

*Placed at the meeting of
Academic Council
held on 15.11.2023*

APPENDIX-AM

MADURAI KAMARAJ UNIVERSITY

(University with Potential for excellence)

B.SC.,PHYSICS(SEMESTER)

CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS

(This will come in to effect from the academic year 2023 onwards)

1. INTRODUCTION OF THE PROGRAMME:

Physics is often considered to be the most fundamental science. It is the basis of all other science subjects. It explains natural phenomena in the Universe. A bachelor degree in Physics is a great foundation for career in government jobs, industries, educational institutions, labs etc., Physics brings a broad perspective to any problem. This intensive thinking makes the Physicist desirable in any field. That's why Physics graduates can expect career salaries similar to those of computer science and engineering major.

2. QUALIFICATION FOR ADMISSION:

Candidates should have passed the higher secondary Examination conducted by the board of Higher Secondary Examination, Government of Tamilnadu or any other examination accepted by the syndicate of Madurai Kamaraj University as equivalent thereto with PHYSICS as one of the subjects along with MATHEMATICS in Higher Secondary Education.

3. DURATION OF THE COURSE:

The students shall undergo the prescribed course of study for a period of three academic years (six semesters).

4. MEDIUM OF INSTRUCTION: English/ Tamil

5. OBJECTIVE OF THE PROGRAMME:

The UG course in Physics helps the students to understand the world around us, the world inside us and the world beyond us. Physics encompasses the study of the universe from the smallest subatomic particles to the largest galaxies. Moreover, it is the basis of many sciences like chemistry, oceanography, seismology and can be applied to a bachelor's degree in physics.

Physics challenges our imagination with concepts like relativity and string theory. It leads to great discoveries like computers and lasers that lead to technologies which change our lives -from healing joint stocuring cancer and to develop sustainable energy solutions.

6. OUTCOME OF THE PROGRAMME:

The syllabus for B.Sc., Physics degree under semester system has been designed on the basis of Choice Based Credit System,(CBCS)which would focus on job oriented programme sand values added education. It will effect from June 2023 onwards. Duration of the course is threeyears. The students who are joining the B.Sc., (Physics) degree shall undergo a study period of three academic years-Sixsemesters.

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While preparing the syllabus, care is taken to provide there quirements of students who optphysics, for developing their skill and competence in their career. Hence after completion of the course, the student will been riched with recent trendsin Physics and be motivated towards higher studies and research activities. During the preparation of the syllabus and curriculum, the UGC model curriculum and syllabi of world best universities were considered.

8. UNITIZATION:

The important concepts of each subject is uniformly distributed in five units and properly required hours to teach are allotted.

9. PATTERN OF SEMESTER EXAMINATION:

The semester examination comprises of two parts i) internal assessment and ii) External examination. The maximum marks for the internal and external examinations are 25 and 75 respectively.

10. THE SCHEME FOR INTERNAL ASSESSMENT:

The Pattern for internal valuation

- Two tests will be conducted (10mark each).The average of the two is taken-10marks
- 3rd test may be allowed for absentees of anyone of the two tests.
- Group Discussion / Seminar / Quiz-5marks.
- For Quiz, 2 Quiz should be conducted.
- 2 Assignments: 5 mark each; average 5 marks
- Peer team teaching and Peer group learning - 5marks

(Students should be grouped into 5 or 6 members.10% of each subject shall be taught through peer team teaching and learning method and appropriate hours should be allotted.

11. EXTERNAL EXAMINATION:

Student should appear for the external examination at the end of each semester. The University semester examinations will be conducted in the month of November and April for odd and even semesters respectively. He /she must satisfy the minimum attendance as prescribed by the University.

12. QUESTION PAPER PATTERN:

The pattern of Question paper will be as follows.

EXTERNAL

Time: 3 hours

Max.Marks:75

SECTION A

(10X1=10Marks)

Question No. 1to10 (MultipleChoices)

- Two questions from each unit
- Four choices in each question
- No,, none of these,,choice.

SECTION B

(5X7=35marks)

- Answer all questions choosing either (a) or(b)
- Answer not exceeding two pages.(One question from each unit)

Question No:11-15

11 (a) or 11 (b)
12 (a) or 11 (b)
13 (a) or 11 (b)
14 (a) or 11 (b)
15 (a) or 11 (b)

SECTION C

(3X10=30marks)

- Answer not exceeding four pages.
- Answer any three out of five (1 Question from each unit)

Questions16-20

Section	Types of questions	No.of questions	No.of questions to be answered	Marks for each question	Total Marks
A	Multiple Choice.Two questions from each unit	10	1	1	10
B	Not exceeding 2.Pages (either or type)-One from each unit*	5	5	7	35
C	Not exceeding 4 Pages (any three out of five-one from each unit	5	3	10	30

*There must be atleast one problem insection B

13. There will be Two Allied subjects to fulfill the course during three years.

Subject	Maximum marks	Credit	Year of study
Mathematics	200	8	I

Chemistry	400	12	II
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The syllabus for the ancillary subject can be got from the Ancillary Department of Mathematics, Chemistry/ Applied electronics.

➤ Practical: Record NoteBook/ Internal Examination external	5+20	=	25
		=	75
	Total		100

14. SCHEME OF EVALUATION:

For the University theory examination the question paper setter should submit the scheme of valuation along with the question paper for each subject.

15. PASSING MINIMUM:

i) A candidate will be eligible for the B.Sc., degree by completing three years (six semesters) and passing all the prescribed examinations.

ii) A candidate shall be declared as passed the course, if he/she scored a minimum of 35% marks in each paper of all the subjects. He/ She must score a minimum of 27 marks out of 75 in the external examination and a minimum of 40 (internal+external) out of 100.

Classification

Sl.No	Range of CGPA	Class
1	40 & above but below 50	III
2	50 & above but below 60	II
3	60 & Above	I

16. MODEL QUESTION PAPER

Model question paper for a few core subject and skilled based papers of Physics are given below.

(For those who joined in June 2023)

Time: Three hours

Maximum: 75 Marks

Analog Electronics

Section-A

Answer all the questions, choosing correct answer:-

(10X 1=10Marks)

- When a pentavalent impurity is added to a pure semiconductor, it becomes _____
 - An insulator
 - an intrinsic semiconductor
 - p-type semiconductor
 - n-type semiconductor
- An-type semiconductor is
 - Positively charged
 - negatively charged
 - remains the same
 - none of the above

3. A zener diode is always _____ connected
 - a) reverse
 - b) forward
 - c) either reverse or forward
 - d) none of the above
4. Transistor biasing is generally provided by a _____
 - a) biasing circuit
 - b) bias battery
 - c) diode
 - d) none of the above
5. For proper operation of the transistor, its collector should have _____
 - a) proper forward bias
 - b) proper reverse bias
 - c) very small size
 - d) none of the above
6. A JFET has three terminals, namely
 - a) cathode, anode, grid
 - b) emitter, base, collector
 - b) source, drain, gate
 - d) positive, negative, earth
7. A MOSFET has _____ terminals
 - a) two
 - b) three
 - c) four
 - d) four
8. The maximum efficiency of a class B push pull amplifier is
 - a) 25%
 - b) 50%
 - c) 79%
 - d) 98%
9. Demodulation is done in _____
 - a) receiving antenna
 - b) transmitter
 - c) radio receiver
 - d) transmitting antenna
10. In TV transmission picture signal is _____ modulated
 - a) frequency
 - b) phase
 - c) amplitude
 - d) none of the above

REPORT above

Section-B

Answer all the questions, choosing either „a“ or „b“:-

(5X7=35Marks)

11. a) Write a note on working of a forward bias of a PN junction.
 (OR)
 b) Explain the phenomena of avalanche breakdown, zener breakdown and IV characteristics of zener diode.
12. a) Explain briefly about voltage divider bias. (OR)
 b) Write down the relation between α , β and γ
13. a) Explain briefly about Operational Amplifier characteristics.
 (OR)
 b) Explain about the construction and working of operational amplifier as an integrator
14. a) Explain briefly about Barkhausen criteria in negative feedback
 (OR)
 b) An amplifier has a gain of 300. When negative feedback is applied, the gain is reduced to 240. Find the feedback ratio.

15. a) Derive an expression for modulation index in terms of maximum and minimum amplitude of AM wave. (OR)
b) Explain the characteristics of a good receiver.

Section-C

Answer any three questions.

(3X10=30Marks)

16. Explain the construction and working of a full wave Bridge rectifier with neat diagram.
17. Explain the mathematical explanation for a low pass filter.
18. Explain the construction and working of a Junction Field Effect Transistor.
19. Explain the construction and working of a push pull amplifier.
20. Explain about the working of Hartley oscillator, and derive the frequency of oscillator with mathematical derivation.

17. TEACHING METHODOLOGY:

Usual chalk and talk method may be followed. Apart from this seminar, Group Discussion, Peer Team Teaching and Peer Group Learning are practiced in the classroom. Teaching aids like Charts are also used in the classroom. Now a days Computer Aided Technology, E-learning, Smart Class Room Practices with Power Point Presentations are also followed.

18. TEXTBOOKS

The list of text books prescribed for each subject is given under the syllabus of concerned subject.

19. REFERENCEBOOKS

The list of text books prescribed for each subject is given under the syllabus of concerned subject.

20. RE-TOTALING AND REEVALUATION PROVISION

Students may apply for re-totaling and reevaluation after declaration of result within 7 days

B.Sc., PHYSICS SYLLABUS

Preamble

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

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

There structured courses with well-defined objectives and learning outcomes, provide guidance to prospective students in choosing the elective courses to broaden their skills notonly in the field of physics but also in inter disciplinary areas. The elective modules of the framework offer students choice to gain knowledge and expertise in specialized domains of physics like astro physics, medical physics, etc.

TANSICHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAME WORK FOR UNDERGRADUATE EDUCATION	
Programme	B.Sc., Physics
Programme Code	
Duration	3 years[UG]
Programme Outcomes: (These are mere guideline s. Faculty can create POs based on their curriculum or adopt from UGC or the University for their Programme)	<p>PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding Of one or more disciplines that form a part of an undergraduate Programme of study</p> <p>PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share one's views and express her self / him self; demonstrate the ability to listen Carefully read and write analytically and present complex information in a Clear and concise manner to different groups.</p> <p>PO3: Critical thinking: Capability to apply the analytic thought to a body of knowledge; analyse And evaluate the proofs, arguments, claims, beliefs on the basis of Empirical evidences identify relevant as sumptions or implications; Formula te coherent arguments; critically evaluate practices, policies and The ories by following scientific approach.</p> <p>PO4: Problem solving:</p>

Capacity to extrapolate from what one has learned and apply their
Competencies to solve different kinds of non-familiar problems, rather than
Replicate curriculum content knowledge and apply one's learning to real
Life situations.

PO5: Analytical reasoning:

Ability to evaluate the liability and relevance of evidence identify logical
Flaws and holes in the arguments of others analyze and synthesize data
From a variety of sources draw valid conclusions and support them with
Evidence and examples and addressing opposing view points.

	<p>PO6:Research-related skills: A sense of inquiry and capability for asking relevant / appropriate questions,problem arising, synthesizing and articulating;Ability to recognize cause - and -effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan,execute and report the result so fan experiment or investigation</p> <p>PO7:Cooperation / Teamwork: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.</p> <p>PO8:Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative / qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.</p> <p>PO9:Reflective thinking: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.</p> <p>PO10: Information / digital literacy: Capability to use ICT in avariety of learning situations,demonstrate ability to access, evaluate, and use a variety of relevant information sources and use appropriate software for analysis of data.</p> <p>PO11: Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.</p> <p>PO12 Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and aglobal perspective; and capability to effectively engage in a multicultural society and inter act respect fully with diverse groups.</p> <p>PO13:Moralandethical awareness / reasoning: Ability to embrace moral/ethical values in conducting one"s life, formulate a position / argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one"s work, avoid unethical behavior such as fabrication, falsification or misre presentation of data or committing plagiarism, notadhering to intellectual property rights appreciating environmental and sustainability issues;and adopting objective,unbiased and truthful actions in all aspects of work.</p> <p>PO14:Leadership readiness / qualities: Capability for mapping out the tasks of a team or an organization, andsetting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination,in a smooth and efficient way.</p> <p>PO15:Life long learning: Ability to acquire knowledge and skills, including „learning how to learn“,that are necessary for participating in learning activities through out life,through self - paced and self-directed learning aimed at personal development, meeting economic,social and cultural objectives, and adapting to changing trades and demands of work place through knowledge / skill development / reskilling.</p>
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<p>Programme Specific Outcomes:</p> <p>(These are mere guidelines. Faculty can create POs based on their curriculum or adopt from UGC or University for their Programme)</p>	<p>PSO1: Placement: To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, and beliefs and apply diverse frames of reference to decisions and actions.</p> <p>PSO2: Entrepreneur: To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate start-ups and high potential organizations</p> <p>PSO3: Research and Development: Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.</p> <p>PSO4: Contribution to Business World: To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p>PSO5: Contribution to the Society: To contribute to the development of the society by collaborating with stakeholders for mutual benefit</p>
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3–Year UG Programme B.Sc.,Physics Credit Distribution				
Part	Details	No. of Papers	Total Credits	Total Hours
Part-I	Language (3 Credits)	4	12	24
Part-II	English (3 Credits)	4	12	24
Part-III	Core Theory(5Credits)	8	40	40
	Core Theory(4Credits)	2	8	10
	Allied Theory(5 Credits)	2	10	12
	Allied Theory(4 Credits)	2	8	8
	Core Practical (3 Credits)	5	15	26
	Allied Practical(2Credits)	1	2	4
Part-IV	Foundation Course (2 Credits)	1	2	2
	Ability Enhancement Compulsory Course(AECC)(2credits)	1	2	2
	Skills Enhancement Course(SEC)(2Credits)	8	16	16
	Elective Core(2Credits)	2	7	8
	Summer Internship (1Credits)	1	1	-
	EVS(2Credit)	1	2	2
	Value Education(2 Credits)	1	2	2
Part-V	Extension Activity (NSS/NCC/YRC/RRC/ Physical Education) (1Credit)	1	1	-
		47	140	180

Semester	Details	Credit	No.of Hours
I	Part-I-Tamil-1	3	6
II	Part-I-Tamil-2	3	6
III	Part-I-Tamil-3	3	6
IV	Part-I-Tamil-4	3	6
I	Part-II-English-1	3	6
II	Part-II-English-1	3	6
III	Part-II-English-1	3	6
IV	Part-II-English-1	3	6
TOTAL		24	48
Core Theory			
I	Properties of Matter and Acoustics	5	5
II	Heat, Thermodynamics and Statistical Physics	5	5
III	Mechanics	5	5
IV	Optics and Laser Physics	5	5
V	Electricity, Magnetism and Electro magnetism	5	5
V	Atomic and Nuclear Physics	5	5
V	Analog and Communication Electronics	5	5
VI	Quantum Mechanics and Relativity	5	5
VI	Solid State Physics	4	5
VI	Digital Electronics and Microprocessor 8085	4	5
I	Core Practical-1	-	3
II	Core Practical-1	3	3
III	Core Practical-2	-	3
IV	Core Practical-2	3	3
V	Core General Practical-3	-	3
V	Core Analog Electronics Practical-4	-	2
V	Core Digital Electronics Practical-5	-	2
VI	Core General Practical-3	3	3
VI	Core Analog Electronics Practical-4	3	2
VI	Core Digital Electronics Practical-5	3	2
Total		59	76
Allied Papers			
I	Allied Mathematics-Theory-I	5	6
II	Allied Mathematics-Theory-II	5	6
III	Allied Chemistry / Applied Electronics-I-Theory-I	4	4
III	Allied Chemistry / Applied Electronics-I-Practical-I	-	2
IV	Allied Chemistry/ Applied Electronics-II-Theory-II	4	4
IV	Allied Chemistry / Applied Electronics-II-Practical -II	2	2
Total		20	24
I	Foundation Course	2	2

Semester	Details	Credit	No.of Hours
Ability Enhancement Compulsory Course			
V	Ability Enhancement Compulsory Course (AECC) -3 Employability Skills / Naan Mudhalvan Course	2	2
TOTAL		2	2
Skill Enhancement Course-8			
I	Skill Enhancement Course SEC-I Physics for Everyday Life(NME)	2	2
II	Skill Enhancement Course SEC-II Space Physics (NME)	2	2
II	Skill Enhancement Course SEC-III D/SSC-Programming	2	2
III	Skill Enhancement Course SEC-IV EB Bio medical Instrumentation	2	2
III	Skill Enhancement Course SEC-V D/SS Electrical Wiring/Naan Mudhalvan Course	2	2
IV	Skill Enhancement Course SEC-VI D/SS Energy Physics	2	2
IV	Skill Enhancement Course SEC-VII D/SS Material Science / Naan Mudhalvan Course	2	2
VI	Skill Enhancement Course SEC - VIII D/SS Communication Physics / Naan Mudhalvan Course	2	2
Total		16	16
Elective Course			
V	Elective Course-1Mathematical Physics	4	4
VI	Elective Course-2 Nano Science/Project	3	4
Total		7	8
V	EVS	2	2
VI	Value Education	2	2
Total		4	4
V	Internship / Industrial Training(Carried out in II Year Summer Vacation) (30Hours)	1	-
VI	Extension Activity, NSS/NCC/YRC/RRC/Physical Education (Outside College Hours)	1	-
Total		140	180

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

FIRSTYEAR SEMESTER I

Part	List of courses	Credit	No. of Hours
Part-I	Language	3	6
Part-II	English	3	6
Part-III	Core Theory-1.Properties of Matter and Acoustics	5	5
	Core Practical-1	-	3
	Allied Mathematics Theory-I	5	6
Part-IV	Skill Enhancement Course SEC-I / (NME) Physics for Everyday Life	2	2
	Foundation Course	2	2
Total		20	30

FIRST YEAR SEMESTER II

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

SECOND YEAR SEMESTER III

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

SECOND YEAR SEMESTER IV

Part	List of courses	Credit	No. of Hours
Part-I	Language	3	6
Part-II	English	3	6
Part-III	Core Theory - 4.Optics and Laser Physics	5	5
	Core Practical-2	3	3
	Allied Chemistry-I 1/ Applied Electronics-II-Theory-II	4	4
	Allied Chemistry-II / Applied Electronics-II Practical-II	2	2
Part-IV	Skill Enhancement Course SEC- VI(Discipline / Subject Specific) Energy Physics	2	2
	Skill Enhancement Course SEC-VII (Discipline / Subject Specific) Material Science / NaanMudhalvan Course	2	2
Total		24	30

THIRD YEAR SEMESTER V

Part	Listofcourses	Credit	No.of Hours
Part-III	Core Theory- 5. Electricity, Magnetism and Electro magnetism	5	5
	Core Theory-6.Atomic and Nuclear Physics	5	5
	Core Theory-7.Analog and Communication Electronics	5	5
	Core Practical-3.General Practical.	-	3
	Core Practical-4.Analog Electronics Practical.	-	2
	Core Practical-5.Digital Electronics Practical.	-	2
	Elective Course-1.Mathematical Physics	4	4
Part-IV	Internship / Industrial Training (Carried out in II year Summer Vacation)(30 Hours)	1	-
	EVS	2	2
	Ability Enhancement Compulsory Course(AECC)-3 / Employability Skills / NaanMudhalvan Course	2	2
Total		24	30

THIRDYEAR SEMESTERVI

Part	Listofcourses	Credit	No.of Hours
Part-III	Core Theory - 8.Quantum Mechanics and Relativity	5	5
	Core Theory - 9.Solid State Physics	4	5
	Core Theory-10. Digital Electronics and Microprocessor 8085	4	5
	Core Practical-3.General Practical.	3	3
	Core Practical-4.Analog Electronics Practical.	3	2
	Core Practical-5.Digital Electronics Practical.	3	2
	Elective Course-2.Nano Science and NanoTechnology /Project	3	4
Part-IV	Skill Enhancement Course SEC-VIII (Discipline / Subject Specific) Communication Physics / NaanMudhalvan Course	2	2
	Value Education	2	2
Part-V	Extension Activity, NSS/NCC/YRC/ RRC/ Physical Education (Outside College Hours)	1	-
Total		30	30

Semesters	Credit	No.of Hours
Semester-I	20	30
Semester- II	23	30
Semester-III	19	30
Semester-IV	24	30
Semester-V	24	30
Semester-VI	30	30
Total	140	180

Consolidated Semester wise and Component wise Credit Distribution

Parts	Sem-I	Sem-II	Sem-III	Sem-IV	Sem-V	Sem-VI	Total Credits
Part-I	3	3	3	3	-	-	12
Part-II	3	3	3	3	-	-	12
Part-III	10	13	9	12	19	25	88
Part-IV	4	4	4	6	5	4	27
Part-V	-	-	-	-	-	1	1
Total	20	23	19	24	24	30	140

COURSE	FIRST SEMESTER- FOUNDATION COURSE
COURSE TITLE	INTRODUCTORY PHYSICS
CREDITS	2
COURSE OBJECTIVES	To help students get an overview of Physics before learning their core courses. To serve as a bridge between the school curriculum and the degree programme.
UNITS	COURSE DETAILS
UNIT-I	vectors, scalars -examples for scalars and vectors from physical quantities - addition, subtraction of vectors - resolution and result ant of vectors - units and dimensions - standard physics constants
UNIT-II	Different types of forces-gravitational, electrostatic, magnetic, Electro magnetic, nuclear -mechanical forces like centripetal, centrifugal,friction,tension, cohesive,adhesiveforces
UNIT-III	different forms of energy - conservation laws of momentum, energy - types of collisions-angular moment um-alternate energy sources - real life examples
UNIT-IV	types of motion- linear, projectile, circular, angular, simple harmonic motions-satellite motion - banking of a curved roads-stream line and turbulent motions-wave motion-comparison of light and sound waves - free, forced, damped oscillations
UNIT-V	Surface tension - shape of liquid drop - angle of contact - viscosity-lubricants-capillary flow- diffusion-real life examples-properties and types of materials in daily use- conductors, insulators-thermal and electric
UNIT-VI	PROFESSIONAL COMPONENTS: expert lectures - seminars- webinars - industry inputs - social accountability - patriotism
TEXTBOOKS	1. D.S. Mathur, 2010, Elements of Properties of Matter,S.Chandand Co 2. BrijLal and N. Subrahmanyam, 2003, Properties of Matter,S.ChandandCo.
REFERENCE BOOKS	1.H.R. Gulati, 1977, Fundamental of General Properties of Matter,Fifth edition, S.Chandand Co.
WEBRESOURCES	1. http:// hyperphysics.phy-astr.gsu.edu/hbase/permot2.html 2. https://science.nasa.gov/ems/ https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE OUTCOMES:

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

COURSE OUTCOMES	CO1	Apply concept of vectors to understand concepts of Physics and solve problems
	CO2	Appreciate different forces present in Nature while learning about phenomena related to these different forces.
	CO3	Quantify energy in different process and relate momentum, velocity and energy
	CO4	Differentiate different types of motions they would encounter in various courses and understand their basis
	CO5	Relate various properties of matter with their behavior and connect them with different physical parameters involved.

MAPPING WITH PROGRAM OUTCOMES:

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

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

COURSE	FIRST SEMESTER-CORE THEORY1
COURSE TITLE	PROPERTIES OF MATTER AND ACOUSTICS
CREDITS	5
COURSE OBJECTIVES	Study of the properties of matter leads to information which is of practical value to both the physicist and the engineers. It gives us information about the internal forces which act between the constituent part of the substance. Students who undergo this course are successfully bound to get a better insight and understanding of the subject.
UNITS	COURSE DETAILS
UNIT-I	ELASTICITY: Hooke's law-stress-strain diagram-elastic constants -Poisson's ratio-relation between elastic constants and Poisson's ratio-work done in stretching and twisting a wire - twisting couple on a cylinder - rigidity modulus by static torsion-torsional pendulum (with and without masses)

UNIT-II	BENDING OF BEAMS: cantilever-expression for Bending moment - expression for depression at the loaded end of the cantilever- oscillations of a cantilever - expression for time period - experiment to find Young's modulus by Koenig's method-uniform bending- expression for elevation-experiment to determine Young's modulus Using microscope
UNIT-III	FLUID DYNAMICS: <i>Surface tension:</i> definition - molecular forces- excess pressure over curved surface-application to spherical and cylindrical drop and bubbles - determination of surface tension by Jaeger's method-variation of surface tension with temperature <i>Viscosity:</i> definition - stream line and turbulent flow-rate of flow of Liquid in a capillary tube - Poiseuille's formula - corrections-terminal velocity and Stoke's formula - variation of viscosity with temperature
UNIT-IV	WAVES AND OSCILLATIONS: Simple Harmonic Motion (SHM) - differential equation of SHM - graphical representation of SHM - composition of two SHM in a straight line and at right angles - Lissajous's figures- free, damped, forced vibrations -resonance and Sharpness of resonance. Laws of transverse vibration in strings - sonometer-determination of AC frequency using sonometer-determination of frequency using Melde's string apparatus
UNIT-V	ACOUSTICS OF BUILDINGS AND ULTRASONICS: Intensity of sound-decibel-loudness of sound-reverberation- Sabine's reverberation formula - acoustic intensity - factors affecting the acoustics of buildings. <i>Ultra sonic waves:</i> production of ultra sonic waves-Piezo electric crystal method -magnetostriction effect - application of ultra sonic waves
UNIT-VI	PROFESSIONAL COMPONENTS: expert lectures - seminars – webinars-industry inputs - social accountability- patriotism
TEXTBOOKS	1. D.S.Mathur, 2010, Elements of Properties of Matter, S.Chand and Co. 2. Brij Lal and N. Subrahmanyam, 2003, Properties of Matter, S.Chand and Co 3. D.R.Khanna and R.S.Bedi, 1969, Textbook of Sound, Atma Ram and Sons 4. Brij Lal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition, Vikas Publishing House. 5. R.Murugesan, 2012, <u>Properties of Matter</u> , S.Chand and Co.
REFERENCE BOOKS	1. C.J. Smith, 1960, General Properties of Matter, Orient Longman Publishers 2. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, R.Chand and Co. 3. A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.
WEB RESOURCES	1. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work 2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html 3. https://www.youtube.com/watch?v=gT8Nth9NWPM 4. https://www.youtube.com/watch?v=m4u-SuaSu1sandt=3s 5. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work 6. https://learningtechnologyofficial.com/category/fluid-mechanics-

	lab/ 7. http://www.sound-physics.com/ 8. http://nptel.ac.in/courses/112104026/
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METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE OUTCOMES:

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

COURSE OUTCOMES	CO1	Relate elastic behavior in terms of three moduli of elasticity and Working of torsion pendulum.
	CO2	Able to appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.
	CO3	Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface, soap films provide an analogue solution to many engineering problems.
	CO4	Analyze simple harmonic motions mathematically and apply them. Understand the concept of resonance and use it to evaluate the frequency of vibration. Set up experiment to Evaluate frequency of ac mains
	CO5	Understand the concept of acoustics, importance of constructing buildings with good acoustics. able to apply their knowledge of ultrasonics in real life, especially in medical field and assimilate different methods of production of ultrasonic waves

MAPPING WITH PROGRAM OUTCOMES:

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

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

SKILL ENHANCEMENT COURSES (SEC)

SEC-1/ NME

PHYSICS FOR EVERYDAY LIFE	
Learning Objective: To know where all physics principles have been put to use in daily Life and appreciate the concepts with a better understanding also to know about Indian scientists who have made significant contributions to Physics.	
UNITS	COURSE DETAILS
UNIT-I	MECHANICAL OBJECTS: Spring scales- bouncing balls-roller coasters - bicycles - rockets and space travel.
UNIT-II	OPTICAL INSTRUMENTS AND LASER: Vision corrective lenses - polaroid glasses - UV protective glass - polaroid camera - colour photography- holography and laser.
UNIT-III	PHYSICS OF HOME APPLIANCES: Bulb-fan-hair drier-television -air conditioners - microwave ovens-vacuum cleaners
UNIT-IV	SOLAR ENERGY: Solar constant - General applications of solar energy-Solar water heaters-Solar Photo-voltaic cells-General applications of solar cells.
UNIT-V	INDIAN PHYSICIST AND THEIR CONTRIBUTIONS: C.V.Raman, Homi Jehangir Bhabha, Vikram Sarabhai, Subrahmanyam Chandrasekhar, Venkatraman Ramakrishnan, Dr.APJ Abdul Kalam and their contribution to science and technology.
TEXTBOOKS	1. The Physics in our Daily Lives, Umme Ammara, Gugucool Publishing, Hyderabad, 2019. 2. For the love of physics, Walter Lawin, Free Press, New York, 2011.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE	SECOND SEMESTER-CORE THEORY 2
COURSE TITLE	HEAT, THERMO DYNAMICS and STATISTICAL PHYSICS
CREDITS	5
COURSE OBJECTIVES	The course focuses to understand a basic in conversion of temperature in Celsius, Kelvin and Fahrenheit scales. Practical exhibition and explanation of transmission of heat in good and bad conductor. Relate the laws of thermo dynamics, entropy in everyday life and explore the knowledge of statistical mechanics and its relation
UNITS	COURSE DETAILS
UNIT-I	CALORIMETRY: specific heat capacity-specific heat capacity of gases C_P and C_V - Meyer's relation -Joly's method for determination of C_V -Regnault's method for determination of C_P LOW TEMPERATURE PHYSICS: Joule-Kelvin effect-porous plug experiment - Joule-Thomson effect -Boyle temperature - temperature of inversion - liquefaction of gas by Linde's Process- a diabatic demagnetisation.

UNIT-II	THERMODYNAMICS-I: zeroth law and first law of thermo dynamics - P-V diagram - heat engine -efficiency of heat engine - Carnot"engine, construction, working and efficiency of petrol engine and diesel engines-comparison of engines.
UNIT-III	THERMODYNAMICS-II: second law of thermo dynamics -entropy of an ideal gas - entropy change in reversible and irreversible processes - T-S diagram -thermo dynamic cal scale of temperature -Max well"s thermo dynamical relations-Clasius-Clapeyron"s equation (first latent heat equation) - third law of thermodynamics -un attainability of absolute zero-heat death.
UNIT-IV	HEATTRANSFER: modes of heat transfer: conduction, convection and radiation. <i>Conduction:</i> thermal conductivity- determination of thermal conductivity of a good conductor by Forbe"s method-determination of thermal conductivity of a bad conductor by Lee"s disc method. <i>Radiation:</i> black body radiation (Ferry"s method) - distribution of energy in black body radiation - Wien"s law and Rayleigh Jean"slaw-Planck"s law of radiation-Stefan"s law-deduction of Newton"s law of cooling from Stefan"s law.
UNIT-V	STATISTICALMECHANICS: definition of phase-space - micro and macro states - ensembles -different types of ensembles - classical and quantum Statistics - Maxwell-Boltzmann statistics - expression for distribution function - Bose - Einstein statistics-expression for distribution function-Fermi-Diracstatistics-expression for distribution function - comparison of three statistics.
UNIT-VI	PROFESSIONALCOMPONENTS: expert lectures - seminars- webinars-industry inputs - social accountability- patriotism
TEXTBOOKS	<ol style="list-style-type: none"> 1. Brijlal and N.Subramaniam, 2000, Heat and Thermodynamics, S.ChandandCo. 2. Narayanamoorthy and Krishna Rao, 1969, Heat, Triveni Publishers,Chennai. 3. V.R.Khanna and R.S.Bedi,19981stEdition,Text book of Sound , Kedharnaath Publish and Co, Meerut 4. Brijlal and N.Subramanyam, 2001,Waves and Oscillations, Vikas Publishing House, NewDelhi. 5. Ghosh, 1996, Text Book of Sound, S.Chandand Co. 6. R.Murugesan and Kiruthiga Sivaprasath, Thermal Physics, S.Chand and Co.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. J.B.Rajam1976, Heat and Thermo dynamics, 8thedition,S.Chand and Co. L and C.L.Arora,td. 2. D.S.Mathur, Heat and Thermo dynamics, Sultan Chand and Sons. 3. Gupta,Kumar,Sharma,2013, Statistical Mechanics, 26th Edition, S.ChandandCo. 4. Resnick, Halliday and Walker, 2010, Fundamentals of Physics, 6th Edition. 5. Sears, Zemansky,HughD.Young,RogerA.Freedman,2021 University Physics with Modern Physics15th Edition,Pearson.
WEBRESOURCES	<ol style="list-style-type: none"> 1. https://youtu.be/M_5KYncYNyc 2. https://www.youtube.com/watch?v=4M72kQuIGKkandvl=en 3. Lecture 1: Thermodynamics Part 1 Video Lectures Statistical Mechanics I: Statistical Mechanics of Particles Physics MIT Open Course Ware

	4. http://www.freebookcentre.net/Physics/Physics-Books-Online.html
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METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAM OUTCOMES:

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

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

CORE PRACTIAL – 1

COURSE	EVEN SEMESTER- CORE
COURSETITLE	CORE PRACTICAL-I
CREDITS	3
COURSEOBJECTIVES	Apply various Physics concepts to understand concepts of Properties of matter, Mechanics, surface tension, sound and viscosity setup Experimentation to verify the ories, quantify and analyse, able to doer or analysis and correlate results.
Minimum of Fourteen Experiments from the list:	
1. Young's Modulus	- Uniform bending- Pin & Microscope
2. Young's Modulus	- Non-Uniform bending- Scale and Telescope
3. Young's Modulus	- Cantilever- Pin & Microscope
4. Young's Modulus	- Cantilever- Dynamic method
5. Rigidity Modulus	- Static Torsion- Searle's method
6. Rigidity Modulus	- Torsion Pendulum (without weight)
7. Rigidity Modulus	- Torsion Pendulum (with weight)
8. Moment of Inertia	- Torsion Pendulum
9. A.C. Frequency	- Sonometer
10. Verification of laws	- Sonometer
11. Frequency of tuning fork	- Sonometer
12. Frequency of vibrator	- Melde's Apparatus
13. Velocity of sound	- Kundt's tube
14. Compound Pendulum	- "g"
15. Thermal conductivity of bad conductor	- Lee's Disc
16. Viscosity of liquid	- Stoke's method
17. Viscosity of liquid	- Burette method
18. Surface Tension	- Capillary Rise
19. Surface Tension	- Drop weight method

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

SEC-2/ NME

SPACE PHYSICS	
Learning Objective: This course intends to introduce principles of astrophysics describing the science of formation and evolution of stars and interpretation of various heavenly phenomena and provide an understanding of the physical nature of celestial bodies along with the instrumentation and techniques used in astronomical research.	
UNITS	COURSE DETAILS
UNIT-I	TELESCOPES: Optical telescopes - magnifying power, brightness, resolving power and f/a ratio - types of reflecting and refracting telescopes- detectors and image processing- radio telescopes- Hubble space telescope.

UNIT-II	SOLAR SYSTEM: Bode's law of planetary distances - meteors, meteorites, comets, asteroids- Kuiperbelt- Oortcloud-detection of gravitational waves- recent advances in astrophysics.
UNIT-III	ECLIPSES: Types of eclipses-solareclipse-total and partialsolareclipse-lunareclipse-total and partiallunareclipse-transits. THE SUN: physical and orbital data-solaratmosphere-photosphere -chromosphere-solarcorona-prominences-sunspots-11years olar cycle-solarflares.
UNIT-IV	STELLARE VOLUTION: H-Rdiagram-birth and death of low mass,intermediate mass and massive stars- Chandrasekar limit-white dwarfs-neutron stars-pulsars-black holes-supernovae.
UNIT-V	GALAXIES: Classification of galaxies-galaxyclusters-interaction sofgalaxies,dark matter and superclusters-evolvinguniverse.
TEXTBOOKS	1. BaidyanathBasu, (2001). <u>An introduction to Astrophysics</u> , Second printing, Prentice-Hall of India(P)Ltd,NewDelhi. 2. K.S.Krishnaswamy,(2002), <u>Astrophysics-a modern perspective</u> ,NewAgeInternational(P)Ltd,NewDelhi. 3. Shylaja, B.S. and Madhusudan, H.R.,(1999),_Eclipse: A CelestialShadowPlay,Orient BlackSwan,

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

SEC-3

PROGRAMMING IN-C	
Learning Objective: The purpose of this course is to introduce students about the key Features and implementation of C, which is a power ful general purpose programming language available in all platforms and provide an in depth knowledge and skill in it.	
UNITS	COURSE DETAILS
UNIT-I	IntroductiontoC:- Basic structure of C programs - Character set-C tokens- keyword and identifiers- Constants-Variables-Data types - Declaring variables-Initializing variables - type conversions.
UNIT-II	Operators, Expressions & I/O functions:- Types of operators - Arithmetic operators - Relational, logical, and assignment operators - Increment and decrement operators - Conditional operators - Bit wiseand special operators - arithmetic expressions - Mathematical functions- priority of operators-Data input and output- getchar(), putchar(),gets(), puts()-scanf(),printf()-escape sequence.
UNIT-III	ControlStatements:- Simple IF statement- Simple IF-ELSE statement- Block IF Statement - Block IF - ELSE statement-looping operation using while statement - for statement - Break statement - continue statement - Switch statement - Goto statement - Simple programs.(To find the solution of quadratic equation-Fibonacciseries -To find the biggest of three nos,factorial of ano,oddoeven.)

UNIT-IV	Functions:- Defining a function - Accessing a function-Category of function - Passing arguments to function -Recursion- Library function. Programs using functions- Binomialcoefficient,Sinseries,summing The numbers1 to nusing recursion.
UNIT-V	Arrays:- Defining an Array - Processing an array - one, two dimensional arrays-Simple programs using arrays:-(addition of two matrices-subtraction of two matrices-Multiplication of two matrices- Ascending and descending order.)
TEXTBOOKS	1. Theory and problems of programming with C-By ByronGottfried Second edition-TataMegrawHill,2004. 2. Programming in C-PradipDeyandManasGhosh,Oxford University Press,Second Edition.
REFERENCE BOOKS	1. Programming in C -ByE.Balagurusamy-ThirdEdition- TataMegrawHill,2004. 2. Programming in C by S. Ramasamy and P.Radhaganesan, Sci tech Publications (India) Private Limited, Chennai and Hyderabad,2006.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE	THIRD SEMESTER-CORE
COURSE TITLE	MECHANICS
CREDITS	5
COURSE OBJECTIVES	This course allows the students: To have a basic understanding of the laws and principles of mechanics; To apply the concepts of forces existing in the system; to understand the forces of physics in every day life;To visualize conservation laws;To apply Lagrangian Equation to solve complex problems.

UNITS	COURSE DETAILS
UNIT-I	LAWS OF MOTION: Newton's Laws - forces - equations of motion – Frictional force -motion of a particle in a uniform gravitation alfield – types of everyday forces in Physics. <i>Gravitation:</i> Classical theory of gravitation–Kepler's laws, Newton'slaw of gravitation - Determination of G by Boy's method - Earth-moon system - weightlessness - earth satellites - parking orbit -earth density - mass of the Sun - gravitational potential - velocity of escape - satellite potential and kinetic energy -Einstein's theory of gravitation - introduction -principle of equivalence - experimental test sof general theory of relativity-gravitation alred shift-bending of light-perihelion of mercury.

UNIT-II	CONSERVATION LAWS OF LINEAR AND ANGULAR MOMENTUM: conservation of linear and angular momentum - Internal forces and momentum conservation - center of mass - examples-general elastic collision of particles of different masses -system with variable mass-examples-conservation of angular momentum-torque due to internal forces-torque due to gravity-angular momentum about center of mass-proton scattering by heavy nucleus.
UNIT-III	CONSERVATION LAWS OF ENERGY: Introduction - significance of conservation laws - law of conservation of energy concepts of work-power-energy-conservative forces-potential energy and conservation of energy in gravitational and electric field - examples -non- conservative forces - general law of conservation of energy.
UNIT-IV	RIGID BODY DYNAMICS: translational and rotational motion - angular momentum - moment of inertia - general theorems of moment of inertia - examples - rotation about fixed axis - kinetic energy of rotation-examples-body rolling along a plane surface - body rolling down an inclined plane - gyroscopic precision - gyrostatic applications.
UNIT-V	LAGRANGIAN MECHANICS: generalized coordinates-degrees of freedom-constraints-principle of virtual work and D'Alembert's Principle - Lagrange's equation from D'Alembert's principle - application-simple pendulum-Atwood's machine.
UNIT-VI	PROFESSIONAL COMPONENTS: expert lectures-seminars-webinars-industry inputs-social accountability-patriotism
TEXTBOOKS	<ol style="list-style-type: none"> 1. J.C.Upadhyaya, 2019, Classical Mechanics, Himalaya Publishing house, Mumbai. 2. P.Durai Pandian, Laxmi Durai Pandian, Muthamizh Jayapragasam, 2005, Mechanics, 6th revised edition, S.Chand and Co. 3. D.S.Mathur and P.S.Hemne, 2000, Mechanics, Revised Edition, S.Chand and Co. 4. Narayanamurthi, M. and Nagarathnam. N, 1998, Dynamics. The National Publishing, Chennai. 5. Narayanamurthi, M. and Nagarathnam, N, 198 Statics, Hydrostatics and Hydrodynamics, The National Publishers, Chennai.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Goldstein Herbert, 1980, Classical Mechanics. U.S.A: Addison and Wesley. 2. Halliday, David and Robert, Resnick, 1995, Physics Vol. I. New Age, International, Chennai. 3. Halliday, David Robert Resnick and Walker Jearl, 2001, Fundamentals of Physics, John Wiley, New Delhi
WEB RESOURCES	<ol style="list-style-type: none"> 1. https://youtu.be/X4K-XLUIB4 2. https://nptel.ac.in/courses/115103115 3. https://www.youtube.com/watch?v=p075LPq3Eas 4. https://www.youtube.com/watch?v=mH_pS6fruyg 5. https://onlinecourses.nptel.ac.in/noc22_me96/preview 6. https://www.youtube.com/watch?v=tdkFc88Fw-M 7. https://onlinecourses.nptel.ac.in/noc21_me70/preview

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
	75	100

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAM OUTCOMES:

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

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

SEC-4

BIOMEDICAL INSTRUMENTATION	
Learning Objective: In this course, the student will get idea about design of medical instruments and component of the Biomedical instrument system-get knowledge about characteristics of bio potential recording system -understand the operation and uses of ECG and EEG equipments-understand the application of Lasers and Computers in the Field of medicine.	
UNITS	COURSE DETAILS
UNIT-I	Design of medical instruments - Components of the Biomedical instrument system -Electrodes- Half cell potential - Purpose of electrode paste-Types of electrodes -Transducers-Active transducers-Magnetic induction type transducers-Piezo electric type transducers
UNIT-II	Biopotential recorders-Characteristics of recording system-Writer And Pen damping system - Electro cardiography-Origin of cardiac potential- ECG lead configurations-Practical considerations for ECG recording.

UNIT-III	Electroencephalography- Origin of EEG-Brain waves-Placement Of electrodes- Recording setup- Analysis of EEG.
UNIT-IV	Computer sin medicine-Lasers in medicine - Endoscopes.
UNIT-V	ComputerTomography-Magneticresonancelmaging-Magneticresonance phenomenon-Magneticresonance spectros copy in vivo - Magnetic resonance imaging.
TEXTBOOKS	“ Biomedical instrumentation ” byDr.M.Arumugam, Anuradha publications, Chennai, 2008 Reprint” UnitI:ChapterII-Sections2.2,2.3,2.4(2.4.1-2.4.3),2.4.4,2.5 (2.5.1-2.5.3) UnitII:ChapterIV-Sections4.2,4.2.1,4.3(4.3.1,4.3.2,4.3.4) UnitIII:ChapterIV-Sections4.4,4.4.1-4.4.5)UnitIV:Chapter X-Sections10.2,10.3,10.4 UnitV:ChapterX-Sections10.7,10.10,10.10.1-10.10.3
REFERENCE BOOKS	1. Hand book of Biomedical instrumentation by R.S. Khandpur and Raghbir Khandpur, TMH, Second edition, 1987 2. Biomedical instrumentation and measurements by R. Ananda Natarajan, PHI India, Second edition, 1995

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

SEC-5

ELECTRICAL WIRING	
Learning Objective: In this course, the student will understand the basics of AC circuits.learn about Electrical Installations. acquire the knowledge of Design of Simple Electrical Circuits.Will know about the guidelines for sub-circuits, fittings and Simple Wiring Schemes know about electrical protective devices and electrical estimation.	
UNITS	COURSE DETAILS
UNIT-I	Basic Concepts : Ohm’s law - Kirchoff’s law - Biot-Savart Law - Electro magnetic induction:Faraday’slaw-Lenz’slaw-Super position theorem - Thevenin theorem - Norton’s theorem - Reciprocity theorem-Star-Delta conversion.
UNIT-II	Design Considerations of Electrical Installations: Electric supply system - Three Phase four wire distribution system - Protection of electric installation against overload, short circuit, earth fault and electric shock-Single phase supply-Three phase, four wire supply-Neutral and Earthwire.
UNIT-III	Electrical Wiring: Introduction - List of Symbols - Supply Voltages-Service Connection - Interior wiring- Guidelines for sub-circuits and fittings-Simple Wiring Schemes-Two way control of lamps-Three way control of lamps.
UNIT-IV	Design of Simple Electrical Circuits: Electrical diagram - Methods of Representation for wiring diagram - Introduction to simple light and fan circuits-System of connection of appliances and accessories-Solved examples of light and fan circuits - Alarm circuits with relays

UNIT-V	Electrical protective devices and Electrical estimation: Fuses- Miniature circuit breaker(MCB)-Earth Leakage Circuit Breaker(ELCB)- Earthing-Computation of Energy consumed.
TEXTBOOKS	1. “ Basic Electrical Engineering ” by K. Uma Rao and A. Jayalakshmi, Sanguine Technical Publishers, Bangalore. 2014 Unit I-1.3, 1.5, 2.2.1, 2.7, 2.7.1, 2.7.2, 3.6-3.8, 3.10, 3.11 Unit III- 6.1-6.9 Unit V-6.11-6.15 2. “ Electrical Design Estimating and Costing ” by K. B. Raina and S. K. Bhattacharya, New Age International (P) Ltd Publishers, New Delhi, 2007 Unit II-4.1-4.3.3, 4.3.5, 4.5.7, 4.5.8, 4.8 Unit IV-1.3, 1.4, 2.1, 2.2, 2.3, 2.7
REFERENCE BOOKS	1. V. K. Mehta, “Principles of Electrical Engineering and Electronics”, S. Chand & Company Ltd, 2012. 2. Uppal S. L., “Electrical Wiring - Estimating and Costing”, Khanna Publishers, Sixth edition 2011.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE	FOURTH SEMESTER – CORE THEORY 4
COURSE TITLE	OPTICS and LASER PHYSICS
CREDITS	5
COURSE OBJECTIVES	To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics; To explain the behavior of light in different mediums; To understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life; to understand the design of optical systems and methods to minimize aberrations to understand the working and application of laser
UNITS	COURSE DETAILS
UNIT-I	LENS AND PRISMS: Fermat’s principle of least time - postulates of geometrical optics - thick and thin lenses - focal length, critical thickness, power and cardinal points of a thick lens - narrow angled prisms. <i>Lens:</i> aberrations: spherical aberration, chromatic aberrations, coma, and astigmatism - curvature of the field - distortion - chromatic aberrations methods. <i>Prism:</i> dispersion, deviation, aberrations - applications rainbows and halos, constant deviation spectroscopy. <i>Eye pieces:</i> advantage of an eyepiece over a simple lens - Huygen’s and Ramsden’s eyepieces, construction and working - merits and demerit of the eyepiece. <i>Resolving power:</i> Rayleigh’s criterion for resolution - limit of resolution for the eye - resolving power of, (i) Prism (ii) grating (iii) telescope

UNIT-II	<p>INTERFERENCE: division of wave front, Fresnel's biprism - fringes with white light - division of amplitude: interference in thin films due to, (i) reflected light, (ii) transmitted light - colours of thin films applications - air wedge - Newton's rings.</p> <p><i>Interferometers</i> : Michelson's interferometer - applications, (i) determination of the wave length of a monochromatic source of light, (ii) determination of the wavelength and separation D_1 and D_2 lines of sodium light, (iii) determination of a thickness of a mica sheet.</p>
UNIT-III	<p>DIFFRACTION: Fresnel's assumptions - zone plate - action of zone plate for an incident spherical wave front - differences between a zone plate and a convex lens - Fresnel type of diffraction - diffraction pattern due to a straight edge - positions of maximum and minimum intensities - diffraction due to a narrow slit - Fraunhofer type of diffraction - Fraunhofer diffraction at a single slit - plane diffraction grating - experiment to determine wavelengths - width of principal maxima.</p>
UNIT-IV	<p>POLARISATION: optical activity - optically active crystals - polarizer and analyser - double refraction - optic axis, principal plane - Huygens's explanation of double refraction in uniaxial crystals - polaroids and applications - circularly and elliptically polarized light - quarter wave plate - half wave plate - production and detection of circularly and elliptically polarized lights - Fresnel's explanation - specific rotation - Laurent half shade polarimeter - experiment to determine specific rotator power.</p>
UNIT-V	<p>LASERS: general principles of lasers - properties of lasers action - spontaneous and stimulated emission - population inversion - optical pumping - He-Ne laser (principle and working) - CO₂ laser (principle and working) semi conductor laser - laser applications - holography.</p>
UNIT-VI	<p>PROFESSIONAL COMPONENTS: expert lectures - seminars - webinars - industry inputs - social accountability - patriotism</p>
TEXTBOOKS	<ol style="list-style-type: none"> 1. Subramaniam.NandBrijlal, 2014, Optics, 25th Ed, S.Chand and Co. 2. P.R.Sasikumar, 2012, Photonics, PHIPvt Ltd, New Delhi. 3. V.Rajendran, 2012, Engineering Physics, Tata McGraw Hill.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Sathyaprakash, 1990, Optics, VI edition, Ratan Prakashan Mandhir, New Delhi. 2. Ajoy Ghatak, 2009, Optics, 4th edition, PHIPvt Ltd, New Delhi. 3. D.Halliday, R.Resnick and J.Walker, 2001, Fundamentals of Physics, 6th edition, Wiley, New York. 4. 7.Jenkins A.Francis and White, 2011, Fundamentals of Optics, 4th edition, McGraw Hill Inc., New Delhi.
WEB RESOURCES	<ol style="list-style-type: none"> 1. https://science.nasa.gov/ems/ 2. https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UIGkb-8Pr6svxWo-LA&start_radio=1&dt=2472 3. https://science.nasa.gov/ems/ 4. https://imagine.gsfc.nasa.gov/educators/gammaraybursts/imagine/index.html 5. http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE OUT COMES :

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

COURSE OUTCOMES	CO1	Outline basic knowledge of method sof rectifying different defect sinlenses,articulate technological applications of eyepieces
	CO2	Discuss the principle of super position of wave,use these ideas to understand the wave nature of light through working of interferometer
	CO3	Extend the knowledge about nature of light through diffraction techniques; apply mathematical principle stoanaly see the optical instruments
	CO4	Interpret basic formulationofpolarizationandgainknowledgeaboutpolarimeter,ap praiseitsusageinindustries
	CO5	Relatetheprinciplesofoptictovariousfields ofIR,Ramanand UVspectroscopyandunderstandtheirinstrumentationandapplicati onin industries

MAPPINGWITHPROGRAMOUTCOMES:

Mapcourseoutcomes(**CO**)foreachcoursewithprogramoutcomes(**PO**)inthe3-pointscaleofSTRONG (**S**),MEDIUM(**M**)and LOW(**L**).

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

SEC-6

ENERGYPHYSICS	
LearningObjective: Togettheunderstandingoftheconventionalandnon-conventional energysources, theirconservation andstoragesystems.	
UNITS	COURSEDETAILS
UNIT-I	INTRODUCTIONTOENERGYSOURCES: RenewableEnergy- NonRenewable Energy - energy sources and their availability - conventional energy sources - non-conventional and renewableenergysources-comparison-meritsanddemerits.
UNIT-II	SOLAR ENERGY: solar energy Introduction - solar constant - solarradiation at the Earth"s surface - solar radiation geometry - Solarradiationmeasurements-solarcooker-solarwaterheater-greenhouseeffect-solarcells.

UNIT-III	WIND ENERGY: Introduction -nature of the wind - basic principle of wind energy conversion - basic components of Wind Energy Conversion Systems (WECS) - advantages and disadvantages of WECS-applications-tidal energy
UNIT-IV	BIOMASS ENERGY: Introduction- classification- biomass conversion technologies -photosynthesis - fermentation - bio gas generation-classification of bio gas plants-advantages and disadvantages.
UNIT-V	ENERGY STORAGE: Importance of energy storage- batteries - lead acid battery -nickel-cadmium battery - fuel cells - types of fuel cells -advantages and disadvantages of fuel cells-applications of fuel cells -hydrogen storage.
TEXT BOOKS	<ol style="list-style-type: none"> 1. G.D.Rai, Non-Conventional Sources of Energy, Khanna Publishers, 2009, 4th Edn. 2. S P Sukhstme, JK Nayak, Solar Energy, Principles of Thermal Collection and Storage, McGrawHill, 2008, 3rd Edn. 3. D P Kothari, K P Singal, Rakesh Rajan, PHI Learning Pvt Ltd, 2011, 2nd Edn.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. John Twidell and Tony Weir, Renewable Energy Resources, Taylor and Francis, 2005, 2nd Edn. 2. S.A. Abbasi and Nasema Abbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd, 2008. 3. M.P. Agarwal, Solar Energy, S. Chand and Co. Ltd., New Delhi, 1982 4. H.C. Jain, Non-Conventional Sources of Energy, Sterling Publishers, 1986.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

SEC-7

MATERIALS SCIENCE	
Learning Objective: To learn imperfection in crystals, deformation of materials and Testing of materials. To get knowledge on behavior of a material, under the action of light and their applications. To know the applications of crystal defects.	
UNITS	COURSE DETAILS
UNIT-I	CRYSTAL IMPERFECTIONS: Introduction - point defects: vacancies (<i>problems</i>), interstitials, impurities, electronic defects - equilibrium concentration of point imperfections - application of point defects - line defects: edge dislocation, screw dislocation - surface defects: extrinsic defects - intrinsic defects: grain boundaries, tilt and twist boundaries, twin boundaries, stacking faults - volume defects - effect of imperfections.
UNIT-II	MATERIAL DEFORMATION: Introduction - elastic behavior of materials - atomic model of elastic behavior - modulus as a parameter in design - rubber like elasticity - in elastic behavior of materials - Relaxation process - visco elastic behavior of materials - spring.
UNIT-III	PERMANENT DEFORMATION ANDS TRENGTHENING METHODS OF MATERIALS: Introduction - plastic deformation: tensile stress-strain curve - plastic deformation by slip - creep: mechanism of creep - Creep resistant materials - strengthening methods: strain hardening, Grain refinement - solid solution strengthening - precipitation strengthening.

UNIT-IV	OPTICAL MATERIALS: Introduction-optical absorption in metals, semi conductors and insulators-NLO materials and their applications display devices and display materials: fluorescence and phosphorescence - light emitting diodes - liquid crystal displays.
UNIT-V	MECHANICAL TESTING: Destructive testing: tensile test, compression test, hardness test - non destructive testing (NDT):radio graphic methods, ultra sonic methods-thermal methods of NDT: thermography - equipment used for NDT: metallurgical microscope
TEXTBOOKS	1. Material science and Engineering, Raghavan V, Prentice Hall of India, Sixth Edition, 2015 2. Materials science,V.Rajendran, Mc Graw Hill publications2011
REFERENCE BOOKS	1. William D. Callister, Jr., Material Science and Engineering - An Introduction, 8 th Edition, John Wiley and Sons, Inc.,2007 2. W. Bolton, "Engineering materials technology", 3rd Edition, Butter worth and Heinemann, 2001. 3. Donald R. Askeland, Pradeep P.Phule , "The Science and Engineering of Materials", 5 th Edition, Thomson Learning, First Indian Reprint, 2007. 3. William F.Smith, " Structure and Properties of Engineering Alloys", Mc-Graw- HillInc., U.S.A, 2 nd edition,1993.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COREPRACTIAL-II

COURSE	EVEN SEMESTER CORE																				
COURSE TITLE	CORE PRACTICAL -II																				
CREDITS	3																				
COURSE OBJECTIVES	Apply various Physics concepts to understand concepts of Light, electricity and Magnetism setup experimentation to verify the ories, quantify and analyse, able to do error analysis and correlate results.																				
<p>Minimum of Fourteen Experiments from the list:</p> <table> <tbody> <tr> <td>1. Refractive Index</td> <td>:Spectrometer A and D</td> </tr> <tr> <td>2. Grating</td> <td>:Spectrometer-N and λ</td> </tr> <tr> <td>3. Air Wedge</td> <td>:Thickness of wire</td> </tr> <tr> <td>4. Newton's Rings</td> <td>:Radius and Wave length measurements</td> </tr> <tr> <td>5. Carey Foster Bridge</td> <td>: Resistance and specific resistance</td> </tr> <tr> <td>6. Carey Foster Bridge</td> <td>:Temperature coefficient</td> </tr> <tr> <td>7. Potentiometer</td> <td>:Calibration of low range volt meter</td> </tr> <tr> <td>8. Potentiometer</td> <td>:Calibration of ammeter</td> </tr> <tr> <td>9. Potentiometer</td> <td>:Comparison of EMF's</td> </tr> <tr> <td>10. Determination of B_H</td> <td>:Axialcoil</td> </tr> </tbody> </table>		1. Refractive Index	:Spectrometer A and D	2. Grating	:Spectrometer-N and λ	3. Air Wedge	:Thickness of wire	4. Newton's Rings	:Radius and Wave length measurements	5. Carey Foster Bridge	: Resistance and specific resistance	6. Carey Foster Bridge	:Temperature coefficient	7. Potentiometer	:Calibration of low range volt meter	8. Potentiometer	:Calibration of ammeter	9. Potentiometer	:Comparison of EMF's	10. Determination of B_H	:Axialcoil
1. Refractive Index	:Spectrometer A and D																				
2. Grating	:Spectrometer-N and λ																				
3. Air Wedge	:Thickness of wire																				
4. Newton's Rings	:Radius and Wave length measurements																				
5. Carey Foster Bridge	: Resistance and specific resistance																				
6. Carey Foster Bridge	:Temperature coefficient																				
7. Potentiometer	:Calibration of low range volt meter																				
8. Potentiometer	:Calibration of ammeter																				
9. Potentiometer	:Comparison of EMF's																				
10. Determination of B_H	:Axialcoil																				

11. Determination of M	:Axialcoil
12. Determination of Mand B_H	:Tan C method
13. Spot Galvanometer	:Figure of Merit
14. Spot Galvanometer	: Charge sensitivity
15. Spot Galvanometer	: Comparison of EMF's
16. Spot Galvanometer	:Comparison of capacities
17. Owen's Bridge	:C1 / C2
18. DeSauty's Bridge	:C1 / C2

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE	FIFTH SEMESTER – CORE THEORY 3
COURSE TITLE	ELECTRICITY, MAGNETISM AND ELECTRO MAGNETISM
CREDITS	5
COURSE OBJECTIVES	To classify materials based on their electrical and magnetic properties. To analyse the working principles of electrical gadgets. To understand the behaviour of dc, ac and transient currents. To know about the communication by electro magnetic waves.

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

UNIT-III	MAGNETISM AND ELECTROMAGNETIC INDUCTION: magnetic induction B-magnetization M-relation between B, H and M- magnetic susceptibility - magnetic permeability - experiment to draw B-H curve - energy loss due to hysteresis - Importance of hysteresis curves-Faraday and Lenz laws-vector form -self-induction-coefficient of self-inductance of solenoid-Anderson's method-mutual induction-coefficient of mutual inductance between two coaxial solenoids - coefficient of coupling - earth inductor-determination of angle of dip(Φ)
UNIT-IV	TRANSIENT AND ALTERNATING CURRENTS: growth and decay of current in a circuit containing resistance and inductance - growth and decay of charge in a circuit containing resistance and capacitor -growth and decay of charge in an LCR circuit (expressions for charge only) - peak, average and rms values of ac - LCR series and parallel circuits - resonance condition - Q factor - power factor.
UNIT-V	MAXWELL EQUATIONS AND ELECTROMAGNETIC WAVES: Maxwell's equations in vacuum, material media-physical significance of Maxwell's equations - displacement current-plane electro magnetic waves in free space - velocity of light-Poynting vector - electro magnetic waves in a line anhomogenous media-refractive index.
UNIT-VI	PROFESSIONAL COMPONENTS: expert lectures - seminars- webinars - industry inputs - social accountability - patriotism
TEXTBOOKS	<ol style="list-style-type: none"> 1. Murugesan.R.,-Electricity and Magnetism, 8th Edn, 2006, S.Chand and Co, NewDelhi.\ 2. Sehgal D.L., Chopra K.L, Sehgal N.K.,-Electricity and Magnetism, Sultan Chand and Sons, NewDelhi. 3. M. Narayanamurthy and N. Nagarathnam, Electricity and Magnetism, 4th Edition. 4. National Publishing Co., Meerut.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Brijlal and Subramanian, Electricity and Magnetism, 6th Edn., Ratan and Prakash, Agra. 2. Brijlal, N. Subramanyan and Jivan Seshan, Mechanics and Electro dynamics (2005), 3. Eurasia Publishing House (Pvt.) Ltd., NewDelhi. 4. David J. Griffiths, Introduction to Electro dynamics, 2nd Edn. 1997, Prentice Hall of India Pvt. Ltd., NewDelhi 5. D. Halliday, R. Resnik and J. Walker-Fundamentals of Physics, 6th Edn., Wiley, NY, 2001.
WEB RESOURCES	<ol style="list-style-type: none"> 1. https://www.edx.org/course/electricity 2. https://www.udemy.com/courses/electricity 3. https://www.edx.org/course/magnetism 4. http://www.hajim.rochester.edu/optics/undergraduate/courses.html

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAM OUTCOMES:

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

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

COURSE	FIFTH SEMESTER- CORE
COURSE TITLE	ATOMIC and NUCLEAR PHYSICS
CREDITS	5
COURSE OBJECTIVES	To make students understand the development of atom models, quantum numbers, coupling schemes and analysis of magnetic moments of an electrons; To gain knowledge on excitation and ionization potentials, splitting of spectral lines in magnetic and electric fields; To get knowledge on radioactive decay; To know the concepts used in nuclear reaction; to understand the quark model of classification of elementary particles.
UNITS	COURSE DETAILS
UNIT-I	VECTOR ATOM MODEL: Introduction to atom model-vector atom model - electron spin -spatial quantisation- quantum numbers associated with vector atom model -L-S and J-J coupling - Pauli's exclusion principle-magnetic dipole moment due to orbital motion and spin motion of the electron -Bohr magnetron -Stern-Gerlach experiment-selection rules-intensity rule.

UNIT-II	<ul style="list-style-type: none"> • ATOMIC SPECTRA: Origin of atomic spectra - excitation and ionization potentials - Davis and Goucher's method - spectral terms and notations - fine structure of sodium D-lines - Zeeman effect - Larmor's theorem - quantum mechanical explanation of normal Zeeman effect - anomalous Zeeman effect (qualitative explanation) - Paschen - Back effect - Stark effect.
UNIT-III	<p>RADIOACTIVITY: Discovery of radio activity - natural radio activity properties of alpha rays, beta rays and gamma rays - Geiger-Nuttall law - alpha particle spectra - Gammow's theory of alpha decay (qualitative study) - beta ray spectra - neutrino theory of beta decay - nuclear isomerism - internal conversion - non-conservation of parity in weak interactions.</p>
UNIT-IV	<ul style="list-style-type: none"> • NUCLEAR REACTIONS: Conservation laws of nuclear reaction - Q-value equation for a nuclear reaction - threshold energy - scattering cross section - artificial radio activity - application of radio isotopes - classification of neutrons - models of nuclear structure - liquid drop model - shell model.
UNIT-V	<ul style="list-style-type: none"> • ELEMENTARY PARTICLES: Classification of elementary particles • -fundamental interactions - elementary particle quantum numbers • -isospin and strangeness quantum number - Conservation laws and symmetry - quarks - quark model (elementary ideas only) - discovery of cosmic rays - primary and secondary cosmic rays - latitude effect - altitude effect.
UNIT-VI	<ul style="list-style-type: none"> • PROFESSIONAL COMPONENTS: Expert lectures - seminars - webinars - industry inputs - social accountability - patriotism
TEXTBOOKS	<ul style="list-style-type: none"> • R. Murugesan, Modern Physics, S. Chand and Co. (All units) (Units I and II - Problems) • Brijlal and N. Subrahmanyam, Atomic and Nuclear Physics, S. Chand and Co. (All units) • J. B. Rajam, Modern Physics, S. Chand and Co. • Sehgal and Chopra, Modern Physics, Sultan Chand, New Delhi • Arthur Beiser - Concept of Modern Physics, Mc Graw Hill Publication, 6th Edition.
REFERENCE BOOKS	<ul style="list-style-type: none"> • Perspective of Modern Physics, Arthur Beiser, Mc Graw Hill. • Modern Physics, S. Ramamoorthy, National Publishing and Co. • Laser and Non-Linear Optics by B. B. Laud, Wiley Eastern Ltd., New York, 1985. • Tayal, D. C. 2000 - Nuclear Physics, Edition, Himalaya Publishing House, Mumbai. • Irving Kaplan (1962) Nuclear Physics, Second Edition, Oxford and IBH Publish and Co, New Delhi. • J. B. Rajam - Atomic Physics, S. Chand Publication, 7th Edition. • Roy and Nigam, - Nuclear Physics (1967) First edition, Wiley Eastern Limited, New Delhi.

WEB RESOURCES	<ul style="list-style-type: none"> • http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html • https://makingphysicsfun.files.wordpress.com/2015/01/photoelectric-effect.pptx • https://www.khanacademy.org/science/physics/quantum-physics/in-in-nuclei/v/types-of-decay • https://www.khanacademy.org/science/in-in-class-12th-physics-india/nuclei
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METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAM OUTCOMES:

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

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

COURSE	FIFTH SEMESTER- CORE
COURSE TITLE	ANALOG AND COMMUNICATION ELECTRONICS
CREDITS	5

COURSE OBJECTIVES	To study the design, working and applications of semi conducting devices. To construct various electronic circuits. To study them in details. To study the basis of audio and video communication system and the aspects of satellite and Fibre Optic Communications.
UNITS	COURSE DETAILS
UNIT-I	DIODES: diode characteristics- rectifiers-clippers circuits, clamping circuits. half wave rectifier, center tapped and bridge full wave rectifiers, calculation of efficiency and ripple factor. DC power supply: Block diagram of a power supply, qualitative description of shunt capacitor filter, Zener diode as voltage regulator, temperature coefficient of Zener diode.
UNIT-II	TRANSISTOR AMPLIFIERS: Transistor configurations: CB, CE, CC modes-I-V characteristics and hybrid parameters-DC load line-Q point self-bias - RC coupled CE amplifier -power amplifiers - classification of power amplifiers: A, B, C- push pull amplifiers- tuned amplifiers.
UNIT-III	TRANSISTOR OSCILLATORS: Feedback amplifier - principle of feedback, positive and negative feedback of voltage and current gain, advantages of negative feedback - Barkhausen's criterion. Transistor oscillators: Hartley, Colpitt, Phase shift oscillators with mathematical analysis.
UNIT-IV	OPERATIONAL AMPLIFIERS: Differential amplifiers – OPAMP characteristics -IC 741 pin configuration – inverting and non-inverting amplifiers- unity follower-summing and difference amplifiers- differentiator and integrator- astable multivibrator (square wave generator)- monostable vibrator
UNIT-V	MODULATION AND DEMODULATION: Theory of amplitude modulation-frequency modulation-comparison of AM and FM-phase modulation-sampling theorem-pulse width modulation-pulse modulation systems: PAM, PPM, and PCM-demodulation: AM and FM detection-duper heterodyne receiver(block diagram)
UNIT-VI	PROFESSIONAL COMPONENTS: Expert lectures- seminars- webinars- industry inputs- social accountability-patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. V.K.Mehta-Principles of Electronics, S.Chand and Co.Ltd., 2004. 2. V.Vijayendran - Integrated Electronics, S.Vishwanathan Publishers, Chennai. 3. B.L.Theraja - A Text Book of Electrical Technology. 4. John D. Ryder-Electronic fundamentals and Applications. 5. Malvino -Electronic Principles, Tata Mc Graw Hill.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. B. Grob- Basic Electronics, 6th edition, McGrawHill, NY, 1989. 2. Herbert Taub and Donald Schilling - Digital Integrated Electronics, McGraw Hill, NY. 3. Ramakant A.-Opamp principles and linear integrated circuits, Gaykward 4. Bagde and S.P.Singh-Elements of Electronics. 5. Millman and Halkias-Integrated Electronics, Tata McGraw Hill.

WEB RESOURCES	<ol style="list-style-type: none"> 1. https://www.queenmarycollege.edu.in/eresources/undergraduateprogram/py157 2. www.ocw.mit.edu>...>CircuitsandElectronics 3. www.ocw.mit.edu>...> Introductory Analog ElectronicsLaboratory 4. https://www.elprocus.com>semiconductordevices 5. https://www.britannica.com>technology
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METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAM OUTCOMES:

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

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

ELECTIVE COURSE-1

MATHEMATICAL PHYSICS	
Learning Objective: To understand higher mathematical concepts which are applied to solve problems in Physics and similar situations	
UNITS	COURSE DETAILS
UNIT-I	MATRICES: Types of matrices-symmetric, Hermitian, unitary and orthogonal matrices- characteristic equation of a matrix - Eigen values and Eigen vectors of a matrix-Cayley-Hamilton theorem-inverse of matrix by Cayley- Hamilton theorem- similarity transformations- diagonalization of 2x2 real symmetric matrices.

UNIT-II	VECTOR CALCULUS: Vector differentiation- directional derivatives - definitions and Physical significance of gradient, divergence, curl- Laplace operators- vector identities - line, surface and volume integrals-statement, proof and simple problems for Gauss's divergence theorem, Stoke's theorem, Green's theorem.
UNIT-III	ORTHOGONAL CURVILINEAR COORDINATES: Tangent basis vectors-scale factors-unit vector in cylindrical and spherical coordinate systems- gradient to scalar- divergence and curl of a vector- Laplacian in these coordinate systems.
UNIT-IV	FOURIER SERIES: periodic functions- Dirichlet's conditions- general Fourier series - even and odd functions and their Fourier expansions- Fourier cosine and sine-half range series-change of length of interval. Fourier analysis of square wave, saw-tooth wave, half wave / full wave rectifier wave forms. FOURIER TRANSFORMS: Fourier Integral theorem (Statement only)- Fourier, Fourier sine and Fourier cosine transforms,- Fourier transform of single pulse-trigonometric, exponential and Gaussian functions-inverse Fourier transform- convolution theorem.
UNIT-V	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS (PDE): PDE for transverse vibrations in elastic strings (one dimensional wave equation) - one dimensional heat flow equation - solutions to these PDE's by method of separation of variables - problems based on boundary conditions and initial conditions.
TEXTBOOKS	<ol style="list-style-type: none"> Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India. Mathematical Physics - P. K. Chattopadhyay, New Age International Publishers. Mathematical Physics-B.D.Gupta. Mathematical Physics-H.K.Das, S.Chand and Co, New Delhi.
REFERENCE BOOKS	<ol style="list-style-type: none"> Fourier Analysis by M.R.Spiegel, 2004, Tata Mc Graw-Hill. Engineering Mathematics III-B, M.K.Venkataraman, Applied Mathematics for Scientists and Engineers, Bruce R.Kusse and Erik A.Westwig, 2nd Ed, WILEY-VCH Verlag, 2006. Vector space and Matrices- J.C.Jain, Narosa Publishing House Pvt.Ltd.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	75	100	

ABILITY ENHANCEMENT COMPULSORY COURSE

EMPLOYABILITY SKILLS	
Learning Objective: To enrich the Employability Skills by imparting Reasoning skills, Aptitude skills and General Knowledge.	
UNITS	COURSE DETAILS
UNIT-I	Quantitative Aptitude-Averages, Percentage, Profit & Loss, Ratio & Proportion, Time & Work, Time & Distance, Clock
UNIT-II	Quantitative Aptitude-Problems on Ages, Boat & Stream, Simple Interest, Compound Interest, Area, Partnerships.
UNIT-III	Verbal Reasoning-Analogy, Classification, Series, Coding & Decoding, Blood Relations, Direction Sense Test.

UNIT-IV	Verbal Reasoning-Number Test, Ranking & Time sequence Test, Alphabet Test, Logical Venn Diagrams.
UNIT-V	General Knowledge: Abbreviations, Acronyms, Famous Personalities, Important Days, Capital Cities, Currencies, Books and Authors, Inventions.
TEXTBOOKS	1. Verbal I& Non Verbal Reasoning- R.S. Aggarwal 2. Quantitative Aptitude- R.S. Aggarwal

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE	SIXTH SEMESTER – CORE
COURSE TITLE	QUANTUM MECHANICS AND RELATIVITY
CREDITS	5
COURSE OBJECTIVES	To understand the theory of relativity, its postulates and the consequences. To learn the importance of transformation equations and also to differentiate between special and general theory of relativity. To interpret the wave theory of matter with various theoretical and experimental evidences. To derive and use Schrodinger's wave equation and also learn about various operators. To solve Schrodinger's wave equation for simple problems and analyse to understand the solutions.

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

UNIT-V	SOLVING SCHRÖDINGER EQUATION FOR SIMPLE PROBLEMS: <i>one-dimensional problems:</i> (i) particle in a box, (ii)
	barrier penetration problem - quantum mechanical tunneling, (iii) linear harmonic oscillator. <i>higher dimensional problems:</i> (i) Rigid rotator (qualitative), (ii) Hydrogen atom (qualitative).
UNIT-VI	PROFESSIONAL COMPONENTS: Expert lectures-seminars-webinars-industry inputs-social accountability-patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. Modern Physics, R. Murugesan, Kiruthiga Sivaprasath, S. Chand and Co., 17th Revised Edition, 2014. 2. Concepts of Modern Physics, A. Beiser, 6th Ed., McGraw-Hill, 2003. 3. Special Theory of Relativity, S. P. Puri, Pearson Education, India, 2013. 4. Quantum Mechanics, Ghatak and Loganathan, Macmillan Publications. 5. Quantum mechanics-Satyaprakash and Swati Saluja. Kedar Nath Ram Nath and Co.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Fundamentals of Modern Physics, Peter J. Nolan, 1st Edition, 2014, by Physics 2. Quantum Mechanics, V. Devanathan, Narosa Pub. House, Chennai, 2005. 3. Quantum Mechanics, V.K. Thangappan, New Age International, New Delhi. 4. A Text Book of Quantum Mechanics, Mathews and Venkatesan, Tata McGraw Hill, New Delhi. 5. Introduction to Quantum Mechanics, Pauling and Wilson, McGraw Hill Co., New York.
WEB RESOURCES	<ol style="list-style-type: none"> 1. http://hyperphysics.phy-astr.gsu.edu/hbase/qapp.html 2. https://swayam.gov.in/nd2_arp19_ap83/preview 3. https://swayam.gov.in/nd1_noc20_ph05/preview 4. https://www.khanacademy.org/science/physics/special-relativity/minkowski-spacetime/v/introduction-to-special-relativity-and-minkowski-spacetime-diagrams

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAM OUTCOMES:

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

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

COURSE	SIXTH SEMESTER-CORE
COURSETITLE	SOLIDSTATE PHYSICS
CREDITS	4
COURSEOBJECTIVES	To understand constituents, properties and models of nucleus. To give reason for radioactivity and study their properties. To learn about the principles of various particle detectors and accelerators. To acquire knowledge on different types of nuclear reactions and their applications. To know the reason for cosmic rays and their effect on the surface of earth and also understand the classification of elementary particles.
UNITS	COURSE DETAILS
UNIT-I	BONDING IN SOLIDS, CRYSTAL STRUCTURE: types of bonding- ionic bonding - bond energy of NaCl molecule -covalent bonding - metallic bonding - hydrogen bonding - Van-der-Waals bonding - crystallattice-latticetranslationalvectors-latticewithbasis-unitcell- Bravais"lattices-Millerindices-procedureforfindingthem-packing of BCC and FCC structures - structures of NaCl anddiamond crystals -reciprocal lattice - reciprocal lattice vectors -properties - reciprocal lattices to SC, BCC and FCC structures - Brillouinzones- X-rays- Bragg'slaw(simpleproblems)- experimental methods: Laue method,powder method and rotating crystal method
UNIT-II	ELEMENTARY LATTICE DYNAMICS: lattice vibrations and phonons: linear monoatomic and diatomic chains. acoustical andoptical phonons -qualitative description of the phonon spectrum insolids -Dulong and Petit"s Law - Einstein and Debye theories of specific heat of solids- T^3 law (qualitativeonly)-properties of metals - classical free electron theory of metals (Drude-Lorentz) - Ohm"s law-electrical an thermal conductivities-Weidemann- Franz"law -Sommerfeld"s quantum free electron theory (qualitative only) -Einstein"s theoryofspecificeatcapacity.
UNIT-III	MAGNETIC PROPERTIES OF SOLIDS: permeability, susceptibility,relation between them - classification of magnetic materials -propertiesofdia,para,ferro,ferriandantiferro magnetism-Langevin"s theoryofdiamagnetism- Langevin"s theoryofparamagnetism- Curie-Weisslaw-Weisstheoryofferromagnetism(qualitativeonly)-
	Heisenberg"s quantum theory of ferromagnetism - domains - discussionofB-Hcurve-hysteresisandenergyloss- softandhardmagnets-magneticalloys.

UNIT-IV	<p>DIELECTRIC PROPERTIES OF MATERIALS: polarization and electric susceptibility - local electric field of an atom - dielectric constant and polarisability - polarization processes: electronic polarization - calculation of polarisability - ionic, orientational and space charge polarization - internal field - Clausius-Mosotti relation - frequency dependence of dielectric constant - dielectric loss - effect of temperature on dielectric constant - dielectric breakdown and its types - classical theory of electric polarisability - normal and anomalous dispersion - Cauchy and Sellmeier relations - Langevin - Debye equation - complex dielectric constant - optical phenomena. Application - plasma oscillations - plasma frequency - plasmons,</p>
UNIT-V	<p>FERRO ELECTRIC and SUPER CONDUCTING PROPERTIES OF MATERIALS: <i>Ferroelectric effect:</i> Curie-Weiss Law - ferroelectric domains, P-E hysteresis loop - <i>elementary band theory:</i> Kronig-Penny model - band gap (no derivation) - conductor, semiconductor (P and N type) and insulator - conductivity of semiconductor - mobility - Hall effect - measurement of conductivity (four probe method) - Hall coefficient.</p> <p><i>Superconductivity:</i> experimental results - critical temperature - critical magnetic field - Meissner effect - type-I and type-II superconductors - London's equation and penetration depth - isotope effect - idea of BCS theory (no derivation)</p>
UNIT-VI	<p>PROFESSIONAL COMPONENTS: Expert lectures - seminars - webinars - industry inputs - social accountability - patriotism</p>
TEXTBOOKS	<ol style="list-style-type: none"> 1. Introduction to Solid State Physics, Kittel, Wiley Eastern Ltd (2003). 2. Solid State Physics, Rita John, 1st edition, Tata Mc Graw Hill publishers (2014). 3. Solid State Physics, RL Singhal, Kedarnath Ram Nath and Co., Meerut (2003) 4. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice - Hall of India 5. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill 6. Solid State Physics, N.W. Ashcroft and N.D. Mermin, 1976, Cengage Learning 7. Solid-state Physics, H. Ibach and H. Luth, 2009, Springer 8. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India 9. Solid State Physics, M.A. Wahab, 2011, Narosa Publishing House, ND
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Puri and Babber - Solid State Physics - S. Chand and Co. New Delhi. 2. Kittel - Introduction to solid state physics, Wiley and Sons, 7th edition. 3. Raghavan - Materials science and Engineering, PHI 4. Azaroff - Introduction to solids, TMH 5. S. O. Pillai - Solid State Physics, Narosa publication 6. A.J. Dekker - Solid State Physics, Mc Millan India Ltd. 7. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India
WEB RESOURCES	<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/115105099/ 2. https://nptel.ac.in/courses/115106061/

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAM OUTCOMES:

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

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

COURSE	SIXTH SEMESTER– DISCIPLINE SPECIFIC ELECTIVE
COURSE TITLE	DIGITAL ELECTRONICS AND MICRO PROCESSOR 8085
CREDITS	4
COURSE OBJECTIVES	To learn all types of number systems, Boolean algebra and identities, digital circuits for addition and subtraction, flip-flops, registers, counters. To get the knowledge on fundamentals of 8085 architecture, instruction sets and simple programs.
UNITS	COURSE DETAILS
UNIT-I	decimal, binary, octal, hexadecimal numbers systems and their conversions- codes: BCD, gray and excess - 3 codes -code conversions - complements (1's, 2's, 9's and 10's)-binary addition, binary subtraction using 1's and 2's complement methods- Boolean laws- De-Morgan's theorem- basic logic gates- universal logic gates

	(NAND and NOR) - standard representation of logic functions (SOP and POS) - minimization techniques (Karnaugh map: 2, 3, 4 variables).
UNIT-II	adders, half and full adder - subtractors, half and full subtractor - parallel binary adder - magnitude comparator - multiplexers (4:1) and demultiplexers (1:4), encoder (8-line-to-3-line) and decoder (3-line-to-8-line), BCD to seven segment decoder.
UNIT-III	flip-flops: S-R Flip-flop, J-K Flip-flop, T and D type flip-flops, master-slave flip-flop, truth tables, registers:- serial in serial out and parallel in and parallel out - counters asynchronous:- mod-8, mod-10, synchronous-4-bit and ring counter - general memory operations, ROM, RAM (static and dynamic), PROM, EPROM, EEPROM, EAROM. IC - logic families: RTL, DTL, TTL logic, CMOS NAND and NOR Gates, CMOS Inverter, Programmable Logic Devices - Programmable Logic Array (PLA), Programmable Array Logic (PAL).
UNIT-IV	8085 Micro processor: introduction to microprocessor - INTEL 8085 architecture - register organization - pin configuration of 8085, interrupts and its priority - Program Status Word (PSW) - instruction set of 8085 - addressing modes of 8085 - assembly language programming using 8085 - programmes for addition (8-Bit and 16-Bit), subtraction (8-Bit and 16-Bit), multiplication (8-Bit), division (8-Bit) - largest and smallest number in an array - BCD to ASCII and ASCII to BCD.
UNIT-V	I/O Interfaces: serial communication interface (8251-USART) - programmable peripheral interface (8255-PPI) - programmable interval timers (8253) - keyboard and display (8279), DMA controller (8237).
UNIT-VI	PROFESSIONAL COMPONENTS: Expert lectures- seminars- webinars- industry inputs- social accountability- patriotism
TEXTBOOKS	<ol style="list-style-type: none"> 1. M. Morris Mano, "Digital Design" 3rd Edition, PHI, New Delhi. 2. Ronald J. Tocci. "Digital Systems- Principles and Applications" 6/e. PHI. New Delhi. 1999. (UNIT I to IV) 3. S. Salivahana and S. Arivazhagan- Digital circuits and design 4. Micro processor Architecture, Programming and Applications with the 8085 - Penram International Publishing, Mumbai.- Ramesh S. Gaonakar 5. Micro computer Systems the 8086/8088 family - YU-Cheng Liu and Glen SA
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Herbert Taub and Donald Schilling. "Digital Integrated Electronics" Mc Graw Hill. 1985. 2. S.K. Bose. "Digital Systems". 2/e. New Age International. 1992. 3. D.K. Anvekar and B.S. Sonade. "Electronic Data Converters: Fundamentals and Applications". TMH. 1994. 4. Malvino and Leach. "Digital Principles and Applications". TMG Hill Edition 5. Micro processors and Interfacing- Douglas V. Hall 6. Micro processor and Digital Systems- Douglas V. Hall

WEBRESOURCES	1. https://youtu.be/-paFaxtTCKI 2. https://youtu.be/s1DSZEaCX_g
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METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAM OUTCOMES:

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

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

ELECTIVE COURSE-2

NANOSCIENCE AND NANOTECHNOLOGY	
Learning Objective: This course aims to provide an overall understanding of Nanoscience and Nanotechnology and introduces different types of nanomaterials, their properties, fabrication methods, characterization techniques and a range of applications.	
UNITS	COURSE DETAILS
UNIT-I	NANOSCIENCE AND NANOTECHNOLOGY: Nanoscale-nature and nano structures-nano structures: 0D, 1D, 2D-surface to volume ratio-size effect - excitons-quantum confinement-metal based nanoparticles (metal and metaloxide)-nano composites (non-polymer based)- carbon nano structures- fullerene-SWCNT and MWCNT

UNIT-II	PROPERTIES OF NANO MATERIALS: Introduction-Mechanical behavior -elastic properties - hardness and strength - ductility and tough ness -super plastic behavior - optical properties - surface Plasmon resonance-electricalproperties-dielectricmaterialsand properties- magneticproperties- superparamagnetism-electro chemical properties- properties of CNTs.
UNIT-III	FABRICATION METHODS AND VACUUM TECHNIQUES: Top- down and bottom- upapproaches- electro chemical method-chemical and physical vapour depositions (CVD and PVD) - plasma arc discharge - sputtering- ther male vaporation-pulsed laser deposition- ball milling – lithography:photo lithography-e-beam lithography-sol-gel methods – synthesis of CNT.
UNIT-IV	CHARACTERIZATION TECHNIQUES: Scanning probe microscopy - scanning tunneling microscopy-a to micforce microscopy-scanning electron microscopy - transmission electron microscopy -powder XRD method: determination of structure and grain size analysis-UV-visible and photo lumine scence spectroscopy.
UNIT-V	APPLICATIONS OF NANOMATERIALS: Medicine: drug delivery - photodynamic therapy - molecular motors -energy: fuel cells - rechargeable batteries - super capacitors- photo voltaics. sensors: nano sensors based on optical and physical properties-electro chemical sensors- nano biosensors.Nano electronics: CNTFET -display screens- GMR read / write heads- nano robots-applications of CNTs
TEXTBOOKS	<ol style="list-style-type: none"> 1. K.K.Chattopadhyay and A.N.Banerjee, (2012),Introduction to Nanoscience and Nanotechnology,PHI Learning Pvt. Ltd., 2. M.A.Shah,Tokeer Ahmad (2010), Principles of Nano science and Nano technology,Narosa Publishing House Pvt Ltd. 3. Mick Wilson, etal (2005) Nano technology, Overseas Press.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Richard Booker and Earl Boysen, (2005) Nanotechnology, WileyPublishingInc.USA 2. J.H.Fendler(2007)Nanoparticlesandnanostructuredfilms;Preparatio n, Characterization andApplications, John Wiley andSons 3. B.S.Murty,etal(2012)TextbookofNanoscienceandNanotechnology, UniversitiesPress.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

SEC-8

COMMUNICATION PHYSICS	
Learning Objective: To get at horough knowledge on transmission and reception of radio waves,the different types of communication like fibroptic,radar,satellite,cellular.	
UNITS	COURSEDETAILS

UNIT-I	RADIO TRANSMISSION AND RECEPTION: Transmitter - modulation types of modulation - amplitude modulation - limitations of amplitude modulation - frequency modulation - comparison of FM and AM - demodulation- essentials in demodulation - receivers: AM radio receivers.- types of AM radio receivers - superheterodyne radio receiver, advantages-FM receiver- difference between FM and AM receivers.
UNIT-II	FIBER OPTIC COMMUNICATION: Introduction - Basic principle of fiber optics- advantages- construction of optical fiber- classification based on their refractive index profile - classification based on the number of modes of propagation - losses in optical fibers-attenuation-advantages of fiber optic communication.
UNIT-III	RADAR COMMUNICATION: Introduction - basic radar system - radar range - antenna scanning -pulsed radar system - search radar-tracking radar -moving target indicator Doppler effect-MTI principle- CW Doppler radar.
UNIT-IV	SATELLITE COMMUNICATION: Introduction history of satellites - satellite communication system - satellite orbits - basic components of satellite communication system- commonly used frequency in satellite - communication -multiple access communication - satellite communication in India.
UNIT-V	MOBILE COMMUNICATION: Introduction- concept of cell-basic cellular mobile radio system - cell phone - facsimile - important features of fax machine - application of facsimile - VSAT (very small aperture terminals)modemIPTV(internetprotocoltelevision)-Wi-Fi-4G (basic ideas).
TEXTBOOKS	1. V.K.Metha, Principles of Electronics, S.Chand and Co Ltd., 2013. 2. Anokh Singh and Chopra A.K.Principles of communication Engineering, S.Chand and Co, 2013.
REFERENCE BOOKS	1. J.S. Chitode, Digital Communications, 2020, Unicorn publications. 2. Senior John. M, Optical Fiber Communications: Principles and Practice, 2009, Pearson Education.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

CORE PRACTICAL-III

COURSE	EVEN SEMESTER CORE
COURSE TITLE	CORE GENERAL PRACTICAL-III
CREDITS	3
COURSE OBJECTIVES	Apply various Physics concepts to understand concepts of Light, electricity, Galvanometer and bridge circuits setup experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results.

Minimum of Fourteen Experiments from the list:

- | | |
|--------------------------------|---|
| 1. LCR | : Series Resonance circuit- L and Q |
| 2. LCR | : Parallel Resonance circuit- L and Q |
| 3. Spot Galvanometer | : Determination of mutual inductance |
| 4. Spot Galvanometer | : Comparison of mutual inductance |
| 5. Spot Galvanometer | : High Resistance by leakage |
| 6. Spot Galvanometer | : Internal Resistance of a cell |
| 7. Anderson's Bridge | : Self Inductance |
| 8. Rayleigh's Bridge | : Self Inductance |
| 9. Maxwell's Bridge | : Self Inductance |
| 10. Small angled prism | : Refractive Index |
| 11. Spectro meter | : i - d curve |
| 12. Spectro meter | : i - i'' curve |
| 13. Grating | : Minimum deviation |
| 14. Spectro meter | : Cauchy's constant |
| 15. Spectro meter | : Hartmann's Interpolation Formula |
| 16. Spectro meter | : Small angled prism-refractive index |
| 17. Impedance and power factor | : L R circuit |
| 18. Impedance and power factor | : C R circuit |

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

CORE PRACTICAL - IV

COURSE	EVENT SEMESTER CORE
COURSE TITLE	CORE ANALOG ELECTRONICS PRACTICAL - IV
CREDITS	3
COURSE OBJECTIVES	Apply various Physics concepts to understand concepts of Electronics and Logic gates set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results.

Minimum of Fourteen Experiments from the list:

1. Transistor characteristics: Common Emitter
2. Zener diode characteristics
3. Zener voltage regulator
4. Single Stage Amplifier : gain and band width
5. Clipper and Clamper: discrete components only
6. FET characteristics
7. Hartley Oscillator: Frequency and Inductance of coil
8. Colpitt's Oscillator: Frequency and Inductance of coil
9. Phase Shift Oscillator: Frequency
10. Wien's Bridge Oscillator:
11. Astable Multi vibrator: using discrete components

- 12. Monostable Multivibrator: using discrete components
- 13. Integrator and Differentiator : using discrete components
- 14. Voltage Doubler and Voltage Tripler
- 15. Logic gates : using discrete components
- 16. Full wave rectifier: n filters
- 17. UJT characteristics
- 18. SCR characteristics

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

CORE PRACTICAL – V

COURSE	EVEN SEMESTER CORE
COURSE TITLE	CORE DIGITAL ELECTRONICS PRACTICAL -V
CREDITS	3
COURSE OBJECTIVES	Apply various Physics concepts to understand concepts of Electronics and Logic gates setup experimentation to verify the theories, quantify and analyse, able to do error analysis and correlate results.
1. Logic Gates: IC 2. NAND as Universal gate : IC 3. NOR as Universal gate: IC 4. Dual Power Supply- IC 7812 and IC 7912 5. De-Morgan's Laws- Verification 6. Half Adder and Full Adder 7. Four bit binary adder 8. Half Subtractor and Full Subtractor 9. Four bit binary subtractor 10. Astable Multi vibrator -IC 555 11. Schmitt Trigger-IC 555 12. BCD counter 13. Astable Multivibrator-IC 741 14. Integrator and Differentiator-IC 741 15. Adder and subtractor -IC 741 16. Four bit binary counter 18. Ring Counter 19. Voltage Regulator -IC 7805	

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE	ALLIED PAPER
COURSE TITLE	ALLIED PHYSICS-I
CREDITS	3
COURSE OBJECTIVES	To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.
UNITS	COURSE DETAILS
UNIT-I	WAVES, OSCILLATIONS AND ULTRASONICS: simple harmonic motion (SHM) - composition of two SHMs at right angles (periods in the ratio 1:1) - Lissajous figures - uses - laws of transverse vibrations of strings - determination of AC frequency using sonometer (steel and brass wires)-ultrasound -production- piezo electric method- application of ultra sonics: medical field.
UNIT-II	PROPERTIES OF MATTER: <i>Elasticity:</i> elastic constants- bending of beam - theory of non- uniform bending - determination of Young's modulus by non-uniform bending- energy stored in a stretched wire- torsion of a wire - determination of rigidity modulus by torsion al pendulum <i>Viscosity:</i> streamline and turbulent motion- critical velocity- coefficient of viscosity - Poiseuille's formula - comparison of viscosities - burette method, <i>Surface tension:</i> definition- molecular theory- droplets formation- shape, size and lifetime.
UNIT-III	HEAT AND THERMODYNAMICS: Joule-Kelvin effect - Joule-Thomson porous plug experiment-theory-temperature of inversion – liquefaction of Oxygen- Linde's process of liquefaction of air-thermodynamic system - thermodynamic equilibrium - laws of thermodynamics-heat engine-Carnot's cycle-efficiency-entropy – change of entropy in reversible and irreversible process.
UNIT-IV	ELECTRICITY AND MAGNETISM: potentiometer-principle- measurement of thermo emf using potentiometer -magnetic field due to a current carrying conductor-Biot-Savart's law-field along the axis of the coil carrying current - peak, average and RMS values of current and voltage-power factor and current values in an AC circuit- types of switches in household and factories- fuses and circuit breakers in houses.
UNIT-V	DIGITAL ELECTRONICS AND DIGITAL LOGIC: logic gates, OR, AND, NOT, NAND, NOR, EXOR logic gates-universal building blocks- Boolean algebra-De Morgan's theorem-verification.
UNIT-VI	PROFESSIONAL COMPONENTS: expert lectures-seminars – webinars-industry inputs-social accountability-patriotism

UNIT-I	OPTICS: Interference -interference in thin films - colors of thin films – air wedge-determination of diameter of a thin wire by air wedge – diffraction -normal incidence - experimental determination of wavelength using diffraction grating (no theory) - polarization - polarization by double reflection - Brewster's law - optical activity - application in sugar industries
UNIT-II	ATOMIC PHYSICS: Atom models - Bohr atom model- mass number-atomic number-nucleons-vector atom model- Pauli's exclusion principle -periodic classification of elements - Bohr magnetron- Stark effect- Zeeman effect (elementary idea only)- photoelectric effect- Einstein's photoelectric equation- application of photoelectric effect: solar cells.
UNIT-III	NUCLEAR PHYSICS: Nuclear models- liquid drop model- magic numbers- shell model- nuclear energy- mass defect- binding energy - radioactivity - uses - half life - mean life - radio isotopes and uses- nuclear fission- energy released in fission- atom bomb - nuclear reactor- nuclear fusion- thermonuclear reactions- differences between fission and fusion.
UNIT-IV	INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES: Frame of reference - postulates of special theory of relativity- Galilean transformation equations- Lorentz transformation equations - derivation - length contraction - time dilation- twin paradox- mass-energy equivalence.
UNIT-V	SEMICONDUCTOR PHYSICS: p-n junction diode - forward and reverse biasing- characteristic of diode- zener diode- characteristic of zener diode- voltage regulator- full wave bridge rectifier - construction and working - advantages (no mathematical treatment)- Transistor- PNP- NPN- working- CE amplifier- frequency response curve.
UNIT-VI	PROFESSIONAL COMPONENTS: Expert lectures- seminars – webinars- industry inputs- social accountability- patriotism
TEXTBOOKS	<ol style="list-style-type: none"> 1. R.Murugesan (2005), Allied Physics, S.Chand and Co, New Delhi. 2. K.Thangaraj and D.Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai. 3. Brijlal and N.Subramanyam (2002), Textbook of Optics, S.Chand and Co, New Delhi. 4. R.Murugesan (2005), Modern Physics, S.Chand and Co, New Delhi. 5. A.Subramaniyam Applied Electronics, 2nd Edn., National Publishing Co., Chennai.

REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Willey and Sons, Asia Pvt. Ltd., Singapore. 2. D.R.Khanna and H.R.Gulati (1979). Optics, S.Chand and Co. Ltd., New Delhi. 3. A.Beiser (1997), Concepts of Modern Physics, Tata Mc Graw Hill Publication, New Delhi. 4. Thomas L.Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, New Delhi. 5. V.K.Metha(2004), Principles of electronics, 6th Edn., S.Chand and Company, New Delhi.
WEB RESOURCES	<ol style="list-style-type: none"> 1. https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo 2. https://www.youtube.com/watch?v=JrRrp5F-Qu4 3. https://www.validyne.com/blog/leak-test-using-pressure-transducers/ 4. https://www.atoptics.co.uk/atoptics/blsky.htm 5. https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE	EVEN SEMESTER- CORE
COURSE TITLE	ALLIED PRACTICAL- I
CREDITS	3
COURSE OBJECTIVES	Apply various Physics concepts to understand concepts of Properties of matter, Mechanics Light, electricity and Electronics setup experimentation to verify the ories, quantify and analyse, able to do error analysis and correlate results.

Minimum of Fourteen Experiments from the list:

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using opticlever, scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations with out mass
5. Calibration of low range voltmeter using potentiometer
6. Verification of truth tables of basic logic gates using ICs
7. Verification of De Morgan's the or ems using logic gate ICs.
8. Use of NAND as universal building block.
9. Radius of curvature of lens by forming Newton's rings
10. Thickness of a wire using air wedge
11. Refractive index of material of the lens by minimum deviation
12. Determination of AC frequency using sonometer
13. Thermal conductivity of poor conductor using Lee's disc
14. Characterisation of Zener diode
15. Construction of AND, OR, NOT gates using diodes and transistor
16. Use of NOR gate as a universal building block
17. wave lengths of Spectral lines using spectro meter and Grating
18. Bridge Rectifier.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

ANCILLARY-APPLIED ELECTRONICS AND INTEGRATED CIRCUITS

BASIC ELECTRONICS AND INSTRUMENTATION	
Learning Objective:- To understand the basic semiconductor physics. -To study the operation of various diodes, transistors. -To gain knowledge about optoelectronic devices and transducers. -To understand the working of DC and AC measuring instruments.	
UNITS	COURSE DETAILS
UNIT-I	Semiconductors: Semiconductor-bands in semiconductors-crystal structure-Intrinsic semiconductor-Extrinsic semiconductor-pn junction-pn junction characteristics-half wave, full wave and bridge rectifiers with RC & LC filters-zener diode characteristics-Tunnel diode-Varactor diode-Shockley diode. (Mehta & Rohit Mehta Chap 6, 7-relevant areas).
UNIT-II	Transistors : Transistor-transistor action-transistor biasing- npn, pn transistor-transistor characteristics-common base and common emitter characteristics-FET and MOSFET Depletion Mode and Enhancement mode-characteristics. (Mehta & Rohit Mehta Chap 8, 19-relevant areas).
UNIT-III	Optoelectronic devices: LDR or Photoconductive cell- Photodiode-Photovoltaic or solar cells-LED (light emitting diode)-Types of lasers-laser action-Population Inversion-spontaneous and stimulated emission-pn junction laser. (Gupta & Kumar Chap 3-relevant areas).

UNIT-IV	Transducers: Classification of Transducers- Characteristic of transducers- Active and passive transducers- requirements of a transducer- piezoelectric transducer- photoelectric transducer- thermistor- capacitive transducer- inductive transducer- potentiometric transducer. (Salivahanan & Sureshkumar Chap 3-relevant areas).
UNIT-V	DC and AC measuring instruments: Galvanometer- ammeter- dc voltmeter- digital multimeter- energy meter- power meter- wattmeter- Vacuum tube voltmeter- application of VTVM- merits and demerits of VTVM. (Salivahanan & Sureshkumar Chap 23-relevant areas).
TEXTBOOKS	1. V.K.Mehta, Rohit Mehta- Principles of Electronics. 2. Dr S.L.Gupta and Dr V.Kumar- Handbook of Electronics. 3. S.Salivahanan and N.Sureshkumar- Electronic devices and circuits.
REFERENCE BOOKS	1. A.K.Sawhney- A course in electrical and electronic measurements and instrumentation. 2. B.L.Theraja- Basic electronics. 3. J.J.Brophy- Basic electronics for scientists.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

INTEGRATED CIRCUITS AND APPLICATIONS	
Learning Objective:- To understand the fabrication of integrated circuits. - To gain knowledge about logic gates. - To study data processing circuits. - To understand the working of OPAMP.	
UNITS	COURSE DETAILS
UNIT-I	Integrated Circuit Fabrication: Classification of ICs- monolithic circuits- epitaxial growth- oxidation- photolithography- metallization- monolithic bipolar transistor- monolithic diodes- integrated resistors- monolithic capacitors and inductors. (Salivahanan & Sureshkumar Chap 19-relevant areas).
UNIT-II	Number system and logic gates: Number system- binary, decimal- binary addition- binary subtraction- basic laws of Boolean algebra- positive logic- logic gates- OR, AND, NOT, NOR, NAND and EX-OR gates using discrete components. (Malvino & Leach Chap 2, 3, 5-relevant areas).
UNIT-III	Optoelectronic devices: LDR or Photoconductive cell- Photodiode- Photovoltaic solar cells- LED (light emitting diode)- lasers- laser action- spontaneous and stimulated emission- pn junction laser. (Gupta & Kumar Chap 3-relevant areas).
UNIT-IV	Timers, Flip flops and Counters: Timer- IC 555- astable multivibrator - monostable multivibrator- Flip flops- RS flip flop (using NAND and NOR), D flip flop- JK flip flop- JK master slave flip flop- counters- decade counter- digital clock. (Malvino & Leach Chap 7, 8, 10-relevant areas).

UNIT-V	Operational Amplifier: Operational amplifier-differential amplifier-basic circuit of differential amplifier-operation of differential amplifier-common mode and differential mode signals-voltage gain-common mode rejection ratio (CMRR)-slew rate-applications-adder, comparator. (Mehta & Rohit Mehta Chap 25-relevant areas).
TEXTBOOKS	1. S. Salivahanan and N. Sureshkumar-Electronic devices and circuits. 2. Donald P Leach, Albert Paul Malvino, Gautam Saha (8 th edition)-Digital Principles and Applications. 3. V.K. Mehta, Rohit Mehta-Principles of Electronics.
REFERENCE BOOKS	1. Millman and Halkias-Electronic Devices and Circuits. 2. Jaydeep Chakravorty-Digital Electronics and Logic Design. 3. Dr S. L. Gupta and Dr V. Kumar-Handbook of Electronics.

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

COURSE	APPLIED ELECTRONICS PRACTICAL-I
COURSE TITLE	LINEAR AND DIGITAL IC s LAB
CREDITS	2
COURSE OBJECTIVES	Apply various Physics concepts to understand concepts of Electronics and Logic Gates setup experimentation to verify the ories, quantify and analyse, able to do error analysis and correlate results.
Minimum of Fourteen Experiments from the list:	
<ol style="list-style-type: none"> 1. Measurement of R, C and L 2. Diode wave shaping circuits 3. Bridge rectifier-output characteristics and percentage of regulation 4. IC 7805 voltage regulator 5. FET characteristics 6. Logic gates-OR, AND, NOT, NOR, NAND (using ICs only) 7. Half adder (using NOR and NAND gates only) 8. Half subtractor (using NOR and NAND gates only) 9. Opamp oscillator 10. Opamp-low pass filter 11. LED and seven segment display 12. BCD to decimal decoder 13. Opamp-D/A conversion 14. IC 555 timer characteristics 15. Monostable multivibrator-IC 555 16. Bistable multivibrator-IC 555 17. Astable multivibrator-IC 741 18. Solar cell characteristics 	

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total
25	75	100