification - coupling schemes - LS and JJ coupling - spatial quantization - Stern and Gerlach experiment - Bohr magneton	**1**	**CO4**
4	**Unit 4: Fine structure of spectral lines** Spectral terms and notations - selection rules - intensity rule and interval rule - fine structure of sodium D lines - Zeeman effect – Zeeman shift - Larmor's theorem - Debye's explanation of normal Zeeman effect - anamalous Zeeman effect - theoretical explanation - Lande's `g' factor - explanation of splitting of D1 and D2 lines of sodium - Paschen - Back effect - Stark effect (qualitative study only).	**1**	**CO5**
5	**Unit 5: X-Rays** X- rays - continuous X-rays - characteristic X-ray Bragg's law in one dimension – Bragg's spectrometer - uses of X- rays - Compton effect – expression for Compton shift in wavelength spectra – absorption of X-rays	**1**	**CO6**

	by matter – Moseley's law - diffraction of X- rays - - experimental verification		

TEXT BOOKS:

1. J.B. Rajam (2004). Atomic Physics (20th Edition), S. Chand & Co., New Delhi.
2. D.L. Sehgal, K.L. Chopra and N.K. Sehgal (1991). Modern Physics (7th Edition), Sultan Chand & Sons Publication, New Delhi.
3. N. Subrahmanyam and BrijLal (2000). Atomic and Nuclear Physics (5th Edition), S. Chand & Co. New Delhi.
4. R. Murugeshan, Kiruthiga Sivaprasath(2008). Modern Physics, S. Chand & Co., New Delhi.

REFERENCE BOOKS:

1. J.H. Hamilton and Yang (1996). Modern Physics, McGraw-Hill Publication.
2. A. Beiser (1997). Concepts of Modern Physics, Tata McGraw-Hill, New Delhi.
3. D. Halliday, R. Resnick and J. Walker (2001). Fundamentals of Physics (6th Edition), Wiley, New York .
4. Kenneth S. Krane (1998). Modern Physics, John Willey & sons, Canada.

WEB LINKS:

http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/atomstructcon.html

http://hyperphysics.phy-astr.gsu.edu/hbase/Bohr.html

https://physics.info/atomic-models/

http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/xrayc.html

https://physics.info/x-ray/

https://www.youtube.com/watch?v=MFPKwu5vugg

http://hyperphysics.phy-astr.gsu.edu/hbase/mod1.html

https://www.youtube.com/watch?v=v-1zjdUTu0o

https://physics.info/photoelectric/https://www.livescience.com/58816-photoelectric-effect.html

CORE PRACTICAL-II

Course Code : 09413	**Credits : 4**
L: T: P: S : 0:0:3:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

On taking this course the student will be able to

- *Explain demonstrating various optical phenomena principles, working and application of optical instruments.*
- *Understanding the basic concept of electricity, magnetism, optics and properties of matter and their applications.*

Course Outcomes: At the end of the Course, the Student will be able to:

Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Develop skills to understand the concept of elastic constants of solid and acquire knowledge of applications.	K3
CO2	Demonstrate experiments to involving various optical phenomena, principles, workings and application of optical instruments.	K2
CO3	Apply standard method to calibrate the analog meters and to measure various physical quantities.	K3

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 **moderately correlated - 2** **weakly correlated -1**

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**

CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**

LIST OF EXPERIMENTS:

1. Young's modulus - cantilever - depression - Static method-Scale and telescope
2. Young's modulus - cantilever oscillations - Dynamic method
3. Rigidity modulus - Static torsion
4. Compound pendulum - g and k
5. Sonometer - A.C. Frequency - Using Steel wire.
6. Melde's string - frequency, Relative Density of a solid and liquid
7. Thermal conductivity of a bad conductor - Lee's disc method
8. Spectrometer - μ of a glass prism - i-d Curve
9. Spectrometer - Grating N and λ - normal incidence method
10. Spectrometer - Grating N and λ - minimum deviation method
11. Air wedge - Thickness of a wire
12. m and BH - deflection magnetometer -Tan C position and vibration magnetometer
13. Carey Foster’s bridge - Temperature coefficient of resistance of a coil
14. Potentiometer - Calibration of low range voltmeter
15. Potentiometer - Ammeter calibration.
16. Figure of merit of galvanometer (Mirror Galvanometer or Table Galvanometer).
17. Determination of conductivity of Human body and various liquids using EXP EYES – software.
18. Verification of the Malus law for plane polarized light
19. Determination of the specific rotation of sugar solution using polarimeter
20. Characteristics of laser diode

Allied Physics – II

(For II B.Sc.Chemistry students)

Course Code : B.Sc.Chemistry 09412	**Credits : 5**
L: T: P: S : 6:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

Understand the basic concepts of optics, modern physics, concepts of relativity and quantum physics, semiconductor physics, and digital electronics. Plan and execute experiments and appropriate methods.

Course Outcomes: At the end of the Course, the Student will be able to:

Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) ,K5(Evaluating) ,K6(Creating)

CO1	Explain the concepts of Interference diffraction using principles of superposition of waves, Interpret wave patterns,	K2
CO2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation. Appreciate interdisciplinary nature of science.	K3,K4
CO3	Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on delay rate half life and mean life. Interpret nucleus process like fission fusion and production of nuclear energy in nuclear reactors atom bombs and stars.	K3,K2
CO4	To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and translate the mathematical equation to physical concepts and vice versa.	
CO5	Summarize the working of semiconductor devices like junction diode, zener diode, transistors. Interpret the real life solutions using AND, OR, NOT basic	K2

	logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and acquire elementary ideas of IC circuits.	
CO6	Construct circuits using semiconductor devices and ICs and analyze their working.	K3,K4

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 **moderately correlated - 2** **weakly correlated -1**

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**
CO3	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**
CO4	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO6	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

S. NO	**CONTENTS OF MODULE**					**Hrs**	**COs**
1	**Unit 1: Physical Optics** Velocity of light – Michelson's method - Interference – interference in thin films - Colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – test for optical flatness – Diffraction – bending of light vs. bending of sound - theory of transmission grating – normal incidence – experimental determination of wavelength					**1**	**CO1**

	using diffraction grating - polarization – polarization by double reflection – Brewster's law – optical activity.						
2	**Unit 2: Atomic Physics** Atom model – Bohr atom model – mass number – atomic number – nucleons- vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration of elements and periodic classification of elements - Bohr magneton – Stark effect –Zeeman effect (Elementary ideas only) – ionization potential - Frank and Hertz experiment.					**1**	**CO2** **CO3**
3	**Unit 3: Nuclear Physics** Nuclear model – liquid drop model – magic numbers - shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and its uses –controlled and uncontrolled chain reaction - nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor – breeder reactor – nuclear fusion - thermonuclear reactions – difference between fission and fusion.					**1**	**CO4**
4	**Unit 4 : Elements of relativity** Frame of reference - postulates of special theory of relativity – Galilean transformation equations - Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox - mass energy equivalence					**1**	**CO5**

5	**Unit 5: Electronics** Basic Electronics: pn junction diode - forward and reverse biasing - characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – junction transistor – CE mode characteristics– LED – theory – Construction and working - uses. Digital Electronics: OR, AND, NOT, NAND and NOR logic gates – universal building blocks – Boolean algebra – De Morgan's theorem – verification – elementary ideas of ICs.					**1**	**CO6**

TEXT BOOKS:

6. R. Murugesan (2005). Allied Physics, S. Chand& Co, New Delhi.
7. K. Thangaraj and D. Jayaraman (2004). Allied Physics, Popular Book Depot, Chennai.
8. Brijlal and N. Subramanyam (2002). Text book of Optics, S. Chand & Co, New Delhi.
9. R. Murugesan (2005). Modern Physics, S.Chand& Co, New Delhi.
10. A. Subramaniyam Applied Electronics (2nd Edition), National Publishing Co., Chennai.

REFERENCE BOOKS:

6. Resnick Halliday and Walker (2018). Fundamentals of Physics (11th edition), John Willey and Sons, Asia Pvt.Ltd., Singapore.
7. D.R. Khanna and H.R. Gulati (1979). Optics, S. Chand & Co. Ltd., New Delhi.
8. A.Beiser (1997). Concepts of Modern Physics, Tata McGraw Hill Publication, New Delhi.
9. Thomas L.Floyd (2017). Digital Fundamentals (11th edition), Universal Book Stall – New Delhi.
10. V.K. Metha (2004). Principles of electronics (6th edition), S.Chand and company.

WEB LINKS:

https://www.berkshire.com/learning-center/delta-p-facemask/

https://www.youtube.com/watch?v=QrhxU47gtj4

https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo

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

https://www.validyne.com/blog/leak-test-using-pressure-transducers/
https://www.validyne.com/blog/basics-pneumotach-flow-measurement/

https://www.atoptics.co.uk/atoptics/blsky.htm -https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects

https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects
https://books.google.co.in/books?id=grqxTeY1z4oC&pg=PA897&lpg=PA897&dq=size+of+nitrogen+molecule+and+blue+light&source=bl&ots=hC0V9FvzP-&sig=ACfU3U270Hhk0SD3yXV10QDHjPrC1qGnDg&hl=en&sa=X&ved=2ahUKEwjKgrP6rvzpAhWNyDgGHRB_DGYQ6AEwDnoECA0QAQ#v=onepage&q=size%20of%20nitrogen%20molecule%20and%20blue%20light&f=false

https://youtu.be/JLz7qASICYU

https://youtu.be/u6m4lI-qZ58

https://youtu.be/C0HsQykDdKg

Allied Physics – Practical

Course Code	**: 09414**	**Credits**	**: 4**
L: T: P: S	**: 0:0:3:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

Learning Objectives:

The aim of this course is to enable the students to gain practical knowledge of various basic concepts of physics.

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Relate scientific methods and recall the process of measuring different physical variables.	(K2)
CO2	Demonstrate the fundamentals of instrumentation data acquisition and interpretation of results.	(K2)
CO3	Apply the concepts of Physics to understand material properties.	(K3)
CO4	Experiment with fundamental of optics, acoustics, electricity and magnetism.	(K3)

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 **moderately correlated - 2** **weakly correlated -1**

CO/PO/ PSO	PO										PSO				
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
CO1	3	3	3	3	3	3	3	3	2	3	3	3	3	3	2
CO2	3	3	3	3	3	3	3	3	2	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	3	2	3	3	3	3	3	2

LIST OF EXPERIMENTS:

(Any 15 experiments)

1. Young's Modulus by Non-uniform bending using Pin and Microscope
2. Young's Modulus by Non-uniform bending using Optic lever – Scale and telescope
3. Rigidity modulus by Static torsion method
4. Rigidity modulus by torsional oscillations without mass
5. Surface tension and interfacial tension – Drop Weight method – Hare's apparatus given.
6. Comparison of viscosities of two liquids – Burette method
7. Specific heat Capacity of a liquid – Half time correction
8. Sonometer – Determination of a.c frequency
9. Newton's rings - Radius of curvature
10. Air wedge – Thickness of a wire
11. Spectrometer – Grating – Wavelength of Mercury lines – Normal Incidence
12. Potentiometer – low range Voltmeter Calibration
13. P.O. Box – Specific resistance of a coil
14. Figure of merit – Table Galvanometer
15. Construction of AND, OR, NOT gates – using diodes and transistor
16. Zener Diode – Study of Characteristics
17. NAND gate as a Universal logic gate
18. NOR gate as a Universal logic gate
19. Verification of De Morgan's Theorems.
20. Deflection magnetometer – Field along the axis of the coil – Determination of BH.
21. Refraction order of liquid hollow prism – Spectrometer

22. Determination of latitude and longitude of a place
23. Junction diode - study of characteristics
24. Refraction order of solid prism – Spectrometer

Note: Use of digital balance is permitted

SEMESTER – V

ELECTRICITY AND ELECTROMAGNETISM

Course Code : 09515	**Credits : 05**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

The aim of the course is

**to acquire knowledge about chemical effects of electric current and understand various circuit laws, network theorems*

**to enable the student to get strong foundation in magnetism, as well laws associated with it and their application*

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate the relationship between thermodynamics and electricity. (K2)
CO2	Compare and contrast D.C and A.C circuits. (K2)
CO3	Apply theorems to construct and solve electric circuits. (K3)
CO4	Design and construct experiments as well to analyze and interpret magneto static concepts. (K4,K6)
CO5	Relate the principles and of electromagnetic and build simple circuits involving inductors. (K3)
CO6	Discuss the four fundamental equation that govern all electromagnetic phenomena.(K2)

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 moderately correlated – 2 weakly correlated –1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**1**	**3**	**3**	**3**	**2**	**3**	**3**	**3**

CO2	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**1**	**3**	**3**	**3**	**2**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO6	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**2**	**2**	**2**

Sl NO	**CONTENTS OF MODULE**	**Hrs**	**Cos**
1	**Unit 1: Chemical Effects of Electric Current** Faraday's laws of electrolysis - ionic velocities and mobilities - Calculation - experimental determination of ionic mobilities - transport number. Thermoelectricity- Peltier effect - Experimental determination of Peltier coefficient - Thomson coefficient - experimental determination of Thomson coefficient - application of thermodynamics to a thermocouple and connected relations - thermoelectric diagram and uses.	**1**	**CO1**
2	**Unit 2 : DC and AC Circuits** **DC Circuits -** Growth and decay of current in a circuit containing resistance and inductance - growth and decay of charge in a circuit containing resistance and capacitor - growth and decay of charge in an LCR circuit - condition for the discharge to be oscillatory - frequency of oscillation - network analysis - Thevenin and Norton's Theorems. **AC Circuits -** AC voltage and current - Power factor and current values in AC circuit containing LCR - series and parallel resonant circuits - AC motors - single phase, three phase - star and delta connections - electric fuses - circuit breakers.	**1**	**CO2** **CO3**
3	**Unit 3: Magnetic effect of electric current**	**1**	**CO4**

	Biot and Savart's law - magnetic field intensity due to a solenoid carrying current - effect of iron core in a solenoid – magnetic field at a point due to circular current carrying coil - Helmholtz galvanometer - moving coil ballistic galvanometer - theory - damping correction – experimental determination of the absolute capacity of a condenser using B.G – experiment to compare the capacitance, emf of cells using B.G.						
4	**Unit 4: Electromagnetic induction and its applications** Faraday's laws of electromagnetic induction - inductance - determination of self inductance of a coil using Anderson method - mutual inductance - experimental determination of absolute mutual inductance - coefficient of coupling - earth inductor - Uses of earth inductor - measurement of horizontal component of the earth's magnetic field - measurement of vertical component of earth's magnetic field – angle of dip - calibration of B.G. - Induction coil and its uses.					**1**	**CO5**
5	**Unit 5: Maxwell's equations and ElectroMagnetic Theory** Basic equations - types of currents - vacuum displacement current - Maxwell's equations - Maxwell's equations in free space - electromagnetic waves in free space - propagation of electromagnetic wave in a non conducting medium - Hertz Experiment - energy density of electromagnetic wave - Poynting's theorem - energy per unit volume.					**1**	**CO6**

TEXT BOOKS:

1. M. Narayanamurthy & N. Nagarathnam, (1996), Electricity & Magnetism**,** NPC pub., (revised edition). ISBN: 1 – 86094 – 630 – 5. 8
2. Brijlal and Subrahmanyam; (2000), Electricity and Magnetism, S. Chand & Co., New Delhi. ISBN: 8121904676
3. D. Chattopadhyay and P.C. Rakshit, (2001), Electricity & Magnetism, Books and Allied (P) Ltd. ISBN: 9788173812514
4. B.D. Dugal and C.L. Chhabra, Shobanlal Nagin, (2005), Fundamentals of Electricity and Magnetism**,** (5^{th} edition), S. Chand & Co., New Delhi. ISBN: 81 7058 634 8
5. R. Murugeshan, (2008), Electricity and Magnetism**,** S. Chand & Co., New Delhi. ISBN: 978812191705

REFERENCE BOOKS:

1. K.K. Tewari, (2002), Electricity & Magnetism, S. Chand & Co., New Delhi. ISBN: 9788121906678
2. D.J. Griffiths, (2003), Introduction to Electrodynamics, (3^{rd} Edition), Printice Hall of India Pvt. Ltd., New Delhi. ISBN: 9789332550445

WEB LINKS:

https://www.youtube.com/watch?v=_6bKJrGCuJk

https://www.youtube.com/watch?v=xER1_SYql44

https://www.youtube.com/watch?v=tC6E9J925pY

https://www.youtube.com/watch?v=nGQbA2jwkWI

https://www.youtube.com/watch?v=bIDTHzEfhtY

https://www.youtube.com/watch?v=CACD5jX8fsY

https://www.youtube.com/watch?v=JZ2pDlhqPio

https://www.youtube.com/watch?v=LFJjls7B6_c

https://www.youtube.com/watch?v=evVb_i9NXsY

https://courses.lumenlearning.com/physics/chapter/20-5-alternating-current-versus-direct-current/

https://www.elprocus.com/main-difference-between-ac-and-dc-currents/

https://www.tf.uni-kiel.de/matwis/amat/elmat_en/kap_2/backbone/r2_3_3.html

http://electricalenergydzumeshiko.blogspot.com/2017/08/electrical-energy-hyperphysics.html

http://www.physicshandbook.com/topic/topics/seebeck%20effect.html

MATHEMATICAL METHODS IN PHYSICS

Course Code : 09517	**Credits : 5**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

The aim of this course is to

**Prepare the students to solve various physical phenomena using mathematical tools like vectors, matrixes, serves solution approach, special function.*

**To educate them necessary classical dynamics to understand various physical systems.*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Discuss basic mathematical concepts in vector calculus and apply them to solve problems in hydrodynamics.	K2
CO2	Outline the fundamentals of matrixes and illustrate their importance in physics.	K2
CO3	Explain special functions such as Beta Gamma and series solution of Bessel and Legendre differential equations.	K2
CO4	Deduce Lagrangian equation of motion and compute solutions of various simple physical systems.	K5
CO5	Solve Hamiltonians of simple system and derivations of equation of motion.	K3

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 **moderately correlated - 2** **weakly correlated -1**

	PO	**PSO**

CO/PO/ PSO	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
CO1	3	3	3	3	3	2	3	1	2	3	3	3	3	3	3
CO2	3	3	3	3	3	2	3	2	2	3	3	3	3	3	2
CO3	3	3	3	3	2	3	3	1	2	3	3	2	2	3	2
CO4	3	3	3	3	3	2	3	1	2	3	3	2	2	3	3
CO5	3	3	2	3	2	2	3	2	2	3	3	3	2	3	3

Sl NO	CONTENTS OF MODULE	Hrs	COs
1	**Unit 1: Vector Analysis** **Scalar and vector fields**: Gradient, divergence and curl - physical interpretation, Lamellar and solenoidal field – (only definition), line, surface and volume integrals – Gauss Divergence theorem – Stoke's theorem – Green's theorem - Application of vectors to hydrodynamics: Equation of continuity, Bernoulli's theorem.	**1**	**CO1**
2	**Unit 2: Matrices** Characteristic equation of a matrix – eigen values and eigen vectors – Cayley Hamilton theorem – Theorems on eigen values and eigen vectors – Hermitian and unitary matrices – Diagonalisation of matrices – matrices in Physics: rotation matrix, Pauli spin matrices (elementary ideas only).	**1**	**CO2**
3	**Unit 3: Special functions** Gamma and Beta functions – definition – Evaluation – other forms of the functions – symmetry property of Beta function- relation between Beta and Gamma functions - Series solutions of Bessel's differential equation and Legendre differential equation.	**1**	**CO3**

4	**Unit 4: Lagrangian formulation** Mechanics of a system of particles – Degrees of freedom – constraints – Generalised coordinates – Configuration space – principle of virtual work – D'Alembert's principle – Lagrange's equation of motion from D'Alembert's principle for a conservative system - Applications of Lagrange's equation: Atwood's machine, a bead sliding on uniformly rotating wire – simple pendulum	**1**	**CO4**
5	**Unit 5: Hamiltonian formulation** Phase space – Hamiltonian function H – physical significance – Hamilton's equations - Applications of Hamiltonian equations: Simple pendulum – motion of a particle in a central force field.	**1**	**CO5**

TEXT BOOKS:

1. Satya Prakash (1996). Mathematical Physics, S. Chand & Sons, New Delhi.
2. J.C. Upadhyaya (2003). Classical Mechanics, Himalaya Publishing House, Mumbai
3. R. Murugesan (1996). Mechanics and Mathematical methods, S. Chand & Company, New Delhi.

REFERENCE BOOKS:

1. B.D. Gupta (1996). Mathematical Physics, Vikas Publishing House Pvt. Ltd, New Delhi.
2. H. Goldstein (1985). Classical Mechanics, Special Indian Student Edition Narosa Publishing House, New Delhi.

WEB LINKS:

https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-61-aerospace-dynamics-spring-2003/lecture-notes/lecture7.pdf

http://kestrel.nmt.edu/~raymond/classes/ph321/notes/lagrange/lagrange.pdf

http://www.iitg.ac.in/physics/fac/padmakumarp/Courses/PH101/Lecture7.pdf

https://www.physics.rutgers.edu/~shapiro/507/book3.pdf

https://phys.libretexts.org/Bookshelves/Classical_Mechanics/Book%3A_Classical_Mechanics_(Tatum)/14%3A_Hamiltonian_Mechanics/14.03%3A_Hamilton's_Equations_of_Motion

https://cds.cern.ch/record/399399/files/p1.pdf

https://www.youtube.com/watch?v=PFDu9oVAE-g

https://www.mathsisfun.com/algebra/eigenvalue.html

https://medium.com/fintechexplained/what-are-eigenvalues-and-eigenvectors-a-must-know-concept-for-machine-learning-80d0fd330e47

SOLID STATE PHYSICS

Course Code : 09517		**Credits**	**: 5**
L: T: P: S : 4:0:0:0		**CIA Marks**	**: 40**
Exam Hours : 03		**ESE Marks**	**: 60**

Learning Objectives:

On taking this course the student will be able to learn and assimilate,

- *Fundamentals concepts of crystal structure.*
- *Different methods of X-ray analysis of crystal structure.*
- *Types of bonding in crystals.*
- *The behavior of dielectric and magnetic materials and their application.*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Summarize the fundamentals of crystals structure; Related the significance of crystal study with industry and other applications.	(K2)
CO2	Experiment with X-ray diffraction techniques; Apply proper methods to explore crystal imperfections.	(K3)
CO3	Compare and contrast bonding in crystals.	(K5)
CO4	Investigate the theoretical fundamentals of lattice vibrations; The theory with the applications such as super conductivity.	(K5)
CO5	Analyze concepts of dielectrics; Categorize types of polarization and apply theory to inspect different types of materials.	(K4)

CO6	Compare the different types of magnetic materials and discuss the necessary theory to understand their basic properties of magnetic materials.	(K5)

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 **moderately correlated - 2** **weakly correlated -1**

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
CO2	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
CO3	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**2**
CO6	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**2**

S. NO	**CONTENTS OF MODULE**	**Hrs**	**Cos**
1	**Unit I: Crystal structure** Crystal Lattice – Primitive cell - Unit cell - Seven classes of crystals - Bravais Lattice – crystal planes and Miller Indices – inter planar spacing in crystal lattice - structure of crystals - Simple cubic, Face centered Cubic, Body Centered Cubic crystal structure, Hexagonal close packed structure, Sodium Chloride, Diamond, Zinc Blende and Cesium Chloride structure	**1**	**CO1**
2	**Unit II: X- rays in crystal study** Diffraction of X-rays by crystals - Bragg's Law in one dimension - Experimental method in X-ray Diffraction - Laue method, rotating crystal method - Powder photograph method - Von Laue's equations – crystal imperfections - point defects, line defects - surface defects - volume defects - effects of crystal imperfections	**1**	**CO2** **CO3**

3	**Unit III: Bonding and Super Conductivity** Types of bonds in crystals – Ionic, covalent, metallic, van-der-waal's and hydrogen bonding – characteristic of various bonding – cohesive energy of cubic ionic crystals – Madelung constant for sodium chloride crystal – Phonons – monoatomic one dimensional lattice – specific heat of solids – Einstein's theory – Debye theory. Super conductivity – general properties of super conductors - Meissner effect – Type I and Type II super conductors – applications of super conductors.	**1**	**CO4**
4	**Unit IV: Dielectrics** Fundamental definitions in dielectrics - different types of Electric polarization - frequency and temperature effects on polarization - dielectric loss - local Field on Internal Field Clausius- Mosotti Relation - Determination of dielectric constant - dielectric Breakdown - properties of different types of insulating materials**.**	**1**	**CO5**
5	**Unit V: Magnetic materials** Different type of magnetic materials - Langevin's theory of diamagnetism - Langevin's theory of paramagnetism - Weiss theory of paramagnetism - qualitative explanation of Heisenberg's internal field quantum theory of ferromagnetism.	**1**	**CO6**

TEXT BOOKS:

1. Charles Kittel (2004). Introduction to Solid State Physics (7th edition), John Wiely and sons.
2. Arumugam.M (1997). Material Science, Anuradha Technical Book publishers.
3. P.K. Palanisamy (2005). Solid State Physics, Scitech publications (India) Pvt. Ltd.
4. R. Murugesan and Kiruthiga Sivaprasath (2005). Modern physics, S.Chand and Company New Delhi.

REFERENCE BOOKS:

1. V.Raghavan (2004). Material Science and Engineering First Course (5th edition), Prentice Hall (India) Pvt. Ltd.
2. S.L. Kakani and L. Hemrajani (1997). Text Book of Solid State Physics, Sultan Chand and sons, New Delhi.
3. A.J. Dekker (2005). Solid State Physics, Macmillan India Ltd.
4. Arthur Bieser (2005). Concepts of Modern Physics (6th edition), Tata Mc. Graw Hill.
5. S.O. Pillai (2005). Solid state physics (6th edition), New Age International Pvt.Ltd.

WEB LINKS:

https://youtu.be/ZXqjx0a1tBA
https://youtu.be/yTDFl3vUoNo
https://youtu.be/ztw-osPIrSE
https://youtu.be/rm0NCgqDKB8
https://youtu.be/B1JzFAD1GAo

BASIC ELECTRONICS

Course Code : 09518	**Credits : 5**
L: T: P: S : 4:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

- *By studying this course student will be able to acquire theoretical and application orientation knowledge on semiconductor and various semiconductor devices.*
- *They will be able to construct various electronic circuits and study them in detail.*

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Interpret the conductivity behavior of solids based on their knowledge acquired in atomic physics course. Explain the properties of semiconductors, their basic configuration, their characteristics, construct and analyze various electronic circuits which have very relevant applications, classify various rectifier circuits based on their efficiency and components used.	**K2,K3,K4**

CO2	To extend the ideas of diodes to understand transistors, build amplifier circuits and analyze based on various parameters.	**K3**
CO3	Classify various transistors amplifier circuits based on their nature, characteristics and working.	**K3**
CO4	Develop oscillators, models using amplifiers construct, classify and categorize various types of oscillators. Extend these oscillators towards designing different types of multivibrators.	**K3**
CO5	Identify the need for special semiconductor devices, Extend their theoretical knowledge in construction of these devices and analyze their behavior using application oriented electronic circuits.	**K3,K4**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**

Sl NO	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Unit 1: Semiconductors:-** Energy bands in a solid – intrinsic semiconductors – extrinsic semiconductors – Fermi level - pn junction – volt – ampere characteristic curve – biasing the pn junction - diode as rectifier – half wave rectifier – full wave rectifier – centre tapped, bridge rectifier – efficiency and ripple factor - circuits using diode – clipper, clamper – zener diode – zener diode as voltage regulator.	**1**	**CO1**

2	**Unit II: Transistors:-** Basic transistor amplifier – Transistor input and collector characteristics – common base and common emitter amplifier – relation between α and ß – transistor biasing techniques – emitter bias – voltage divider bias. Transistor hybrid model – the h parameter – analysis of transistor amplifier (CE only) circuit using h parameters.	**1**	**CO2** **CO**
3	**Unit III: Transistor amplifiers:-** Emitter follower, RC coupled amplifier – analysis using h parameters – frequency response – power amplifiers – classification – class A, push – pull, class B, power amplifier – collector efficiency – differential amplifier – Ad, ACM and CMRR.	**1**	**CO4**
4	**Unit IV: Oscillator and switching circuits:** Feedback in amplifier – negative feedback - Essential of transistor oscillator – basic LC oscillator circuit – Hartley oscillator – phase shift oscillator – Wein's bridge oscillator – expression for frequency. Types of multivibrators – Astable – monostable and bi-stable multivibrators.	**1**	**CO5**
5	**Unit V: Special semiconductor devices:** Junction field transistor (JFET) – characteristics – Common source FET amplifier – UJT – characteristics – UJT as relaxation oscillator – SCR – characteristic – SCR as a rectifier.	**1**	**CO6**

TEXT BOOKS:

1. V.K. Metha (2006). Principles of electronics (10th edition), S.Chand and company.

2. M. K. Bagde, S.R. singh and Kamal Singh (2002). Elements of electronics, S.Chand and company.

3. R.S. Sedha (1998). A Textbook of Applied Electronics, S. Chand and Company, New Delhi.

4. Gupta and Kumar (1991). Handbook of Electronics, Pragati Prakashan, Meerut.

REFERENCE BOOK

1. Allen Mottershead (1989). Electronic devices and circuits, Prentice Hall of India.

2. Millman and Halkias (2005). Integrated electronics, Tata McGrawHill Publication, New Delhi.

3. Mitchell E Schultz (2006). Grob's Basic Electronics (10th Edition), Tata McGraw Hill., New Delhi.

WEB LINKS:

https://youtu.be/NMD4KECE-7I

https://youtu.be/KynKHr2cXgk

https://youtu.be/MNp-WxkF5h4

https://youtu.be/rERBi7Ao9To

https://youtu.be/dQbrI_iQWig

ELECTIVE 1

(Any one of the three below)

I a.APPLIED ELECTRONICS

Course Code : 09519	**Credits : 4**
L: T: P: S : 4:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

This course helps the students to gain basic ideas of the construction and working of digital electronic devices / circuit to understand the fundamentals of communication systems, design circuit for solving problems.

Course Outcomes: At the end of the Course, the Student will be able to:

Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Summarize the characteristics of operational amplifier its parameters and construct circuit to perform various mathematical operation.	K2,K3
CO2	Solve simultaneous equation and differential equation using electronic circuit analyzes the performance of electronic circuit in handling mathematical equations. Design circuits to generate waveform to perform analog computation.	K3,K4,K6
CO3	Extend their knowledge of digital analog circuit to understand 555 times, design circuits which are very commonly used in various applications.	K4
CO4	Compare digital and analog systems, discuss the need for conversion and design circuits for the same.	K4
CO5	Classify semiconductor memories based on the principle of operation, categorize and compare them based on the size and other memory parameters.	K2

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO6	**3**	**3**	**3**	**3**	**3***	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**

Sl NO	**CONTENTS OF MODULE**	**Hrs**	**COs**

1	**Unit I: Operational Amplifier fundamentals** Characteristics– op-amp parameters – inverting amplifier- non- inverting amplifier – unity follower – summing amplifier – difference amplifier. Differentiator, integrator, comparator using op-amp.	**1**	**CO1**
2	**Unit II: Analog computation and waveform generation** Analog computation and waveform generation using op amp - solving simultaneous equation – second order differential equation – square wave generation (astable operation) – sine wave generation – Wien's Bridge oscillator.	**1**	**CO2**
3	**Unit III: 555 Timer** 555 Timer – internal block diagram – and working – applications – Schmitt Trigger – astable, monostable multivibrator.	**1**	**CO3**
4	**Unit IV: D/A and A/D converters** Introduction – Binary weighted resistor D/A converter – R -2R ladder method – resolution A/D converter – counter type – successive approximation type – resolution.	**1**	**CO4**
5	**Unit V: Semiconductor Memories** Semiconductor memories- classification based on Principle of operation – ROM – organization – 256 x 4 ROM – 1K x 4 ROM – PROM – EPROM – EEPROM – Random Access Memory (RAM) – static RAM – Dynamic RAM –memory parameters	**1**	**CO5**

TEXT BOOKS:

1. Ramakant A. Gayakwad (1994). Op- AMPs and Linear Integrated Circuits, Prentice Hall of India.

2. V. Vijayendran, S. Viswanathan (2005). Introduction to Integrated Electronics, (printers and publishers) Pvt. Ltd, Chennai.

3. Millman and Halkias (2005). Integrated electronics, Tata McGrawHill Publication, New Delhi.

REFERENCE BOOKS:

1. D. Roy Choudhury and Shail Jian (2003). Linear integrated circuits, New Age International (P) Ltd.
2. J. Millman and C. Halkias (2001). Integrated Electronics , Tata McGraw Hill, New Delhi.

WEB LINKS:

https://learnabout-electronics.org/Amplifiers/amplifiers60.php

https://www.youtube.com/watch?v=kiiA6WTCQn0

https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-01sc-introduction-to-electrical-engineering-and-computer-science-i-spring-2011/unit-3-circuits/op-amps/

https://www.youtube.com/watch?v=HicZcgdGxZY&list=PLwjK_iyK4LLCnW-df-_53d-6yYrGb9zZc

https://www.youtube.com/watch?v=66KqmPRy1uI

https://courses.lumenlearning.com/zeliite115/chapter/reading-read-only-memory/

http://www.555-timer-circuits.com/

I b NUMERICAL METHODS

Course Code :	**Credits : 4**
L: T: P: S : 4:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives: *By studying this course student will be able to learn fundamentals of Numerical methods*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Solve simultaneous equations using method of triangularisation	**K2,K3**
CO2	Find the inverse of a matrix using Gauss Jordan Method	**K3**
CO3	Solve Algebraic, Transcendental and Differential Equation using different methods	**K3,K4**
CO4	To fit a curve for the given data using principles of least squares	**K3,K4**
CO5	Integrate the functions using different rules like Simpsons 1/3 rule	**K3,K4**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 moderately correlated – 2 weakly correlated –1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO3	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO6	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

S. NO	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Unit 1: Method of Triangularisation** - Gauss elimination method - Inverse of a matrix - Gauss- Jordan method	**1**	**CO1**

2	**Unit 2: Numerical solution of algebraic, transcendental and differential equation** Bisection method – Regula falsi method - Newton - Raphson method - - Horner'smethod - Solution of ordinary differential equation - Euler's method.	**1**	**CO2**
3	**Unit 3: Interpolation** Finite differences – Operators $\Delta\nabla$ D – Relation between operators –Linear interpolation – Interpolation with equal intervals – Newton forward interpolation formula –Newton backward interpolation formula.	**1**	**CO3**
4	**Unit 4: Curve fitting** Principles of least squares - fitting a straight line - linear regression - fitting an exponential curve.	**1**	**CO4**
5	**Unit 5: Numerical integration** Trapezoidal Rule - Simpson's 1/3 rule and 3/8 rule - Applications - Weddle's rule	**1**	**CO5**

TEXT BOOKS:

Trapezoidal Rule - Simpson's 1/3 rule and 3/8 rule - Applications - Weddle's rule Books for Study:

1. M.K.Venkatraman, (1990) Numerical methods, National Publishing Company.

2. V. Rajaraman, (2003) Numerical methods, Prentice - Hall India Pvt. Ltd.

3. P. Kandasamy, K. Thilagavathy and K. Gunavathy, (2002) Numerical methods, S. Chand & Co.

REFERENCE BOOKS:

1. Numerical methods for Scientific and Engineering computation, Jain Iyenge and Jain, New Age International (P) Ltd. (2004).

2. Numerical methods, S.S. Sastry, Prentice Hall of India Pvt. Ltd., New Delhi (2003).

Web Site:

http://www.sst.ph.ic.ac.uk/angur/lectures/compphys/compphys.html.

ELECTIVE I c. PROBLEMS SOLVING SKILLS IN PHYSICS

Course Code :	**Credits : 4**
L: T: P: S : 4:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

Physics without problems "pressure"

To inculcate the problem solving skills in different areas of physics

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Think Laterally and provide necessary solution	**K2,K3**
CO2	Use appropriate mathematical methods to given problem	**K3**
CO3	Verify whether the answer obtained is correct or not	**K3,K4**
CO4	Use logical and other skills to solve problem	**K3,K4**
CO5	Clear all the entrance examinations leading higher education in premier institutions	**K3,K4**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 moderately correlated – 2 weakly correlated –1

CO/PO/ PSO	PO										PSO				
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
CO1	3	3	3	2	3	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	2	3	2	3	3	3	3	3	3	3	2	3
CO3	3	3	3	2	3	3	3	2	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	2	3	3	3	2	3	3	3	3	3	3	3
CO6	3	3	3	2	3	3	3	2	3	3	3	3	3	3	3

S. NO	CONTENTS OF MODULE	Hrs	Cos
1	**UNIT 1: Problems in mechanics** Newton laws of motion for various systems (1, 2 and 3 dimension), Conservation laws and collisions, Rotational mechanics, central force, Harmonic oscillator, special theory of relativity	**1**	**CO1**
2	**UNIT 2: Problems in thermal physics** Kinetic theory– Laws of Thermodynamics – Ideal Gas law–Various Thermodynamic process– Entropy calculation for various process– Heat engine–TS and PV diagram–Free energies and various relations	**1**	**CO2**
3	**UNIT 3: Problems in electricity & magnetism** Electrostatics– calculation of Electrostatic quantities for various configurations– Conductors, Magneto statics– Calculation of Magnetic quantities for various configuration, Electromagnetic induction, Poynting vector, Electromagnetic waves.	**1**	**CO3**

4	**UNIT 4: Problems in quantum mechanics** Origin of Quantum mechanics– Fundamental Principles of Quantum mechanics– potential wells and harmonic oscillator– Hydrogen atom	**1**	**CO4**
5	**UNIT 5: Problems in general physics & mathematics** Plotting the graphs for various elementary and composite functions– Elasticity–Viscosity and surface tension– fluids– Buoyancy–pressure– Bernoulli's theorem–applications– waves and oscillations, Errors and propagation of errors	**1**	**CO5**

TEXT BOOKS:

1. Charles Kittel, Walter D knight, Mechanics (in SI units) (Berkeley Physics course–volume 1), Tata McGraw Hill publication, second edition.

2. S.C.Garg, RM Bansal &CK Ghosh, Thermal physics, (Tata McGraw Hill Publications), 1stedition.

3. E.M.Purcell, Electricity &magnetism(in SI units), Tata Mcgraw hill Publication, 2ndEdition.

4. N.Zettili, Quantum mechanics, Wiley Publishers, second edition.

5. David. J.Griffith, Introduction to quantum mechanics, Pearson cPublications, second edition

REFERENCE BOOKS:

6. Halliday&Resnick, Fundamentals of Physics, Wiley Publications, 8thEdition

7. Nelkon and Parker, Advanced level physics, CBS publishers, 7thedition

8. AmithAgarwal, Play with graphs, ArihantPublications

9. D.S.Mathur, Properties of matter, S.Chand Publications, 11th Edition

SEMESTER - VI

RELATIVIY & QUANTUM PHYSICS

Course Code : 09620	**Credits : 5**
L: T: P: S : 6:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

The aim of this course is to acquire sufficient knowledge in relativity, properties of matter wave, operator formalism, schrodinger wave equation and applications.

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	To describe the basic concepts of relativity and to translate the mathematical equations to physical concepts and vice-versa.	(K2)
CO2	To identify the wave nature of matter; to illustrate the wave-particle duality with experiments.	(K3)
CO3	To apply the concepts of basic postulates Quantum mechanics; compute the Schrodinger equation for the systems.	(K3)
CO4	Associated the Quantum mechanics wave functions with the corresponding operators and eigen values.	(K4)
CO5	To deduce angular momentum operators. To evaluate various commutator relations of orbital and spin angular momenta.	(K4) (K5)
CO6	To solve the Schrodinger equation of physically important one dimension potentials.	(K5)
CO7	To estimate the shape of wave functions; to conceive methods such as separation of variables to solve three dimension problems.	(K6)

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 **moderately correlated – 2** **weakly correlated –1**

CO/PO/ PSO	PO										PSO				
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
CO1	3	3	2	3	3	3	3	1	2	3	3	2	2	3	2
CO2	3	3	2	3	2	3	3	2	3	3	3	2	3	3	2
CO3	3	2	3	3	3	3	3	2	3	3	3	2	3	2	2
CO4	3	2	3	3	2	2	3	1	3	3	3	2	3	2	2
CO5	3	2	3	3	3	2	3	2	2	3	3	2	2	3	2
CO6	3	2	2	3	2	2	3	1	3	3	3	2	2	2	2
CO7	3	2	2	3	3	3	3	2	3	3	3	2	2	2	2

S. NO	CONTENTS OF MODULE	Hrs	COs
1	**Unit I: Relativity** Frame of reference – Gallilean transformation – Michelson – Morley experiment – Postulates of special theory of relativity – Lorentz transformation – length contraction – time dilation – relativity of simultaneity – addition of velocities – variation of mass with velocity – mass energy equation – elementary ideas of general theory of relativity – Principle of equivalence – Bending of rays of light due to gravitational field- shift of spectral lines - Minkowski's four dimensional space.	**1**	**CO1**
2	**Unit II: Wave nature of matter** Matter wave – phase and group velocity – wave packet – expression for de Broglie wavelength – experimental confirmation of particle waves – Davisson and Germer's experiment – G.P. Thomson's experiment – applications of electron diffraction – electron microscope – principle of complementarity – Heisenberg's uncertainty principle – experimental illustration of uncertainty principle – applications of uncertainty principle.	**1**	**CO2** **CO3**
3	**Unit III: Schrodinger's Equation** Inadequacy of classical mechanics – basic postulates of wave mechanics – properties of wave function – probability interpretation of a wave function – operator formalism – linear operators – self – adjoint operators – expectation value – eigen values and eigen functions – commutativity and	**1**	**CO4**

	compatibility – Schrodinger's equation - steady state and time dependent form.		
4	**Unit IV: Angular Momentum** Orbital angular momentum operators and their commutation relations – elementary ideas of spin angular momentum of an electron – Pauli matrices – spin matrices - properties.	**1**	**CO5**
5	**Unit V: Solution of Schrodinger's Equations** Free particle solution – particle in a box – Qualitative treatment of the Barrier penetration problem (one dimension only), linear harmonic oscillator, rigid rotator and Hydrogen atom	**1**	**CO6**

TEXT BOOKS:

1. Brijlal Subramanyam, (1990), Mechanics and Relativity, S. Chand & Co., New Delhi, ISBN: 8121926114

2. G. Aruldas, (2002), Quantum mechanics, Prentice Hall India. ***ISBN***: 9789390464869

3. R. Murugeshan and Kiruthiga Sivaprasath, (2008), Modern Physics, S. Chand & Co. ISBN:9789352533107

4. Satyaprakash, (2009), Quantum Mechanics, Pragati Prakashan, Meerut. ISBN: 9789387812352

REFERENCE BOOKS:

1. P.M. Mathews and S. Venkatesan, (2005), A text book of Quantum mechanics, Tata McGraw – Hill, New Delhi. ISBN: 9780071322140

2. Arthur Beiser. (1997), Concepts of modern physics, (5th edition), Tata McGraw – Hill, New Delhi. ISBN: 9780072448481

3. A. Ghatak and Loganathan, Quantum mechanics, McMillan India Pvt. Ltd. ISBN: 9781402018503

4. V.K. Thankappan, (2003), Quantum Mechanics, New Age International (P) Ltd. Publishers, New Delhi. ISBN: 9781781830871

WEB LINKS:

https://youtu.be/TcmGYe39XG0

https://youtu.be/wCOz9AOEDgM

https://youtu.be/iS-e4BMmpF4

NUCLEAR AND PARTICLE PHYSICS

Course Code	**: 09621**	**Credits**	**: 5**
L: T: P: S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

Learning Objectives: *On taking course the student will be able to*
**Gain an insight into the theories of nuclear structure & radioactivity.*
**Understand the working of various particle detectors and accelerators.*
**Obtain knowledge about various nuclear reactions and their application.*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Characterize nuclei based on their general properties and describe qualitatively models of nuclear structure.	**K2**
CO2	Outline the mechanism of radioactivity and summarize the necessary theories related to it.	**K2**
CO3	Quantify radioactivity and describe its dependence using concepts of half life.	**K2**
CO4	Relate the properties of nature of nuclear system with radiation detectors and particle acceleration.	**K3**
CO5	Paraphrase basic aspects of nuclear reaction and calculate Q-value and realize the nature of the reaction.	**K2**

CO6	Apply the fission and fusion well as nuclear energy in nuclear reactors and stellar energy in star.	**K3**
CO7	Appraise the theoretical prediction of nuclear reaction to understand the host of sub atomic particle nature reveals.	**K5**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 **moderately correlated – 2** **weakly correlated –1**

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**1**	**3**	**2**
CO2	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**2**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**1**	**2**	**3**	**3**	**3**	**2**	**3**	**2**
CO4	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**1**	**3**	**2**
CO5	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**
CO6	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**2**
CO7	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**1**	**2**	**3**	**3**	**3**	**1**	**3**	**2**

S. NO	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Unit I: General Properties of Nuclei** Nuclear size, charge, mass-determination of nuclear radius-mirror nucleus - mass defect and binding energy-packing fraction – nuclear spin – magnetic dipole moment – electric quadrupole moment – nuclear models – liquid drop model – Weizacker semi empirical mass formula – shell model and magic numbers – nuclear forces-meson theory of nuclear force(qualitative)	**1**	**CO1**
2	**Unit II: Radioactivity** Natural radioactivity – properties of alpha, beta and gamma rays - alpha rays – characteristics determination of e/m of alpha particle – determination of		**CO2**

	range of alpha particle– Geiger Nuttal experiment and law – α-ray spectra – Gamow's theory of α-decay (qualitative study) – beta rays – characteristics - beta ray spectra – neutrino hypothesis – violation of parity conservation – gamma rays – determination of wavelength - internal conversion – nuclear isomerism - law of disintegration – half life and mean life period – units of radioactivity – transient and secular equilibrium – radiocarbon dating – age of earth	**1**	**CO3**
3	**Unit III: Radiation Detectors and Particle Accelerators** Ionization chamber – G.M. Counter and resolving time – scintillation counter – photo multiplier tube – Linear accelerators – cyclotron – synchrocyclotron - betatron.	**1**	**CO4**
4	**Unit IV: Nuclear Reactions** Conservation laws – nuclear reaction Kinematics-Q-value-threshold energy – artificial radioactivity – radioisotopes and its uses – classification of neutrons – nuclear fission – chain reaction – critical mass and size – nuclear reactor-breeder reactor – transuranic elements – nuclear fusion – thermonuclear reactions – sources of stellar energy.	**1**	**CO5**
5	**Unit V: Elementary Particles** Classification of elementary particles – particles and anti particles – anti matter - fundamental interaction – elementary particle quantum numbers – isospin and strangeness – conservation laws**.**	**1**	**CO6**

TEXT BOOKS:

1. N. Subrahmanyam and Brijlal(1996). Atomic and nuclear Physics, S. Chand & Co., New Delhi.

2. Tayal D.C (2006). Nuclear Physics, Himalaya publishing House, Mumbai.

3. R.C. Sharma (2000). Nuclear Physics, K. Nath& Co., Meerut.

4. R. Murugesan and Kiruthiga Sivaprasath (2005). Modern physics, S. Chand and Company, New Delhi.

REFERENCE BOOKS:

1. R.R. Roy and B.P. Nigam (1997). Nuclear Physics, New Age International (P) Ltd., New Delhi.

2. Irving Kaplan (2002**).** Nuclear Physics, Narosa Publishing house, New Delhi.

WEB LINKS:

http://hyperphysics.phy-astr.gsu.edu/hbase/nuccon.html

http://hyperphysics.phy-astr.gsu.edu/hbase/Nuclear/nucstructcon.html

http://hyperphysics.phy-astr.gsu.edu/hbase/Nuclear/radact.html

http://hyperphysics.phy-astr.gsu.edu/hbase/Particles/parcon.html

https://www.int.washington.edu/users/mjs5/Class_560/lec560_1/node2.html

https://brilliant.org/wiki/nuclear-decay/

https://www.britannica.com/science/radioactivity

https://www.youtube.com/watch?v=1iOI8PIosVU

https://home.cern/science/accelerators/how-accelerator-works

http://abyss.uoregon.edu/~js/ast123/lectures/lec07.html

Elective II

(Any one of the three below)

I a.DIGITAL ELECTRONICS

Course Code : 09622	**Credits : 4**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives*: By studying this course student will be able to learn fundamentals of Boolean algebra synthesis of Boolean functions and combinational and sequential circuits and basics of IC fabrication technology.*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Classify numbers based on various number systems using digital technology and apply to solve binary operation.	**K2,K3**
CO2	Interpret real life situations using AND, OR, NOT, basic logic gates and extend their ideas to universal building blocks. Infer operation using Boolean Algebra simplify using mapping techniques.	**K3**
CO3	Construct analyze digital circuits - combinational and using logic circuits.	**K3,K4**
CO4	Build sequential circuits and analyze working.	**K3,K4**
CO5	Construct digital circuits – registers and counters analyze their working.	**K3,K4**
CO6	Explain basic of IC technology various process during fabrication and integration.	**K2**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 **moderately correlated – 2** **weakly correlated –1**

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO3	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO6	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

S. NO	CONTENTS OF MODULE	Hrs	COs
1	**Unit 1: Number System and Binary Code** Introduction, binary, octal and hexadecimal number system. Binary operations-addition; Subtraction, multiplication and division. Subtraction using 1's and 2's complement; BCD system.	**1**	**CO1**
2	**Unit 2: Combinational Logic Design** Boolean algebra-De Morgan's theorem- basic logic gates- NAND and NOR as universal gates-SOP, POS- Karnaugh map representation and simplification, pair, quad, octet (limited to four variables). Arithmetic circuits - half and full adders, half and full subtractors), BCD adder. Demultiplexers /Decoders, Multiplexers, Encoders, Code converters (BCD-to Binary, Binary to BCD converters).	**1**	**CO2**
3	**Unit 3 : Flip flops** Sequential logic circuits – 1-bit memory, Latch, R-S Flip flop, J-K Flip flop – Race-around condition – master – Slave Flip flop – T and D flip flops.	**1**	**CO3**
4	**Unit 4: Registers and counters** Registers, Modes of operation, shift right, shift left registers. Counters (4 bit). Ripple (or) asynchronous Counters – synchronous counters –Up - down counters – decade counter – BCD counter.	**1**	**CO4**
5	**Unit 5: Introduction to IC technology** Basic fabrication steps: epitaxial growth, oxidation, photolithography, etching, diffusion, ion implantation, film deposition and metallisation. Process integration for integrated Circuits, Diodes and transistor for monolithic circuits, integrated resistors, capacitors.	**1**	**CO5**

TEXT BOOKS:

1. V. Vijayendran (2005). Introduction to Integrated Electronics, S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai.
2. R.P.Jain (1996). Digital Electronics by Practice Using Integrated Circuits, Tata McGraw Hill.
3. J. Millman and C. Halkias (2001). Integrated Electronics, Tata McGraw Hill, New Delhi.
4. Malvino Leach (1992). Digital Principles and Application (4th Edition), Tata McGraw Hill.

REFERENCE BOOKS:

1. D. Roy Choudhury and Shail Jain (2003). Linear Integrated Circuits, New Age Internation (P) Ltd.
2. I.J. Nagrath (1999). Electronics - Analog and Digital, Prentice Hall of India, New Delhi.

WEB LINKS:

Digital Electronics videos created by our alumni
https://youtu.be/JLz7qASICYU

https://youtu.be/u6m4lI-qZ58

https://youtu.be/C0HsQykDdKg

Other sources
https://youtu.be/-paFaxtTCkI
https://youtu.be/s1DSZEaCX_g

ELECTIVE II b. GEOPHYSICS

Course Code :	**Credits : 4**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

To make the students understand the basic principles of geophysics, geomagnetism and concepts of earthquakes.

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Understand the different layers of the atmosphere.	**K2,K3**
CO2	Know the details about geophysical and chemical methods	**K3**
CO3	Gain sufficient knowledge on the earthquakes and Tsunami warning systems	**K3,K4**
CO4	Have an idea on geomagnetism and gravity	**K3,K4**
CO5	Understand the radioactivity of the earth	**K3,K4**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 moderately correlated – 2 weakly correlated –1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO3	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO6	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

S. NO	CONTENTS OF MODULE	Hrs	COs
1	**Unit 1: Physics of the earth** Introduction to Geophysics- Earth as a member of the solar system-Atmosphere-Ionosphere- Asthenosphere-Lithosphere-Hydrosphere and Biosphere-Meteorology-Oceanography and Hydrology	**1**	**CO1**
2	**Unit 2: Geophysical and geochemical methods** Geophysical methods: Geo referencing using Arc GIS software- Electrical methods- Quatitative interpretation of Vertical Electrical Sounding curves –Preparing pseudo cross section for electrical resistivity data and interpretation. Geochemical methods: Introduction-Principles of groundwater chemistry-Sources of contamination- Ground water quality analysis using geochemical methods.	**1**	**CO2**
3	**Unit 3: Introduction to seismology** The earth's interior and crust as revealed by earthquakes-Rayleigh waves and Love waves- Elastic rebound theory-Continental drift -Earthquake magnitude and intensity-Horizontal seismograph and seismograph equation-Tsunami-Causes and Impacts-Tsunami warning systems.	**1**	**CO3**
4	**Unit 4: Geomagnetism and gravity** Historical introduction –The physical origin of magnetism-Causes of the main field-Dynamo theory of earth's magnetism. Gravitational potential-Laplace's equation and Poisson's equation-Absolute and relative measurements of gravity-Worden gravimeter.	**1**	**CO4**
5	**Unit 5: Geochrology and geothermal physics** Radioactivity of the earth-Radioactive dating of rocks and minerals-Geological time scale- The age of the earth. Flow of heat to the surface of the earth –Sources of heat within the earth-Process and heat transport and internal temperature of earth.	**1**	**CO5**

TEXT BOOKS:

1. Arthur W.Hounslow, 1995. Water quality data -Analysis and Interpretation, Lewis publishers Washington D.C.
2. Cook A.H, 1973. Physics of the Earth and Planets, McMillanPress, London.
3. John Milsom, Field geophysics-The geophysical field guide III edition, Wiley publications, England.
4. Krauskopf. K.B, 1967. Introduction to Geochemistry, McGraw Hill.
5. RamachandraRao, 1975. Outline of geophysical prospecting-a manual for geologists, University of Mysore.

REFERENCE BOOKS:

1. Garland, Introduction to Geophysics (11 edition), WB Saunder Company, London,
2. William Lowrie, Fundamentals of Geophysics (11Edition), Cambridge press UK.
3. Nils-Axel Morne, Geochronology-Methods and case studies, INTECH publications.
4. John Raferty, 2011. Geochronology –Dating and Precambrian time –The beginning of the world as we know it, Britannica Educational publishers, New York-.
5. Don L.Anderson, 1989. Theory of the Earth, Blackwell scientific Publications-UK.

ELECTIVE II c. MEDICAL PHYSICS

Course Code :	**Credits : 4**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives: *To gain a broad and fundamental understanding in Physics while developing particular expertise in medical applications Learning Outcomes*:

Course Outcomes: At the end of the Course, the Student will be able to:

Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Functional knowledge regarding the need of radiological protection	**K2,K3**
CO2	Gain knowledge on diagnostic and therapeutic application like X-rays, Ultrasound imaging , Magnetic resonance imaging etc.,	**K3**

CO3	Gets familiar with various detectors used in medical imaging	**K3,K4**
CO4	Hands on training which will be useful for the students to enter the job market	**K3,K4**
CO5	Learn importance concepts of radiation as an applied knowledge	**K3,K4**

Mapping of Course Outcomes to Program Outcomes:
Strongly correlated – 3 moderately correlated – 2 weakly correlated –1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO3	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO6	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

S.No.	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Unit-1: X-rays** Electromagnetic spectrum - production of x-rays - x-ray spectra - Brehmsstrahlung - Characteristic x-ray - X-ray tubes - Coolidge tube - x-ray tube design - tube cooling - stationary mode - Rotating anode x-ray tubes -Tube rating - quality and intensity of x-ray. X- ray generator circuits - half wave and full wave rectification - filament circuit - kilo voltage circuit - high frequency generator - exposure timers - HT cables.	**1**	**CO1**

2	**Unit-2: Radiation physics** Radiation units - Exposure - Absorbed dose - rad to gray - kera relative biological effectiveness - Effective dose: Sievert (Sv)- Inverse Square Law - Interaction of radiation with matter - Linear Attenuation coefficient- Radiation Detectors -Thimble Chamber - Condenser Chambers - Geiger counter - Scintillation counter -Ionization Chamber - Dosimeters - Survey methods - Area monitors - TLD and Semiconductor Detectors.	**1**	**CO2**
3	**UNIT-3: Medical imaging physics** Radiological Imaging - Radiography - Filters - grids - Cassette - X-ray film - Film processing - Fluoroscopy - Computed Tomography Scanner - Principle Function -Display - Generations - Mammography- Ultrasound imaging - Magnetic Resonance Imaging - Thyroid Uptake system - Gamma camera (Only Principle, function and display)	**1**	**CO3**
4	**Unit-4: Radiation therapy physics** Radiotherapy - Kilo voltage machines - Deep Therapy Machines - Tele-cobalt machines - Medical Linear Accelerator - Basics of Teletherapy units - Deep x-ray, telecobalt units, Medical linear accelerator - Radiation Protection - External Beam Characteristics - Phantom - Dose maximum and build up - Bolus - Percentage depth dose - Tissue - Air ratio - Back Scatter factor.	**1**	**CO4**
5	**Unit-5: Radiation protection** Principles of radiation protection - Protective materials - Radiation effects -Somatic, genetic stochastic and deterministic effect- Personal monitoring devices- TLD film badge - Pocket dosimeter.	**1**	**CO5**

TEXT BOOKS:

1. Dr. K. Thayalan, Jayapee Brothers (2003). Basic Radiological Physics, Medical Publishing Pvt. Ltd. New Delhi .
2. Williams and Wilkins (1990) Christensen's Physics of Diagnostic Radiology: Curry, Dowdey and Murry -Lippincot
3. FM Khan, Williamd and Wilkins, (2003) Physics of Radiation Therapy (Third edition).
4. The essential Physics of Medical Imaging: Bushberg, Seibert, Leidhold

Elective III

(Any one of the below four)

III a. MICROPROCESSOR FUNDAMENTALS

Course Code : 09623	**Credits : 4**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

On taking this course students can understand

**Basic concepts of microprocessor.*

**Programming instructions and interfacing concepts.*

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Explain the basic concepts of microprocessor architecture and describe the functions of different pins.	K2
CO2	Apply programming instruction sets of microprocessor and execute assembly language programs.	K3
CO3	Recognize basic ideas of memory; Extend their knowledge in memory interfacing to 8085.	K2
CO4	Apply the programming techniques to interface I/O ports to 8085.	K3
CO5	Developing algorithm to find solution for real time problems.	K6

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 **moderately correlated - 2** **weakly correlated -1**

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

S.No.	CONTENTS OF MODULE	Hrs	COs
1	**Unit 1: Architecture** Architecture of 8085 – registers, flags, ALU, address and data bus, demultiplexing address/data bus – control and status signals – control bus, Programmer's model of 8085 – Pin out diagram – Functions of different pins.	**1**	**CO1**
2	**Unit 2: Programming Techniques** Instruction set of 8085 – data transfer, arithmetic, logic, branching and machine control group of instructions – addressing modes – register indirect, direct, immediate and implied addressing modes. Assembly language & machine language – programming techniques: addition, subtraction, multiplication, division, ascending, descending order, largest and smallest (single byte)	**1**	**CO2**
3	**UNIT 3: Interfacing memory to 8085** Memory interfacing – Interfacing 2kx8 ROM and RAM, Timing diagram of 8085 (MOV Rd, Rs – MVI Rd, data(8) .	**1**	**CO3**
4	**Unit 4: Interfacing I/O Ports to 8085** Interfacing input port and output port to 8085 – Programmable peripheral interface 8255 – control word-three modes of operation-flashing LEDs.	**1**	**CO4**
5	**Unit 5: Interrupts** Interrupts in 8085 - hardware and software interrupts – RIM, SIM instructions – priorities – simple polled and interrupt controlled data transfer.	**1**	**CO5**

TEXT BOOKS:

1. R.S. Gaonkar (1992). Microprocessor Architecture programming and application with 8085 / 8080A, Wiley Eastern Ltd.

2. V. Vijayendran (2003). Fundamental of microprocessor 8085, S. Viswanathan Publishers, Chennai.

3. B. Ram. Fundamentals of Microprocessors and microcomputers, DhanpatRai publication.

REFERENCE BOOKS:

1. Aditya Mathur (1987). Introduction to microprocessor, Tata Mc.Graw Hill Publishing Company Ltd.
2. Dougles V. Hall (1983). Microprocessor and digital system by (2nd Edition), McGraw Hill Company.

WEB LINKS:

Microprocessor fundamentals

https://youtu.be/VhMWtJUiAgQ

https://youtu.be/uvupli4nik8

https://www.youtube.com/watch?v=YFhLBXggbL4&list=PL6So-guiA-TXZqMUZ0pjAdTz4JFK9dnBn

https://youtu.be/-i3FLKezNqg

ELECTIVE III b. FIBRE OPTICS

Course Code :	**Credits : 4**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives*: To gain in depth knowledge in optical fibres , application in telecom field*

Course Outcomes: At the end of the Course, the Student will be able to:

Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Understand the overview of communications signals transmitted over optical fibers and optical fiber communication devices.	**K2,K3**
CO2	Understand the importance of fiber optic material like GA As laser, LED, modulation formats and modulation and demodulation.	**K3**
CO3	understand and differentiate losses and couplers and its function	**K3,K4**
CO4	Understand the basic concepts in the process involving the parameters like modulation and demodulation.	**K3,K4**
CO5	Learn the various fiber optic materials.	**K3,K4**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 moderately correlated – 2 weakly correlated –1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO3	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO6	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

S. NO	CONTENTS OF MODULE	Hrs	COs
1	**Unit 1: Fiber optics** – Introduction Structure of fiber-why silica (SiO2) as fiber-Snell's Law- Total internal reflection-meridional and skew rays- - acceptance angle and cone- numerical aperture- Goos-Haenchen shift-step and graded index fibers - single mode and multimode fiber – V-number – number of modes in step and graded multimode fibers. Analog & digital optical fiber communication (OFC) system- advantages of OFC.	**1**	**CO1**
2	**Unit 2: Transmission characteristics of optical fibers** Losses in silica glass fibers-intrinsic, extrinsic and OH- absorption losses – scattering losses- Linear: Rayleigh and Mie scattering, Nonlinear: Stimulated Brillouin and Raman scattering- intramodal and intermodal dispersion losses-micro and macro bending losses-evanescent field-attenuation spectrum for an ultra-low-loss single mode fiber.	**1**	**CO2**
3	**Unit 3: Optical fiber connection** Introduction - Multimode and single mode fiber joints–Fusion and mechanical splices– Cylindrical ferrule & duplex and multiple fiber connectors –Grin-rod lenses-Three & four port and WDM couplers	**1**	**CO3**
4	**Unit 4: Optical sources** Basic concepts of absorption and emission of radiations-LED power and efficiency-Double heterojunction LED-surface & edge emitting LED– optical output power-output spectrum- modulation bandwidth-reliability-LASER diodes-Gain guided lasers-quantum-well lasers- Fiber lasers.	**1**	**CO4**
5	**Unit 5: Optical detectors** Optical detection principles-quantum efficiency-responsivity-PIN photodiode-speed of response-noise-Avalanche Photodiodes (APD): Germanium APD-Merits and demerits- multiplication factor-Mid-infrared photodiodes – photo transistors-photo conductive detectors-eye diagrams.	**1**	**CO5**

TEXT BOOKS:

1. John M. Senior, (2009). Optical fiber communications: Principles and Practice), Pearson-Prentice Hall, (unit I – V)

2. Gerd Geiser, (2017). Optical Fiber Communications, (5th edition), Tata McGraw-Hill Education Pvt. Ltd., (unit IV-V)

REFERENCE BOOKS:

1. Henry Zanger and Cynthia Zanger, (1991). Fiber Optic Communication And Other Application, Merrill Pub. Co.
2. N. Sharma, (1987) Fiber Optics in Telecommunications, Tata McGraw Hill.
3. K. Kao Charles, (1982). Optical Fiber Systems: Technology, Design and Applications, (1st edition) McGraw- Hill.
4. Govind P Agrawal, John Wiley (2007). Fiber-optic communication systems.
5. Ajoy Ghatak and K. Thyagarajan, (2004). Introduction to fiber optics.
Cambridge University Press.
6. K. Thyagarajan and Ajoy Ghatak, John Wiley (2007). Fiber optic essentials.

ELECTIVE III c. ASTROPHYSICS

Course Code :	**Credits : 4**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives*: To make the students understand the nature of universe from various theories and phenomena. To study the importance and science behind the Astrophysics for the future invention and space research.*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	There are many institutions have the department as Department of Physics and Astronomy that offers courses and jobs for the students those who study Astrophysics.	**K2,K3**
CO2	The Indian institute of Astrophysics and several other astronomical institutions offer the job opportunities based on this course.	**K3**
CO3	Later in future after the study and experience, the job opportunities are available in famous Indian agencies like DRDO and ISRO and in foreign astronomical institutions and agencies	**K3,K4**
CO4	Understand the evolution of stars, white dwarfs, binary stars, quasars	**K3,K4**
CO5	Learn about various galaxies, cosmic rays	**K3,K4**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 moderately correlated – 2 weakly correlated –1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO3	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO6	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

S.No.	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Unit 1: Earliest astronomy and theories of universe**	**1**	**CO1**

	Earliest Astronomy (2500 – 100 BC) – Pythagorean Spherical Earth – Aristotle's Earth as Centre – Copernicus Theory – Kepler's Law – Galileo's observations – Newton's Synthesis. Origin of the universe – The Big Bang Theory – The steady state theory – The Oscillating Universe theory		
2	**Unit 2: Astronomical scales and instruments** Astronomical Scales – Astronomical Distance – Mass and Time – Stellar Temperature – Astronomical Instruments –The Earth's Atmosphere and the Electromagnetic Radiation – Optical Telescopes – Radio Telescopes – The Hubble Space Telescope (HST) – Astronomical Spectrographs – Photographic Photometry – Photoelectric Photometry – Spectrophotometry.	**1**	**CO2**
3	**Unit 3: Solar system** The sun – Structure of the Sun – Nuclear reactions in sun – Photosphere – Chromosphere – corona – solar prominences – Sunspot cycle – Theory of sunspots – Solar flare – solar constant – Temperature of the sun – Solar energy – Solar wind – Other members of the solar system.	**1**	**CO3**
4	**Unit 4: Stellar evolution** Birth of a star– Death of a star –Red giant stars – Chandrasekhar limit – white dwarfs – Black holes – Quasars – Nebulae – Supernovae Binary stars – Origin of binary stars – Variable stars – Flare stars – Constellations – Zodiac – Magnitude and brightness – Luminosities of stars – Measurement of stellar distance – Geometrical parallax method – Distance from red shift measurement	**1**	**CO4**
5	**Unit 5: The milky way galaxy** The milky way – Basic Structure and Properties of the Milky Way – The General Rotation Law – Density Distribution of Gas and Spiral structure of the Galaxy – The Mass of the Galaxy – Magnetic Field in the Galaxy – Cosmic Rays – Continuous Radio Emission in the Galaxy – Hubble's law – Types of galaxies.	**1**	**CO5**

TEXT BOOKS:

1. Astronomy, S. Kumaravelu, (1993). Janki calendar corporation, Sivakasi.
2. Physics of the Universe, Hewish. (1992). A, CSIR publication, New Delhi.
3. Inside Stars, Biman Basu, (1992). CSIR Publication, New Delhi.
4. Cosmic Vistas, Biman Basu, (2002). National Book Trust of India.
5. Space today, Mohan Sundara Rajan, (2000). National Book Trust of India.
6. William K. Hartmann, (1990). The Cosmic Voyage through time and space, Wads worth Publishing company, California.
7. Astronomy, Baker and Fredrick, (1964). ninth edition, Van No strand Rein hold, Co, New York
8. Textbook of Astronomy and Astrophysics with elements of cosmology, V.B. Bhatia, Narosa Publication.
9. B.W. Carroll & D.A. Ostlie, Modern Astrophysics Addison-Wesley Publishing Co.
10. M. Zeilik and S.A. Gregory, Introductory Astronomy and Astrophysics, (4th Edition), Saunders College Publishing.

ELECTIVE III d. WEATHER FORECASTING

Course Code :	**Credits : 4**
L: T: P: S : 5:0:0:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives *To enable them to develop an awareness and understanding regarding the causes and effects of different weather phenomenon and basic forecasting techniques*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	To learn basic techniques to measure temperature and its relation with cyclones and anti-cyclones..	**K2,K3**
CO2	Gain knowledge of simple techniques to measure wind speed and its directions, humidity and rainfall	**K3**
CO3	Understand various causes of climate change like global warming, air pollution, aerosols, ozone depletion, acid rain	**K3,K4**
CO4	Develop skills needed for weather forecasting.	**K3,K4**

CO5	Uncertainties in predicting weather based on statistical analysis.	**K3,K4**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated – 3 moderately correlated – 2 weakly correlated –1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO3	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO6	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

S. NO	**CONTENTS OF MODULE**	**Hrs**	**COs**
1	**Unit 1: Introduction to Atmosphere** Elementary idea of atmosphere- Physical structure and composition- compositional layering of the atmosphere- Variation of pressure and temperature with height- Air temperature- Requirements to measure air temperature- Temperature sensors- types; atmospheric pressure: its measurement- Cyclones and anticyclones- its characteristics.	**1**	**CO1**
2	**Unit 2: Measuring the Weather** Wind- forces acting to produce wind; wind speed direction units, its direction- measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere- Radiation laws.	**2**	**CO2**

3	**Unit 3: Weather Systems** Global wind systems- air masses and fronts- classifications- jet streams- local thunderstorms- tropical cyclones: classification- tornadoes- hurricanes	**1**	**CO3**
4	**Unit 4: Climate and Climate Change** Climate: its classification- causes of climate change-global warming and its outcomes- air pollution- aerosols, ozone depletion, acid rain, environmental issues related to climate.	**1**	**CO4**
5	**Unit 5: Basics of Weather Forecasting:** Weather forecasting: analysis and its historical background- need of measuring weather- types of weather forecasting- weather forecasting methods- criteria of choosing weather station- basics of choosing site and exposure- satellites observations in weather forecasting- weather maps- uncertainty and predictability- probability forecasts.	**1**	**CO5**

TEXT BOOKS:

1. Aviation Meteorology (2014). I.C. Joshi, 3rd edition, Himalayan Books
2. Stephen Burt, (2012), The weather Observers Hand book, Cambridge University Press.
3. S.R. Ghadekar, (2001), Meteorology, Agromet Publishers, Nagpur.
4. S.R. Ghadekar, (2005), Text Book of Agrometeorology, Agromet Publishers, Nagpur.
5. Charls Franklin Brooks, (1924), Why the weather, Chpraman & Hall, London.
6. John G. Harvey, (1995), Atmosphere and Ocean, The Artemis Press.

CORE PRACTICAL III

Course Code : 09624	**Credits : 4**
L: T: P: S : 0:0:3:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

This course opens the window to the student about

- *The design of the concepts of electricity, magnetism, light that are learnt in the theory, providing hands on learning experience.*

Course Outcomes: At the end of the Course, the Student will be able to:
Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	The student will be able to Analyze the nature of light both quantitative and quantitatively.	**K4**
CO2	Apply the theory the design basic electrical circuits.	**K3**
CO3	Associate theoretical concepts like seebeck effect and electromagnetism with practical demonstration.	**K4**

Mapping of Course Outcomes to Program Outcomes:
Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**

LIST OF General Experiments (Any 15 experiments)

1. Young's modulus – Koenig's method – Non uniform bending.
2. Young's modulus – Non uniform bending – optic lever – scale and telescope.

3. Newton's Rings - R_1 R_2 and μ of a long focus convex lens.
4. Spectrometer i – i' curve fixing i.
5. Spectrometer – Cauchy's constants and dispersive power of material of the prism.
6. Field along the axis of a circular coil – Deflection Magnetometer – B_H and M.
7. Field along the axis of a Circular coil – vibration magnetic needle.
8. EMF of Thermocouple – Potentiometer (199P method).
9. EMF of Thermocouple – Potentiometer (108P method).
10. Calibration of high range Voltmeter – Potentiometer.
11. Figure of merit – B.G.
12. Internal resistance of a cell – B.G.
13. Comparison of Capacitances – B.G.
14. Comparison of EMFs – B.G
15. Absolute capacitance of a capacitor -B.G.
16. Series resonance Circuit – LCR – finding L, Resonant frequency, Bandwidth, Q.
17. Spectrometer – narrow angled Prism.
18. To determine Self inductance of the coil by Anderson's bridge.
19. Absolute inductance of a coil – B.G.
20. Strain Gauge – Piezoelectric sensor.
21. To draw B-H Curve of Iron using Solenoid and determine energy loss and hysteresis.

CORE PRACTICAL IV

Course Code : 09625	**Credits : 4**
L: T: P: S : 0:0:3:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

This course helps the students to acquire practical knowledge to design basic electrical circuits using diodes, transistors etc.

- *Relate digital electronics concepts learnt in lecture session to construct digital circuits.*

Course Outcomes:

At the end of the Course, the Student will be able to:

Knowledge level - K1(Remembering) ,K2(Understanding),K3(Applying) ,K4(Analyzing) , K5(Evaluating) ,K6(Creating)

CO1	Substitute basic laws and theories learnt in class to use junction diode, Zener diode, transistors etc.	K2
CO2	Apply the theory to design basic electrical circuits.	K3
CO3	Analyze the response of various electrical devices using the circuits construction.	K4
CO4	Interpret the application of basic circuit to create amplification, oscillation, regulate power supply, logical combinations etc.	

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 moderately correlated - 2 weakly correlated -1

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**

LIST OF Basic Electronics EXPERIMENTS (Any 15 experiments)

1. Full wave Rectifier.
2. Bridge rectifier.
3. Zener regulated power supply – 9V - regulation characteristics.
4. Transistor characteristics – CB mode.
5. Transistor characteristics – CE mode.
6. Single Stage RC coupled amplifier – gain – frequency response.
7. Emitter follower.
8. Hartley oscillator.
9. Colpitt’s oscillator.
10. Transistor – astable multivibrator.
11. Basic logic gates – AND, OR, NOT gates using diodes & transistors.
12. NAND/NOR universal building blocks.
13. De Morgan’s theorem – Verification.

14. Half adder – full adder using IC - XOR, AND and OR gates.
15. Half subtractor, full subtractor using IC - XOR, AND and OR gates.
16. 4 bit ripple counter using IC 7473.
17. Decade counter - IC 7490.
18. To study the output and transfer characteristics of JEET
19. UJT – characteristics and relaxation oscillator.

CORE PRACTICAL V

Course Code : 09626	**Credits : 3**
L: T: P: S : 0:0:2:0	**CIA Marks : 40**
Exam Hours : 03	**ESE Marks : 60**

Learning Objectives:

On taking this course the student acquires

- Practical knowledge to design electronic circuits using OP-AMP-555 timer, microprocessor and related software.

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Solve combinational circuits of linear IC's and compute the necessary output.	**K3**
CO2	Relate the theory learnt to design OP-AMP and IC-555 circuits.	**K3**
CO3	Apply the algorithm learnt in classroom to write and execute assembly language program using 8085 Microprocessor.	**K3**
CO4	Correlate theoretical and practical ideas with software	**K4**

Mapping of Course Outcomes to Program Outcomes:

Strongly correlated - 3 **moderately correlated - 2** **weakly correlated -1**

CO/PO/ PSO	**PO**										**PSO**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**

CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**

LIST OF Applied Electronics EXPERIMENTS (Any 15 experiments)

1. OP Amp – IC 741 – Inverting amplifier, non –inverting amplifier, unity follower.
2. OP Amp – Summing and difference amplifier.
3. Op Amp – Differential amplifier – CMRR.
4. OP Amp – AC frequency response.
5. OP Amp – Square wave generator.
6. OP Amp – Wien's bridge oscillator.
7. OP Amp – Phase Shift oscillator.
8. 555 Timer – astable multivibrator.
9. 555 Timer – Schmitt Trigger.
10. D/A convertor – 4 bit binary weighted resistor method.
11. µp- 8085 8 bit addition, multiplication.
12. µp- 8085 8 bit subtraction, division.
13. µp - Sorting in ascending order – 8 bit data.
14. µp -Sorting in descending order – 8 bit data.
15. µp - Finding the largest number in an array.
16. µp - Finding the smallest number in an array.
17. OP Amp – Solving simultaneous equation.
18. Analyzing IC-555 oscillator and OP Amp integrator using EXP EYES – Software.
19. Analyzing OP Amp inverting and non-inverting amplifier using EXP EYES – Software.
20. Design and verification of OP Amp as integrator and differentiator.
21. Analyzing (a) Diode I-V characteristics
    (b) Rectifier characteristics
    (c) Transistor characteristics using EXP EYES – Software**.**

APPENDIX

The Graduate Attributes of B.Sc.Physics programme are as follows:

- **Disciplinary knowledge and skills:** Capable of demonstrating

(i) Good knowledge and understanding of major concepts, theoretical principles and experimental findings in Physics and other related fields of study, including broader interdisciplinary subfields.

(ii) Ability to use modern instrumentation and laboratory techniques to design and perform experiments is highly desirable.

- **Skilled communicator:** Ability to transmit complex technical information in a clear and concise manner in a simple language for better understanding.
- **Critical thinker and problem solver:** Ability to employ critical thinking and efficient problem solving skills
- **Sense of inquiry:** Capability for asking relevant/appropriate questions relating to the issues and problems and planning, executing and reporting the results of a theoretical or experimental investigation.
- **Team player/worker**: Capable of working effectively in diverse teams in classroom, laboratory and Physics workshop, in industry and field-based situations.
- **Skilled project manager:** Capable of identifying/mobilizing appropriate resources required for a project, and manage a project through to completion, while observing responsible and ethical scientific conduct; and safety and laboratory hygiene regulations and practices.
- **Digitally Efficient:** To analyze acquired data using computers, utilize e-learning tools effectively, create teaching learning materials.
- **Ethical awareness / reasoning:** The graduate should be capable of demonstrating ability to think and analyze rationally with modern and scientific outlook and identify ethical issues related to one's work, and adopting objectives, unbiased and truthful actions in all aspects of work.

- **National and international perspective:** To motivate the students to develop an idea on various projects of National and International significance.
- **Lifelong learners:** Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling in all areas of Physics.