A.G& S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE

VUYYURU-521165, KRISHNA Dt., A.P.(Autonomous)

Accredited by NAAC with "A" Grade

2021-2022



DEPARTMENT OF PHYSICS MINUTES OF BOARD OF STUDIES

ODD SEMESTER

02-11-2021

Minutes of the meeting of Board of studies in Physics for the Autonomous course of A.G. & S.G. Siddhartha Degree College of Arts & Science, Vuyyuru held at 10.30 A.M on 02 - 11 - 2021 in the Department of Physics.

Sri U. Ram Prasad Presiding

Members Present:

oun preste Chairman

(Sri U. Ram Prasad)

2)....... (Dr. M. Rami Reddy)

University Nominee

3). (Dr. T. Srinivasa Krishna)

Academic Council Nominee

Academic Council (Sri P.V. Ramana) Nominee

5)

Representative from

(Sri I. Chittibabu)

Industry

Olley Kunar

Alumini

(Sri B. Dileep Kumar)

Member (Sri J. Hareeshchandra)

8) **Г** Sri (M. Sateesh)

Member

Head, Department of Physics A.G. & S.G.S. Degree College of Arts & science, Vuyyuru - 521165

Registrar Krishna University, Machilipatnam.

Associate Professor, H.O.D Dept. of Physics, P.B. Siddhartha college of arts & science, Vijayawada.

> H.O.D Dept. of Physics, A.J. Kalasala, Machilipatnam.

Sub Divisional Engineer, BSNL,

Vijayawada.

Lecturer in Physics,

Dept. of Physics, IIIT , Nuzivid.

Lecturer in Physics, A.G. & S.G.S. Degree College of Arts & Science, Vuyyuru - 521165.

Lecturer in Physics, A.G. & S.G.S.Degree College of Arts & Science, Vuyyuru - 521165. 9). M. P. D. Painals (Smt. M.P.D. Parimala)

Member

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(Sri J. Dileep)

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Member

Lecturer in Physics,

A.G. & S.G.S.Degree College of Arts & Science, Vuyyuru - 521165.

Lecturer in Physics,

A.G. & S.G.S.Degree College of Arts & Science, Vuyyuru - 521165.

- 1 .To recommend the syllabi and model papers for I semester of I Degree B.Sc., Physics for the Academic year 2021-2022.
- To recommend the syllabi and model papers for III semester of II Degree B.Sc., Physics for the Academic year 2021-2022.
- 3. To recommend the syllabi and model papers for V semester of III Degree B.Sc. Physics for the Academic year 2021-2022.
- To recommend the Blue print of question papers for I, III & V semesters of B.Sc. Physics for the Academic year 2021-2022.
- To recommend the Guidelines to be followed by the question paper setters in Physics for I, III, V Semester – end exams.
- 6. To recommend the teaching and evaluation methods to be followed under Autonomous Status.
- 7. Any suggestions regarding seminars, workshops, Guest lecture to be organized.
- Recommend the panel of paper setters and Examiners to the controller of Examinations of Autonomous Courses of A.G. & S.G.S. Degree colleges of Arts & Science, Vuyyuru.
 Any other matter.

Chaimman.

RESOLUTIONS

- It is resolved to Change the syllabi and model papers for I semester of I B.Sc. under Choice Based Credit System (CBCS 2020-2021 onwards) for the Academic year 2021-22.
- It is resolved to change the syllabi and model papers for III semester of II B.Sc. under Choice Based Credit System (CBCS 2020-2021 onwards) for the Academic year 2021-22.
- 3) It is resolved to follow the same **syllabi and model papers** under Choice Based Credit System (CBCS) prescribed by Krishna University for **V semester of III B.Sc.**
- 4) It is resolved to change the **Blue print** of I and III semesters of Degree I & II B.Sc. for the Academic year 2021-22.
- It is resolved to continue the same **Blue prints** of V semester of Degree B.Sc. for the Academic year 2021-22 also.
- 5) It is resolved to change the **Guidelines** of I and III semesters of Degree I & II B.Sc. for the Academic year 2021-22.
- It is resolved to continue the same **Guidelines** of V semesters of Degree B.Sc. for the Academic year 2021-22.
- 6) It is resolved to continue the following teaching and evolution methods for Academic year 2021-2022.

Teaching Methods:

Besides the conventional methods of teaching, we use modern technology i.e. using of LCD projector, U boards, virtual lab etc, for better understanding of concepts.

Evaluation of a student is done by the following procedure:

- Internal Assessment Examinations:
- For I B.SC.(sem I) out of 100 marks in each paper, 25 marks shall be allocated for internal assessment and 75 marks shall be allotted for external valuation.
- Out of these 25 marks, **15 marks are allocated for announced tests (i.e.IA-1 & IA-2).** Two announced tests will be conducted and average of these two tests shall be deemed as the marks obtained by the student, **5 marks** are allocated on the basis of candidate's **percentage of attendance and remaining 5 marks are allocated for the assignment.**
- For II B.SC.(sem III) out of 100 marks in each paper, 30 marks shall be allocated for internal assessment and 70 marks shall be allotted for external valuation.
- For III B.Sc (i.e. V semester) out of 100 marks in each paper, 30 marks shall be allocated for internal assessment and 70 marks shall be allotted for external valuation.
- Out of these 30 marks, 20 marks are allocated for announced tests (i.e.IA-1 & IA-2). Two announced tests will be conducted and average of these two tests shall be deemed as the marks obtained by the student, 5 marks are allocated on the basis of candidate's percentage of attendance, and 5 marks are allocated for assignment / class room seminars.

- Semester End Examination:
- The maximum marks for I B.Sc. Semester I End examination shall be 75 marks and duration of the examination shall be 3 hours.
- The maximum marks for II B.Sc. and III B.SC. Semesters III and V End examination shall be 70 marks and duration of the examination shall be 3 hours.
- Semester End examinations in theory papers and practical Examinations shall be conducted at the end of every semester I, III & V for I, II & III B.Sc.
- 7) Discussed and recommended for organizing seminars, Guest lecturers, workshops to upgrade the knowledge of students, for the approval of the academic council.
- 8) Discussed and empowered the Head of the department of Physics to suggest the panel of paper setters and examiners to the controller of examinations.
- 9) Proposed to conduct add on Programme /Certificate course.

Chairman.

A.G & S.G Siddhartha Degree College of Arts and Science, Vuyyuru (An Autonomous college in the jurisdiction of Krishna University) Accredited at the 'A' level by NAAC SEMESTER- I PAPER- I Total hrs-60 MECHANICS, WAVES AND OSCILLATIONS Credits-3

Course outcomes:

On successful completion of this course, the students will be able to:

- CO1: Understand Newton's laws of motion and motion of variable mass system and its application to rocket motion and the concepts of impact parameter, scattering cross section.
- CO2: Apply the rotational kinematic relations, the principle and working of gyroscope and its applications and the precessional motion of a freely rotating symmetric top. Comprehend the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.
- **CO3**: Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence. Examine phenomena of simple harmonic motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.
- **CO4**: Appreciate the formulation of the problem of coupled oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanical systems.
- **CO5**: Figure out the formation of harmonics and overtones in a stretched string and acquire knowledge on Ultrasonic waves, their production and detection and their applications in different fields.

A.G & S.G Siddhartha Degree College of Arts and Science, Vuyyuru

PHYSICS	РНУ-101С	2020-2021	B.Sc. (MPC&MPCs)
	Se	mester-I	
Work load: 60 hrs per	semester	4 hrs/week	Credits – 4

(An Autonomous College in the jurisdiction of Krishna University, Machilipatnam A.P. India)

Paper-III MECHANICS, WAVES AND OSCILLATIONS

UNIT-I:

1. Mechanics of Particles (5 hrs)

Review of Newton's Laws of Motion, Motion of variable mass system, Multistage rocket, Concept of impact parameter, scattering cross-section, Rutherford scattering-Derivation.

2. Mechanics of Rigid bodies (7 hrs)

Rigid body, rotational kinematic relations, Equation of motion for a rotating body, Angular momentum and Moment of inertia tensor, Euler equations, Precession of a spinning top, Gyroscope, Precession of the equinoxes

Unit-II:

3. Motion in a Central Force Field (12hrs)

Central force - definition and examples, characteristics of central forces, conservative nature of central forces, Equation of motion under a central force, Kepler's laws of planetary motion-Proofs, Motion of satellites – escape velocity, orbital velocity, Basic idea of Global Positioning System (GPS),

UNIT-III:

4. Relativistic Mechanics (12 hrs)

Introduction to relativity, Frames of reference - Galilean transformations, absolute frames, Michelson-Morley experiment & negative result, Postulates of Special theory of relativity, Lorentz transformation, time dilation, length contraction, variation of mass with velocity, Einstein's mass-energy relation

Unit-IV:

5. Undamped, Damped and Forced oscillations: (07 hrs)

Simple harmonic oscillator, Damped harmonic oscillator, Forced harmonic oscillator –differential equations and solutions, Resonance, Logarithmic decrement, Relaxation time and Quality factor.

6. Fourier analysis (05 hrs)

Fourier theorem (Statement & limitations), evaluation of the Fourier coefficients using Fourier's theorem, analysis of periodic wave functions - square wave, triangular wave. Unit-V:

7. Vibrating Strings: (07 hrs)

Transverse wave propagation along a stretched string, General solution of wave equation and its significance, Modes of vibration of stretched string clamped at ends, Overtones and Harmonics.-

8. Ultrasonics: (05 hrs)

Ultrasonics, General Properties of ultrasonic waves, Production of ultrasonics by piezoelectric and magnetostriction methods, Detection of ultrasonics, Applications of ultrasonic waves, SONAR

STUDENT ACTIVITY

1. Seminars

2. Assignments.

LIBRARY ACTIVITY

Student visit library to refer and gather information regarding seminar topics and assignments.

TEXT BOOKS

- 1. B. Sc. Physics, Vol.1, Telugu Academy, Hyderabad
- 2. Unified Physics Waves and Oscillations, Jai PrakashNath & Co.Ltd.

REFERENCE BOOKS:

- 1. Fundamentals of Physics Vol. I Resnick, Halliday, Krane, Wiley
- 2. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
- 3. University Physics-FW Sears, MW Zemansky & HD Young, Narosa Publications, Delhi
- 4. Mechanics, S.G. Venkatachalapathy, Margham Publication, 2003.
- 5. Waves and Oscillations. N. Subramanyam and Brijlal, VikasPulications.
- 6. Waves & Oscillations. S. Badami, V. Balasubramanian and K.R. Reddy, Orient Longman.

7.	The Physics of Waves and Oscillations, N.K. Bajaj, Tata McGraw Hill
8.	Science and Technology of Ultrasonics- Baldevraj, Narosa, New Delhi,2004

Model Question Paper

Mechanics, Waves and Oscillations

SECTION-A

Answer the following:

 $5 \ge 10 = 50 \text{ M}$

1 A) What is Rutherford scattering? Obtain an expression for number of particles scattered per unit area. (CO1).

(OR)

B) What is precessional motion? Find angular velocity of precession of a spinning top. Show that the rate of precession is independent of mass but depends on the distribution of mass. (CO2).

2. A) What is conservative force? Show that central forces are conservative. (CO2).

(OR)

B) State Kepler's third law of motion. And prove that the square of period of revolution of a planet moving in a circular orbit round the sun is proportional to the cube of its distance from the sun. (CO2)

3 A) State the fundamental postulates of special theory of relativity and deduce the Lorentz transformations. (CO3)

(OR)

B) Describe the Michelson-Morley experiment and explain the physical significance of negative results. (CO3)

4 A) What are damped oscillations? Derive the differential equation of damped Harmonic oscillator and discuss the case of under damping. (CO3).

(OR)

B) State Fourier Theorem and evaluate Fourier coefficients. (CO4).

5 A) What are transverse waves? Obtain the equation of velocity of transverse wave in a wire kept under tension. (CO5).

B) What are ultrasonics? Describe Magnetostriction method of producing ultrasonics (CO5).

SECTION-B

Answer any **THREE** of the following questions:

6. State Newton's laws of motion and give two examples each. (CO1)

- 7. Explain central forces with examples. (CO2)
- 8. Explain time dilation. (CO3)
- 9. What is logarithmic decrement and relaxation time? (CO4)
- 10. Explain overtones and harmonics. (CO5)

3x5 = 15M

Answer any **TWO** of the following:

11. The kinetic energy of metal disc rotating at a constant speed of 5 revolutions per second is joules. Find the angular momentum of the disc. (CO2)

12. If the Earth be one-half of its present distance from the sun, what will be the number of days in a year (CO2)

13. If the energy note of frequency 100Hz decreases to one half of tis original value in one second, calculate the Q-factor, (CO4)

13. A piezoelectric crystal has a thickness of 0.002m. If the velocity of sound wave in crystal is 5750m/s, calculate the fundamental frequency of crystal. (CO5)

Practical Course 1: Mechanics, Waves and Oscillations

Work load: 30 hrs	2 hrs/week	Credits:01
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Course outcomes (Practicals):

On successful completion of this practical course, the student will be able to:

- **CO 1.** Perform experiments on Properties of matter such as the determination of moduli of elasticity viz., Young's modulus, Rigidity modulus of certain materials; Surface tension of water, Coefficient of viscosity of a liquid, Moment of inertia of some regular bodies by different methods and compare the experimental values with the standard values.
- **CO 2**. Know how to determine the acceleration due to gravity at a place using Compound pendulum and Simple pendulum.
- **CO 3**. Notice the difference between flat resonance and sharp resonance in case of volume resonator and sonometer experiments respectively.
- CO 4. Verify the laws of transverse vibrations in a stretched string using sonometer and comment on the relation between frequency, length and tension of a stretched string under vibration.
- **CO 5**. Demonstrate the formation of stationary waves on a string in Melde's string experiment.
- **CO 6**. Observe the motion of coupled oscillators and normal modes.

EXPERIMENTS LIST:

- 1. Young's modulus of the material of a bar (scale) by uniform bending
- 2. Young's modulus of the material a bar (scale) by non- uniform bending
- 3. Surface tension of a liquid by capillary rise method

- 4. Simple pendulum- normal distribution of errors-estimation of time period and the error of the mean by statistical analysis
- 5. Determination of 'g' by compound/bar pendulum
- 6. Verification of laws of vibrations of stretched string -Sonometer
- 7. Bifilar suspension Moment of inertia of a regular rectangular body.
- 8. Rigidity modulus of material of a wire-Dynamic method (Torsional pendulum)
- 9. Volume resonator experiment
- 10. Viscosity of liquid by the flow method (Poiseuille's method)
- 11. Determination of the force constant of a spring by static and dynamic method. Coupled oscillators
- 12. Determination of frequency of a bar –Melde's experiment.

Note :

9 (NINE) experiments are to be done and recorded in the lab. These experiments will

be evaluated in CIA.

- 2. For certification minimum of 7 (Seven) experiments must be done and recorded by student who had put in 75 % of attendance in the lab.
- 3. Best 6 experiments are to be considered for CIA.
- 4. 10 marks for CIA.
- 5. 40 marks for practical exam.

The marks distribution for the Semester End practical examination is as follows:

Formula/ Principle / Statement with explanation of symbols	05
Diagram/Circuit Diagram / Tabular Columns	05
Setting up of the experiment and taking readings/Observations	10
Calculations (explicitly shown) + Graph + Result with Units	05
Procedure and precautions	05
Viva-voce	05
Record	05
Total Marks:	40

A.G & S.G Siddhartha Degree College of Arts and Science, Vuyyuru

(An Autonomous College in the jurisdiction of Krishna University, Machilipatnam A.P. India)

Semester-III

Work load: 60 hrs

4 hrs/week

Credits: 03

Paper-III THERMODYNAMICS AND RADIATION PHYSICS

COURSE OUTCOMES

Upon successful completion of this course, students should have the knowledge and skills to:

- CO1 Understand the microscopic behavior of molecules, interactions and the concepts of transport phenomena of heat transfer, mass transfer and momentum transfer.
- CO2 State the First Law and define heat, work, thermal efficiency and the difference between various forms of energy and describe energy exchange processes, reversible and irreversible process.
- CO3 Derive thermodynamic potentials from first principles and derive the Maxwell relations.
- CO4 Understand very low temperatures like the concept of Joule Thomson effect, Liquefaction of gases and the properties at very low temperatures.
- CO5 Understanding of Black-body radiation as the thermal electromagnetic radiation and the statistical principles to the mechanical behavior of large number of small particles.

A.G & S.G Siddhartha Degree College of Arts and Science, Vuyyuru

PHYSICS	РНУ-301С	2020-2021	B.Sc. (MPC&MPCs)
Work load: 60 hr	Sem s per semester	ester-III 4 hrs/week	Credits – 4

(An Autonomous College in the jurisdiction of Krishna University, Machilipatnam A.P. India)

Paper-III THERMODYNAMICS AND RADIATION PHYSICS

UNIT-I:

Kinetic Theory of gases: (12 hrs)

Kinetic Theory of gases-Introduction, Maxwell's law of distribution of molecular velocities (qualitative treatment only), Mean free path, Degrees of freedom, Principle of equipartition of energy (Qualitative ideas only), Transport phenomenon in ideal gases: viscosity, Thermal conductivity and diffusion of gases.

UNIT-II:

Thermodynamics: (12hrs)

Introduction- Isothermal and Adiabatic processes, Reversible and irreversible processes, Carnot's engine and its efficiency, Carnot's theorem, Thermodynamic scale of temperature and its identity with perfect gas scale, Second law of thermodynamics - Kelvin's and Clausius statements; Principle of refrigeration; Entropy, Physical significance, Change in entropy in reversible and irreversible processes; Entropy and disorder-Entropy of Universe; Temperature-Entropy (T-S) diagram and its uses - change of entropy when ice changes into steam (Qualitative).

UNIT-III:

Thermodynamic Potentials and Maxwell's equations: (12hrs) (NO PROBLEM)

Thermodynamic potentials-Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy and their significance, Derivation of Maxwell's thermodynamic relations from thermodynamic potentials, Applications to (i) Clausius-Clayperon's equation (ii) Value of $C_P - C_V$ (iii) Value of C_P/C_V (iv) Joule-Kelvin coefficient for ideal and Van der Waals' gases

UNIT-IV:

Low temperature Physics: (12hrs)

Methods for producing very low temperatures, Joule Kelvin effect, Porous plug experiment, Joule expansion, Distinction between adiabatic and Joule Thomson expansion, Expression for Joule Thomson cooling, Production of low temperatures by adiabatic demagnetization (Derivation), Principle of Refrigeration, effects of chloro and fluoro carbons on ozone layer.

UNIT-V:

Quantum theory of radiation: (12 hrs)

Blackbody and its spectral energy distribution of black body radiation, Kirchoff's law, Wein's displacement law, Stefan-Boltzmann's law and Rayleigh-Jean's law (No derivations), Planck's law of black body radiation-Derivation, Deduction of Wein's law and Rayleigh-Jean's law from Planck's law, Solar constant and its determination using Angstrom pyroheliometer, Estimation of surface temperature of Sun.

TEXT BOOKS

- 1. BSc Physics, Vol.2, Telugu Akademy, Hyderabad
- Unified Physics Vol.2, Optics & Thermodynamics, Jai Prakash Nath &Co.Ltd., Meerut

REFERENCE BOOKS:

- 1. Thermodynamics, R.C. Srivastava, S.K. Saha & Abhay K. Jain, Eastern Economy Edition.
- 2. Fundamentals of Physics. Halliday/Resnick/Walker.C. Wiley India Edition 2007
- 3. Heat, Thermodynamics and Statistical Physics-N Brij Lal, P Subrahmanyam, P S Hemne, S. Chand& Co., 2012
- 4. Heat and Thermodynamics- MS Yadav, Anmol Publications Pvt. Ltd, 2000
- 5. University Physics, HD Young, MW Zemanski Sears, Narosa Publishers, New Delhi

The Guidelines to be followed by the question paper setters in Physics for the III Semester - end exams

PAPER TITLE: Thermodynamics and Radiation Physics

Paper- III Semester – III Maximum marks: 70 marks Duration: 3Hours

Weightage for the question paper

Syllabus	Section-A (Short answer questions)	Section-B (essay questions)
Unit-1(20 Marks)	T+P	1
Unit-2(30 Marks)	T+P	2
Unit-3(15Marks)	Т	1
Unit-4(25 Marks)	Т	2
Unit-5(30 Marks)	T+P	2

Note: T means one theory question, P means one problem

- Section-A contains 5 short questions and 3 problems out of these 8 questions, the student has to answer any 4, each question carries 5 marks.
- \geq <u>Section B</u> contains 8 essay questions, the student has to answer any 5 questions, each question carries 10 marks.
- The Question papers setters are requested to cover all the topics in the syllabus as per the weightage given by us.

Model Question Paper

Title of the Paper: Thermodynamics and Radiation Physics Section-A

Answer any **FOUR** of the following:

- 1. Write a note mean free path. (CO1)
- 2. Explain the second law of thermodynamics in terms of entropy. (CO2)
- 3. Prove $C_p C_v = R$ (CO3)
- 4. Explain the effects of chloro and fluoro carbons on ozone layer. (CO4)
- 5. Estimate the temperature of sun. (CO5)
- 6. Find the R.M.S velocity of hydrogen at N.T.P and at C? (CO1)
- 7. Calculate the efficiency of a reversible engine that operates between the temperatures 200° Cand 120° C? (CO1)
- 8. Find the wavelength at which maximum energy is radiated by a black at a temperature of 227°c and wien's constant is 2.877x10⁻³mk. (CO1)

Section-B

Answer any **FIVE** of the following:

5X10=50M

- 9. Derive an expression for Maxwell's law of distribution of molecular speeds in a gas. (CO1)
- 10. Describe the working of Carnot's reversible engine and derive an expression for its efficiency. (CO2)
- 11. What are reversible and irreversible processes? How does the entropy change in each of these processes? (CO2)
- 12. Define the four thermodynamic potentials. Obtain Maxwell's thermodynamic equations using these potentials. (CO3)
- 13. What is adiabatic demagnetization? How is this principle used in producing low temperatures? (CO4)
- 14. Explain Joule-kelvin effect. Derive an expression for Joule-Thompson cooling. (CO4,)

4X5=20M

- 15. Derive the Planck's formula for the distribution of energy in black body radiation. (CO5)
- 16. Describe the construction and working of Angstrom pyroheliometer (CO5)

A.G & S.G Siddhartha Degree College of Arts and Science, Vuyyuru

(An Autonomous College in the jurisdiction of Krishna University, Machilipatnam)

PHYSICS	РНҮРЗ01С	2020-21	B.Sc. (MPC&MPCs)

Practical Paper III: Thermodynamics and Radiation Physics Lab

Work load: 30hrs	2 hrs/week	Credits: 01

Objectives:

The primary objective of this course is to provide the fundamental knowledge to understand the behaviour of thermal systems.

This course provides a detailed necessary transfer through solids, fluids, and

experimental analysis, including the application and heat vacuum.

Convection, conduction, and radiation heat transfer in one and two dimensional steady and unsteady systems are examined.

COURSE OUTCOMES

Upon successful completion of this course, students should have the knowledge and skills to:

- CO1: Determine the thermal conductivity of bad conductor-Lee's method, thermal conductivity of rubber and Coefficient of thermal conductivity of copper by using Searle's apparatus.
- CO2: Study the heating efficiency of electrical kettle with varying voltages.
- CO3: Determine Specific heat of a liquid by Joule's calorimeter and study Barton's radiation correction by plotting a graph between temperature and time and Specific heat of a liquid by applying Newton's law of cooling correction.
- CO4: Study temperature variation of resistance in a thermostat.
- CO5: Study the heating efficiency of electrical kettle with varying voltages.

List of experiments

- 1. Study of variation of resistance with temperature Thermistor.
- 2. Thermal conductivity of bad conductor-Lee's method
- 3. Thermal conductivity of rubber.
- 4. Measurement of Stefan's constant emissive method
- 5. Heating efficiency of electrical kettle with varying voltages.
- 6. Specific heat of a liquid –Joule's calorimeter –Barton's radiation correction
- 7. Specific heat of a liquid by applying Newton's law of cooling correction.
- 8. Thermo emf- thermo couple Potentiometer
- 9. Thermal behavior of an electric bulb (filament/torch light bulb)
- 10. Measurement of Stefan's constant

Note :

9 (NINE) experiments are to be done and recorded in the lab. These experiments will

be evaluated in CIA.

- 2. For certification minimum of 7 (Seven) experiments must be done and recorded by student who had put in 75 % of attendance in the lab.
- 3. Best 6 experiments are to be considered for CIA.
- 4. 10 marks for CIA.
- 5. 40 marks for practical exam.

The marks distribution for the Semester End practical examination is as follows:

Formula/ Principle / Statement with explanation of symbols	05
Diagram/Circuit Diagram / Tabular Columns	05
Setting up of the experiment and taking readings/Observations	10
Calculations (explicitly shown) + Graph + Result with Units	05
Procedure and precautions	05
Viva-voce	05
Record	05
Total Marks:	40

A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE (AUTONOMOUS), VUYYURU – 521 165 III B.Sc. 5th Semester (2020-2021) Paper V: Electricity, Magnetism and Electronics

Work load:60 hrs per semester 4 hrs/week Course Code : PHY 501C

Unit – I(12hrs)

1.Electrostatics

Gauss's law Statement and its proof-Electric field intensity due to (1) Uniformly charged sphere and (2) an infinite conducting sheet of charge. Electric potential- Equipotential surface –potential due to i) a point charge ii)charged spherical shell.

2.Dielectrics

Electric dipolement and molecular polarizability- Electric displacement D, electric polarization P – relation between D, E, and P- Dielectric constant, susceptibility .

Unit – II(12hrs)

3. Electric and magnetic field Biot – Savart's law and calculation of B due to long straight wire, a circular current loop and solenoid. Hall effect-determination of Hall coefficient and applications.

4.Electromagnetic-induction

Faraday's law – Lenz's law self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid, energy stored in magnetic field. Tansformer- energy losses and efficiency.

Unit-III(12hrs)

5. Alternating current and electro magnetic waves

Alternating current –Relation between current and voltage in LR and CR circuits, vector diagrams, LCR series and parallel resonant circuit, Q- factor, power in AC circuits.

6.Maxwell's equations

Idea of displacement current- Maxwell's equations (integral and differential forms) (no derivation) Maxwell's wave equation(with derivation), Transverse nature of electromagnetic wave. Pointing Vector (statement and proof) production of electromagnetic wave Hertz experiment.

Unit-IV(12hrs)

7.Basic electronics:

PN junction diode Zener diode ,I-V characteristics, PNP and NPN Transistors, CB,CE and CC configuration Relation between α β and Γ transistors (CE) characteristics,Transistor as an amplifier.

Unit-V(12hrs)

Digital electronics:

Number systems-conversion of binary to decimal system and vice versa. Binary addition and subtraction (1's and 2's complement methods) laws of Boolean algebra-De Morgan's laws-statement and proof basic logic gates, NAND and NOR as universal gates Half adder and FULL adder.

REFERENCE BOOKS

- 1) BSC Physics vol.3 Telugu Akademy, Hyderabad.
- 2) Electricity, Magnetism D,N Vasudeva. S.chand & co.,
- 3) Electricity, Magnetism and Electronics, K.K.Tewai, R.Chand &co.,
- 4) Principles of electronics, V.K.Mehta, S.Chand &co.,
- 5) Digital principles and applications A.P Malvino and D.P.Leach, Mc GrawHILL Edition.

The Guidelines to be followed by the question paper setters in Physics for the V Semester - end exams

PAPER TITLE: Electricity, Magnetism and Electronics

Paper- V Semester – V Maximum marks: 70 marks Duration: 3Hours Weightage for the question paper

Syllabus	Section-A	Section-B
	(Short answer questions)	(essay questions)
Unit-1 (25 Marks)	Т	2
Unit-2 (20 Marks)	T+P	1
Unit-3 (30Marks)	T+P	2
Unit-4 (20 Marks)	T+T	1
Unit-5 (25 Marks)	Т	2

Note: T means one theory question, P means one problem

- Section-A contains 6 short questions and 2 problems out of these
 8 questions, the student has to answer any 4, each question carries
 5 marks.
- \blacktriangleright <u>Section –B</u> contains 8 essay questions, the student has to answer any 5 questions, each question carries 10 marks.
- The Question papers setters are requested to cover all the topics in the syllabus as per the weightage given by us.

SEMESTER –

COURSE CODE : PHY- 501 C

PAPER TITLE : Electricity, Magnetism and Electronics

Duration : 3Hours

Maximum marks : 70 Pass marks : 28 marks

MODEL PAPER

V

III B.Sc. (PHYSICS)- V SEMESTER ELECTRICITY, MAGNETISM AND ELECTRONICS

TIME: 3 Hrs PHY – 501 C MAX MARKS: 70 PASS MARK : 28

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<u>SECTION – A</u>

ANSWER ANY FOUR OF THE FOLLOWING

(4 X 5 = 20 M)

- 1) Write a short note on equi potential surfaces
- 2) obtain an expression for energy stored in a magnetic field
- 3) Derive expression for power in ac circuit
- 4) Explain CE configuration of a transisitor
- 5) Explain briefly how a transisitor works as an amplifier
- 6) Explain about half adder circuit with truth table.
- 7) Calculate the intensity of the magnetic field at the center of a circular coil of radius 20 cm and 40 turns having a current of 2A in it.
- 8) In a series RLC circuit R = 100 ohm, L = 0.5H and C = 0.4 μ F. calculate resonant frequency

<u>SECTION – B</u>

ANSWER ANY FIVE OF THE FOLLOWING QUESTIONS $(5 \times 10 = 50 \text{ M})$

9) Derive an expression for the electric field due to uniformly charged sphere using Gauss law?

10) Define D, E and P derive the relation between them

11) Calculate the magnetic induction due to a long straight wire using Biot- savart's law

- 12) State and prove pointing theorem
- 13) Explain the growth and decay of charge in LR- circuit
- 14) Describe the construction and working of Zener diode.
- 15) State and prove De Morgan's theorem with examples.
- 16) Explain about basic logic gates with truth tables.

Practical paper V: Electricity, Magnetism and Electronics

Exam duration : 3Hours Maximum marks : 50 marks Work load:30hrs

Minimum of 6 experiments to be done and recorded

- 1. Figure of merit of a moving coil galvanometer.
- 2. LCR circuit series/parallel resonance, Q-factor
- 3. Determination of Ac-frequency-sonometer
- 4. Verification of Kirchoff's laws
- 5. Field along the axis of a circular coil carrying current.
- 6. PN Junction diode Characteristics
- 7. characteristics of Zener diode
- 8. Transistor CE Characteristics.
- 9. Logic Gates –OR ,AND, NOT, and NAND gates verification of truth tables.
- 10. Verification of De Morgan's theorems.

DEPARTMENT OF PHYSICS A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE (AUTONOMOUS), VUYYURU – 521 165 <u>III B.Sc. Physics – V Semester – Paper –VI (2020 – 2021)</u>

Modern Physics

Course Code :PHY 502CWork Load : 60 hrs per semester4 hrs/weekUnit – I (12 hrs)1. Atomic and molecular physics4 hrs/week

Introduction – Drawbacks of Bohr's atomic model – Sommerfeld's elliptical orbitsrelativistic correction (no derivation). Vector atom model and Stern & Gerlach experiment quantum numbers associated with it. L-S and j-j coupling schemes. Zeeman Effect and its experimental study.

Raman effect, stokes and Anti stokes lines . Quamtum theory of Raman effect. Experimental arrangement – Applications of Raman effect.

UNIT – II (12 hrs) 2. Matter waves & Uncertainty Principle

Matter waves, de Broglie's hypothesis – wavelength of matter waves, Properties of matter waves – Davisson and Germer experiment, uses of electron diffraction-Phase velocity and Group velocity (definitions only)- relation between phase velocity and Group velocity–Heisenberg's uncertainty principle for position and momentum (x and p) & energy and time (E and t). Experiment verification.

UNIT – III (12 hrs) 3.Quantum (wave) mechanics

Basic postulates of quantum mechanics – Schrodinger time independent and time dependent wave equation – derivations. Physical interpretation of wave function. Applications of Schrodinger wave equation to particle in one dimensional infinite box. Harmonic oscillator.

UNIT – IV (12 hrs) 4.General properties of Nuclei

Basic ideas of nucleus – size,mass,charge density(matter energy), binding energy,angular momentum, parity, magnetic moment, electric quadrupole moments.Liquid drop model and shell model (qualitative aspects only)- Magic numbers.

5. Radioactivity decay

Alpha decay : basis of α – decay processes. Range of α -particles , Geiger"s Law,Geiger- Nuttal law. β – decay, β ray continuous and discrete spectrum, neutrino hypothesis.

UNIT – V (12 hrs)

6.Crystal structure

Amorphous and crystalline materials, unit cell, Miller indices, reciprocal lattice, types of lattices, diffraction of X- rays by crystals, Bragg's law, experimental techniques, Laue's method and powder diffraction method.

7. Superconductivity:

Introduction – experimental facts, critical temperature – critical field – Meissner effect – isotope effect – Type I and Type II superconductors – BCS theory (elementary ideas only) – applications of superconductors.

REFERENCE BOOKS :

1.B.Sc physics, VOL .4, Telugu academy, Hyderabad.

- 2. Molecular structure and spectroscopy by G.Aruldas. prentice Hall of india, New Delhi.
- 3. Modern physics by R.Murugeshan and Kiruthiga siva prasanth. S. Chand & co.
- 4. Modern physics by G.Aruldhas & p. Rajagopal. Eastren economy edition.
- 5. Concepts of Modern physics by Arthur Beiser. Tata Mcgrew Hill Edition.
- 6. Quantum Mechanics, Mahesh c Jain , Eastern Economy EDITION
- 7. Nuclear Physics , Irving Kaplan, Narosa Publishing House.
- 8. Nuclear physics, D.C Tayal, Himalaya publishing house.
- 9. Elements of solid state physics, J.P srivastava, Prentice Hall of india pvt. Ltd.
- 10. Solid state physics, A.J.Dekkar, McMillan India.

The Guidelines to be followed by the question paper setters in Physics for the V Semester - end exams

PAPER TITLE: Modern Physics

Paper- VI Semester – V Maximum marks: 70 marks Duration: 3Hours Weightage for the question paper

Syllabus	Section-A (Short answer questions)	Section-B (Essay questions)
Unit-1 (25 Marks)	Т	2
Unit-2 (20 Marks)	T+P	1
Unit-3 (25Marks)	Т	2
Unit-4 (20 Marks)	T+T	1
Unit-5 (30 Marks)	T+P	2

Note: T means one theory question, P means one problem

- <u>Section-A</u> contains 6 short questions and 2 problems out of these
 8 questions, the student has to answer any 4, each question carries
 5 marks.
- \blacktriangleright <u>Section B</u> contains 8 essay questions; the student has to answer any 5 questions. Each question carries 10 marks.

The Question papers setters are requested to cover all the topics in the syllabus as per the weightage given by us.

SEMESTER – V

COURSE CODE : PHY-502

PAPER TITLE : Modern Physics (Model Paper)

Duration : 3Hours Maximum marks : 70 Pass marks : 28 marks

<u>III B.Sc. Physics – V Semester – Paper –VI (2020 – 2021)</u> <u>Modern Physics</u>

Paper Code : PHY 502C <u>SECTION-A</u>

Answer any FOUR questions

- 1. Write the Draw backs of Bohr's atomic model.
- 2. Explain deBroglie concept of matter waves.
- 3. Explain Geiger-Nuttal law.
- 4 Write a note on liquid drop model.
- 5. Explain Meissner effect in super conductivity.
- 6. State postulates of Quantum Mechanics.

7. In a crystal lattice plane cuts intercepts 2a, 3b and 6c along the three axes where a,b and c are primitive vectors of the unit cell. Determine the miller indices of the given plane.

8. If the uncertainty in position of an electron is 4×10^{-10} m and uncertainty in its momentum is 1.65×10^{-24} kg m/sec.

SECTION-B

Answer any FIVE questions :

(5x10=50M)

9. Describe Stern and Gerlach experiment and discuss the importance of the results obtained

10. What is Raman Effect? Write the Experimental setup to study Raman Effect.

11. Describe Davisson and Germer Experiment on electron diffraction. Discuss the results of the Experiment.

- 12. Derive Time independent Schrodinger wave equation.
- 13. Calculate the energy of a particle in one dimensional box using Schrodinger equation.

14. Mention the Basic Properties of Nucleus with reference to Size, Charge, Mass, Nuclear spin and Electric Quadra pole Moment.

- 15. Describe X-Ray diffraction by Laue's method.
- 16. Explain Type-I and Type-II Superconductors.

(4x5=20M)

Practical Paper VI : Modern Physics

Maximum marks : 50 marks Exam duration : 3Hours

Work load : 30 hrs

3 hrs.

Minimum of 6 experiments to be done and recorded

1. e/m of an electron by Thomson method.

- 2. Determination of Planck's Constant (photocell)
- 3. Verification of inverse square law of light using photovoltaic cell.
- 4. Study of absorption of α rays.
- 5. Study of absorption of . β rays.
- 6. Determination of range of β particles.
- 7. Determination of M & H.

8. Analysis of powder X- ray diffraction pattern to determine properties of crystals.

9. Energy gap of semiconductor using junction diode.

10. Energy gap of a semiconductor using Thermistor.