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

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

Accredited by NAAC with "A" Grade

2022-2023

DEPARTMENT OF PHYSICS

MINUTES OF BOARD OF STUDIES

EVEN SEMESTER

01-04-2023

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 11.00 A.M on 01-04-2023 in the Department of Physics.

Sri J. Hareesh Chandra — **Presiding**

Members Present:

1) ..... **(Sri. J. Hareesh Chandra)**	Chairman	**Head, Department of Physics** A.G. &S.G.S. Degree College of Arts & Science, Vuyyuru - 521165
2) ..... **(Dr. M. Rami Reddy)**	University Nominee	**Registrar** Krishna University, Machilipatnam.
3) ..... **(Dr. P.V. Ramana)**	Academic Council Nominee	**H.O.D. Dept. of Physics,** SRI DNR Women's College, Palakollu.
4) ..... **(Dr. T. Srinivasa Krishna)**	Academic Council Nominee	**Associate Professor,** H.O.D, Dept. of Physics, P.B.Siddhartha College of Arts & Science, Vijayawada
5) ..... **(Sri I. Chittibabu)**	Representative from Industry	**Sub Divisional Engineer** BSNL , Vijayawada.
6) ..... **(Sri B. Dileep Kumar)**	Alumni	**Lecturer in Physics,** Dept.ofPhysics,IIIT, Nuzivid.
7) ..... **(Sri M. Sateesh)**	Member	**Lecturer in Physics,** A.G.&S.G.S.Degree College of Arts & Science, Vuyyuru - 521165.
8) ..... **(Smt. M.P.D. Parimala)**	Member	**Lecturer in Physics** A.G. & S.G.S.Degree College of Arts & Science, Vuyyuru - 521165.
9) ..... **(Sri J. Dileep)**	Member	**Lecturer in Physics** A.G.&S.G.S.Degree College of Arts & Science, Vuyyuru - 521165.
10) ..... **(Sri U.Ram prasad)**	Member	**Lecturer in Physics,** A .G.& S.G.S.Degree, College of Art. & Science,Vuyyuru -521165

Agenda for B.O.S Meeting :- PHYSICS

1. To recommend the syllabi (Theory & Practical), Model question paper for II Semester of I B.Sc (MPCS) for the academic year 2022 - 2023.
2. To recommend the syllabi (Theory & Practical), Model question paper for IV Semester of II B.Sc (MPC,MPCS) for the academic year 2022 - 2023.
3. To recommend the Blue print for the semester end exam for II & IV semester of I & II B.Sc (MPC,MPCS) for the academic year 2022 - 2023.
4. To recommend the Guidelines to be followed by the question paper setters in Physics for II, IV Semester – end exams.
5. To recommend the teaching and evaluation methods to be followed under Autonomous status.
6. Any suggestions regarding seminars, workshops, Guest lecture to be organized.
7. Any other matter.

J. Hareeshchandra

Chairman.

(J. Hareesh Chandra)

RESOLUTIONS

1. It is resolved to continue the same syllabi (Theory & Practical), guide lines to be followed by the question paper setters of physics of II semester of I B.Sc. (MPCS) under Choice Based Credit System (CBCS) approved by the Academic Council of 2022 – 2023. Model question paper pattern changed.
2. It is resolved to continue the same syllabi (Theory & Practical), model paper, guide lines to be followed by the question papers under Choice Based Credit System (CBCS) setters of PHYSICS of IV Semester of II B.Sc. (MPC&MPCS) approved by the Academic Council of 2022 –2023.
3. It is resolved to Continue the same Blue prints of II & IV Semesters of B.Sc PHYSICS for the Academic year 2022-2023.
4. It is resolved to continue the following teaching & evaluation methods for the Academic year 2022-23.
5. Any other matter.

Teaching methods:

Besides the conventional methods of teaching, we use modern technology i.e. Using of OHP and LCD projector to display on U boards etc; for better understanding of concepts.

Evaluation of a student is done by the following procedure:

Internal Assessment Examination:

- Out of maximum 100 marks in each paper for I B.Sc, 30 marks shall be allocated for internal assessment.
- 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 remaining 5 marks are allocated for the assignment for I B.SC.
- Out of maximum 100 marks in each paper for II B.Sc, 25 marks shall be allocated for internal assessment.
- 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, 5marks allocated on assignment and reaming 5 marks seminar for IV semester.
- There is no pass minimum for internal assessment for I & II B.Sc.

Semester – End Examination:

- The maximum mark for I (MPCS) semester – End examination shall be 70 marks and duration of the examination shall be 3 hours.
- The maximum mark for II B.Sc semester- End examination shall be 75 marks and duration of the examination shall be 3 hours. Even through the candidate is absent for two IA exams / obtain zero marks the external marks are considered (if the candidate gets 40/70) and the result shall be declared as "PASS"
- Semester – End examination shall be conducted in theory papers at the end of every semester, while in practical papers, these examinations are conducted at the end of II & IV semester for I & II B.Sc.
- Discussed and recommended for organizing Seminars, Guest lectures, Work – Shops to upgrade the Knowledge of students, for the approval of the Academic Council.

T. Hareshchandra

Chairman

ADUSUMILLI GOPALAKRISHNAIAH & SUGAR CANE GROWERS SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE, VUYYURU-521165, KRISHNA Dt., A.P. (AUTONOMOUS).

ALLOCATION OF CREDITS

For the Papers offered during II & IV Semesters

SEMESTER – II

Course Code	Title of the Course	Instruction Hours per week	Credits	Evaluation		
				CIA MARKS	SEE	
					MARKS	DURATION
PHYT21B	WAVE OPTICS	4	3	30	70	3 Hrs.
PHYP21B	WAVE OPTICS	2	2	10	40	3 Hrs.

SEMESTER- IV

Course Code	Title of the Course	Instruction Hours per week	Credits	Evaluation		
				CIA MARKS	SEE	
					MARKS	DURATION
PHYT41A	ELECTRICITY, MAGNETISM AND ELECTRONICS	4	3	25	75	3 Hrs.
PHYP41A	ELECTRICITY, MAGNETISM AND ELECTRONICS	2	2	10	40	3 Hrs.
PHYT01	MODERN PHYSICS	4	3	25	75	3 Hrs.
PHYP01	MODERN PHYSICS	2	2	10	40	3 Hrs.

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TITLE OF THE PAPER: Wave Optics

Semester : II

Course Code	**PHYT21C**	**Course Delivery Method**	**Class Room / Blended Mode - Both**
Credits	**3**	**CIA Marks**	**30**
No. of Lecture Hours / Week	**4**	**Semester End Exam Marks**	**70**
Total Number of Lecture Hours	**60**	**Total Marks**	**100**
Year of Introduction: 2020-21	**Year of Offering: 2021 -22**	**Year of Revision: 2021-22**	**Percentage of Deviation : 20%**
CLASS:	**I MPCs**		

. Course Objectives :

- To help students to understand the nature of light, its propagation and interaction with matter which is essential to constantly emerging newest technologies.
- To create interest among the students about the modern communication systems by studying wave optics.
- Students will be able to understand applications of interference, diffraction, lasers in real life situations .

Course outcomes :

At the end of this course, students should be able to:

- Understand the phenomenon of interference of light and its formation in (i) Lloyd's single, Newton's rings and Michelson interferometer.
- Distinguish between Fresnel's diffraction and Fraunhofer diffraction and observe the diffraction patterns in the case of a single slit and the diffraction grating.
- Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of opticalactivity.
- Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields.

Syllabus
WAVE OPTICS

Course Details

Unit	Learning Units	Lecture Hours
I	**Interference of light: (Problem)** **A) Division of Wavefront:** Introduction, Conditions for the interference of light, Interference of light by division of wavefront and amplitude, Phase change on reflection- Stokes' treatment, Fresnel's Bi-Prism-Determination of Wavelength of Light. **B) Division of Amplitude**: Cosine law - colours in thin films, Newton's rings in reflected light-Theory and experiment - Determination of wavelength of monochromatic light, Michelson interferometer and determination of wavelength.	12
II	**Diffraction of light(Problem)** **A) Fraunhofer Class**: Distinction between Fresnel and Fraunhofer diffraction,Fraunhofer diffraction at a single slit, Double slit and N-slits (No Derivation for N-Slits), Determination of wavelength of light using a diffraction grating, Resolving power of grating, **B) Fresnel's Class: Fresnel's half-period zones, Zone plate, comparison of zone plate with a convexlens**	12
III	**Polarisation of light(Problem)** **A) Polarized light: Methods of production of plane-polarized light - Polarisation by reflection (Brewster's law), Malus law,Double refraction, Nicol prism, Nicol prism as polarizer and analyzer,** Quarter wave plate, Half wave plate **B) Types and production of polarized Light:** **Plane, Circularly and Elliptically polarized light-Production and detection, Optical activity, Laurent's half shade polarimeter: determination of the specific rotation**	12
IV	**A) Aberrations**: **(Problem)** Monochromatic aberrations - Spherical aberration, Methods of minimizing spherical aberration, Coma& Astigmatism -minimization methods, Chromatic aberration-the achromatic doublet; Achromatism for two lenses (i) in contact and (ii) separated by a distance. **B) FibreOptics:(No Problem)** Fibre optics: Introduction to Fibers, different types of fibers, rays and modes in an optical fiber, Principles of fiber communication (qualitative treatment only), Advantages of fiber optic communication.	12
V	**Lasers and Holography (No Problem)** **A) Lasers**: Introduction, Spontaneous emission, stimulated emission, Population Inversion, Laser principle, Einstein coefficients, Types of lasers-He-Ne laser, Ruby laser, Applications of lasers **B) Holography**: Basic principle of holography, Applications of holography	12

REFERENCE BOOKS:

- 1) BSc Physics, Vol.2, Telugu Akademy, Hyderabad
- 2) A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand&Co.
- 3) Optics-Murugeshan, S.Chand&Co.
- 4) Unified Physics Vol.II Optics, Jai PrakashNath&Co.Ltd.,Meerut
- 5) Optics,F.A. Jenkins and H.G.White,McGraw-Hill
- 6) Optics,AjoyGhatak,TataMcGraw-Hill.
- 7)Introduction of Lasers – Avadhanulu, S.Chand&Co.
- 8) Principles of Optics- BK Mathur, Gopala Printing Press,1995

STUDENT ACTIVITY

1. Seminars
2. Assignments.

LIBRARY ACTIVITY

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

RECOMMENDED CO-CURRICULAR ACTIVITIES:

MEASURABLE

- Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual andchallenging)
- Student seminars (on topics of the syllabus and related aspects (individualactivity)
- Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups asteams)
- Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

GENERAL

- Group Discussion
- Visit to Research Stations/laboratories and related industries

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adopted;

- The oral and written examinations (Scheduled and surprisetests),
- Practical assignments and laboratory reports,
- Efficient delivery using seminarpresentations , Viva voce interviews.

(AUTONOMOUS) , VUYYURU – 521 165

New Question Paper Pattern

Semester End Examination-2022-23

With effect from 2022-23 and onwards

Max. Marks : 70 **Max. Time : 3 Hrs**

Answer all Questions.

SECTION A (20MARKS)

1.	(a)	4M	L1
		OR	
	(b)	4M	L1
2.	(a)	4M	L1
		OR	
	(b)	4M	L1
3.	(a)	4M	L2
		OR	
	(b)	4M	L2
4.	(a)	4M	L2
		OR	
	(b)	4M	L2
5.	(a)	4M	L3
		OR	
	(b)	4M	L3

SECTION B (50MARKS)

Answer all Questions.

6.	(a)	10M	L1
		OR	
	(b)	10M	L1
7.	(a)	10M	L1
		OR	
	(b)	10M	L1
8.	(a)	10M	L2
		OR	
	(b)	10M	L2
9.	(a)	10M	L2
		OR	
	(b)	10M	L2
10.	(a)	10M	L3
		OR	
	(b)	10M	L3

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Practical Course II : Wave Optics

Workload : 30 hrs **CREDITS -2** **2 hrs/week**

Course outcomes (Practicals) :

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

1. Gain hands-on experience of using various optical instruments like spectrometer, polarimeterand making finer measurements of wavelength of light using Newton Rings experiment, diffraction grating etc.
2. Understand the principle of working of polarimeter and the measurement of specific rotatory power of sugar solution .
3. Know the techniques involved in measuring the resolving power of telescope and dispersive power of the material of the prism.
4. Be familiar with the determination of refractive index of liquid by Boy's methodand the determination of thickness of a thin wire by wedge method.

Minimum of 6 experiments to be done and recorded

1. Determination of radius of curvature of a given convex lens-Newton'srings.
2. Resolving power of grating.
3. Study of optical rotation– polarimeter.
4. Dispersive power of a prism.
5. Determination of wavelength of light using diffraction grating-minimum deviation method.
6. Determination of wavelength of light using diffraction grating-normal incidence method.
7. Resolving power of a telescope.
8. Refractive index of a liquid-hallowprism
9. Determination of thickness of a thin wire by wedge method
10. Determination of refractive index of liquid-Boy's method.

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TITLE OF THE PAPER**: ELECTRICITY, MAGNETISM AND ELECTRONICS**
Semester: IV

Course Code	**PHYT41A**	**Course Delivery Method**	**Class Room / Blended Mode - Both**
Credits	**3**	**CIA Marks**	**25**
No. of Lecture Hours / Week	**4**	**Semester End Exam Marks**	**75**
Total Number of Lecture Hours	**60**	**Total Marks**	**100**
Year of Introduction: 2021-22	**Year of Offering: 2021-22**	**Year of Revision: ------**	**Percentage of deviation: ------**
CLASS:	**II . B.Sc. (MPC&MPCs)**	**2021-22**	

Course Objective :

1. Understand the magnetic effects of electric current.
2. Study the unification of electric and magnetic phenomena.
3. To gain knowledge about Maxwell's equations and EM waves

4. develop competence in using laboratory instruments to carry out experiments to study different electromagnetic phenomena, that will enhance student's class room learning .

Course outcomes :-

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

CO1 Remember and recollect of basic electrodynamic definitions and apply in daily life.

CO2 Understanding of electrodynamics and relativity.

CO3 Ability to define and derive expressions for the energy both for the electrostatic and magnetostatic fields and derive Poynting's theorem from Maxwell's equations and physical interpret.

CO4 Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.

Syllabus
ELECTRICITY, MAGNETISM AND ELECTRONICS
Course Details

Unit	Learning Units	Lecture Hours
I	**A) Electrostatics: (6hrs)** Gauss's law-Statement and its proof, Electric field intensity due to (i) uniformly charged solid sphere and (ii) an infinite conducting sheet of charge, Deduction of Coulomb's law from Gauss law, Electrical potential–Equipotential surfaces, Potential due to a (i)point charge (ii)uniformly charged sphere **B) Dielectrics: (6 hrs)** Polar and Non-polar dielectrics- Electric displacement D, electric polarization P,Relation between D, E and P, Dielectric constant and electric susceptibility.	12
II	**A) Magnetostatics: (6 hrs)** Biot-Savart's law and its applications: (i) calculation of B due to long straight wire and (ii) solenoid, Ampere's Circuital Law and its application to Solenoid,Hall effect, determination of Hall coefficient and applications. **B) Electromagnetic Induction: (6 hrs)** Faraday's laws of electromagnetic induction, Lenz's law, Self-induction and Mutual induction, Self-inductance of a long solenoid, Mutual inductance of two coils, Energy stored in a magnetic field, Eddy currents and Electromagnetic damping	12
III	**A) Alternating currents: (6 hrs)** Alternating current - Relation between current and voltage in LR and CR circuits,Phasor and Vector diagrams, LCR series and parallel resonant circuit, Q –factor, Power in ac circuits, Power factor. **B) Electromagnetic waves-Maxwell's equations: (6 hrs)** Idea of displacement current,Maxwell's Equations-Derivation, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves, Poynting theorem (Statement and proof)	12
IV	**Basic Electronic devices:** **A) Diodes**: PN junction diode, Zener diode andLight Emitting Diode (LED) and their I-V characteristics, Zener diode as a regulator **B) Transistors**: Transistors and its operation, CB, CE and CC configurations, Input and output characteristicsofa transistor in CE mode, Relation between alpha, beta and gamma; Hybrid parameters, Determination of hybrid parameters from transistor characteristics; Transistor as an amplifier	12
V	**Digital Electronics:** Number systems, Conversion of binary to decimal system and vice versa, Binary addition & Binary subtraction (1's and 2's complement methods), Laws of Boolean algebra, Basic logic gates, DeMorgan's laws-Statements and Proofs, NAND and NOR as universal gates, Exclusive-OR gate, Half adder and Full adder circuits.	12

TEXT BOOKS

1. BSc Physics, Vol.3, Telugu Akademy, Hyderabad.
2. Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.

REFERENCE BOOKS

1. Electricity, Magnetism with Electronics, K. K. Tewari, R. Chand& Co.,
2. Principles of Electronics, V.K. Mehta, S. Chand& Co.,
3. Digital Principles and Applications, A. P. Malvino and D. P. Leach, Mc Graw Hill Edition.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

MEASURABLE

- Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
- Student seminars (on topics of the syllabus and related aspects (individual activity))
- Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams)
- Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity)
- Study projects (by very small groups of students on selected local real-time problems pertaining to the syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

GENERAL

- Group Discussion
- Visit Research Stations/laboratories and related industries
- Others

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adoptee

- The oral and written examinations (Scheduled and surprise tests),
- Practical assignments and laboratory reports,
- Observation of practical skills,
- Efficient delivery using seminar presentations,
- Viva voce interviews.

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MODEL QUESTION PAPER

Title of the Paper: ELECTRICITY, MAGNETISM & ELECTRONICS

Section-A

Answer the following: (5X10=50M)

1 a) State Gauss law in electrostatics. Obtain an expression for potential due to point charge. (CO1, L1)

OR

b) Define D, E and P. Derive the relation between them. Hence deduce the relation between dielectric constant and susceptibility (CO3, L1)

2. a) Explain Biot-Savert Law. Derive an expression for the magnetic induction for infinite long straight wire. (CO2, L2)

OR

b) State Faraday's and Lenz's Law. Derive an expression for a long solenoid.(CO2, L2)

3 a) Derive an expression for the current flowing in an LCR series circuit. Explain resonance condition (CO3, L3)

OR

b) Write Maxwell's equations in differential form. Derive the equation of electromagnetic wave and hence evaluate the velocity of light in free space. (CO1, L3)

4 a) Explain the working and V-I characteristic of PN junction diode. (CO4, L2)

OR

b) Explain the working of PNP and NPN transistors. (CO3, L2)

5 a) State and prove De Morgan laws. (CO4, L2)

OR

b) Discuss the construction and working of Half Adder and Full Adder and give their truth tables. (CO3, L2)

SECTION- B

Answer any THREE of the following (3X5=15M)

6. Define electric potential. Write a note on equi potential surfaces. (CO1, L1)
7. What is Halll effect? Write its applications.(CO2, L1)
8. Explain about Q-factor (CO2, L2)
9. Derive the relation between α and β (CO3, L2)
10. Explain how NAND gate can act as universal gate. (CO4, L1)

SECTION - C

Answer any TWO of the following. (2X5=10M)

11. Find the resonant frequency of LCR series with L = 2mH, C=0.8μf and R = 100KΩ (CO4, L3)
12. In a transistor base current and emitter current are 0.09mA and 9.09mA respectively. Calculate current gains α and β (CO4, L3)
12. Find the binary equivalent of 625. (CO4, L3)
13. Add binary numbers 110, 111 and 101 (CO4, L3)

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Title of the Paper: ELECTRICITY, MAGNETISM & ELECTRONICS

(PRACTICALS)

Offered to: B.Sc. (MPC&MPCs)

Course Type: Core (L) PHYP**41A**

Year of Introduction: 2021-22 **Year of Revision: NIL** **Percentage of Revision: 100**

Semester: IV **Credits: 02**

Hours Taught: 30 hrs. per Semester **Max.Time**: 2 Hours

After successful completion of the course, the student will be able to:

CO1	Learn how a sonometer can be used to determine the frequency of AC-supply.
CO2	Observe the variation of magnetic field along the axis of a circular coil carrying current using Stewart and Gee's apparatus.
CO3	Understand the operation of PN junction diode, Zener diode and a transistor and their V-I characteristics.
CO4	Construct the basic logic gates, half adder and full adder and verify their truth tables. Further, the student will understand how NAND and NOR gates can be used as universal building blocks.
CO5	Observe the resonance condition in LCR series and parallel circuit

Minimum of 6 experiments to be done and recorded

1. LCR circuit series -resonance, Q factor.
2. LCR parallel circuit - 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-Stewart & Gee's apparatus.
6. PN Junction Diode V-I Characteristics
7. Zener Diode –V-I Characteristics
8. Logic Gates- OR, AND, NOT and NAND gates. Verification of Truth Tables.

9. Verification of De Morgan's Theorems.
10. Construction of Half adder and Full adder-Verification of truth tables
11. Zener Diode as a voltage regulator
12. Transistor CE Characteristics- Determination of hybrid parameters
13. Figure of merit of a moving coil galvanometer.

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TITLE OF THE PAPER : MODERN PHYSICS

Semester: IV

Course Code	PHYT01	**Course Delivery Method**	**Class Room / Blended Mode - Both**
Credits	**3**	**CIA Marks**	**25**
No. of Lecture Hours / Week	**4**	**Semester End Exam Marks**	**75**
Total Number of Lecture Hours	**60**	**Total Marks**	**100**
Year of Introduction: 2020-21	**Year of Offering:**	**Year of Revision : 2022-23**	**Percentage of Deviation : 10 %**
CLASS:	**II. B.Sc. (MPC&MPCs)**	**2021-22**	

Course Description:

Students would know about the basic principles in the development of modern physics. The topics covered in the course build a basic foundation of undergraduate physics students to study the advance branches: quantum physics, nuclear physics and particle physics. The course contains the study of atomic models, spectroscopy, matter waves, Schrodinger wave equations, brief idea of nuclear physics, and superconductivity. The students have the opportunity to use the basic principles of condensed matter physics in frontier areas of research and development in the field of material science, nanoscience and nanotechnology.

Course Objectives:

1. To learn the concepts in Atomic Physics.
2. Review the experiments that led development of quantum theory
3. Understand the underlying foundations and basic principles of quantum mechanics
4. impart knowledge of the nuclear processes that yield nuclear energy
5. Acquire the knowledge of Nano materials

Course outcomes:

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

CO1	Remember the different atomic models and basic knowledge of spectroscopy
CO2	Understand the theory and application of microwave, infrared and Raman spectroscopy
CO3	Apply non- relativistic Schrödinger wave mechanics to a variety of potentials in one and three dimensions.
CO4	Analyse the prerequisite in a molecule towards its Rotational and vibrational activity
CO5	Examine the basic properties of nuclei, characteristics of Nuclear forces, salient features of particle physics.

Syllabus

MODERN PHYSICS

Course Details

Unit	Learning Units	Lecture Hours
I	1. **Atomic Physics**: (07 hrs) Vector atom model and Stern-Gerlach experiment, Quantum numbers associated with it, Angular momentum of the atom, Coupling schemes, Selection rules, Intensity rules, Spectral terms and spectral notations. 2. **Molecular Physics** (05 hrs) Raman effect, Characteristics of Raman effect, Experimental study of Raman effect, Quantum theory of Raman effect, Applications of Raman effect.	12
II	3. **Matter waves & de-Broglie's hypothesis** (06 hrs) **Failures of Classical Mechanics**, Matter waves – de-Broglie's hypothesis, Derivation for de-Broglie wave length of matter waves, Properties of matter waves, Davisson and Germer's experiment, Phase and group velocities (**Qualitative**), 4. **Uncertainty Principle and Quantization** (06 hrs) Heisenberg's uncertainty principle for position and momentum (x and p), & energy and time (E and t), Illustration of uncertainty principle using diffraction of beam of electrons (Diffraction by a single slit) and photons (Gamma ray microscope), Bohr's principle of complementarily.	12
III	**5. Quantum (Wave) Mechanics**:(12 hrs) Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equations - Derivations, Physical interpretation of wave function, Eigen functions, Eigen values, Application of Schrodinger wave equation to one dimensional potential box of infinite height (Infinite Potential Well)	12
IV	. 6. **Structure of Nuclei and Nuclear Models**: (06 hrs) Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; Nuclear forces, Characteristics of nuclear forces, Nuclear Models: Liquid drop model, Shell model, Magic numbers. 7. **Elementary Particle Physics** (06 hrs) Elementary Particles and their classification, Fundamental Interactions – gravitational, electromagnetic, strong & week; Properties of Leptons, Mesons and Baryons	12
V	8. **Crystal Structure** Amorphous and crystalline materials, unit cell, Miller indices, reciprocal lattice, types of lattices, diffraction of X-rays by crystals, Bragg's law, Laue's method and powder diffraction method 9. **Superconductivity**: (05 hrs)	12

	Introduction – **Properties of superconductors**- critical temperature (T_c), critical magnetic field (T_m), Meissner effect, Type I and Type II superconductors, BCS theory (Qualitative),Applications of superconductors.	

TEXT BOOKS

1. BSc Physics, Vol.4, Telugu Akademy, Hyderabad
2. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.
3. Nano materials, A K Bandopadhyay, New Age International Pvt Ltd (2007)

REFERENCE BOOKS:

1. Atomic Physics by J.B. Rajam; S. Chand& Co.,
2. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
3. Nuclear Physics, D.C. Tayal, Himalaya Publishing House.
4. S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publ.Co.)
5. K. K. Chattopadhyay & A.N. Banerjee, Introd.to Nanoscience and Technology (PHI Learning Priv. Limited).
6. Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj, BB Rath and J Murday-Universities Press-IIM

LIBRARY ACTIVITY

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

Course Delivery method: Face-to-face / Blended

Course has focus on: Foundation & Employability

Course has focus on: Employability

Websites of Interest:

Co-curricular Activities:

1. Assignments
2. Student seminars
3. Quiz

Model Question Paper

Title of the Paper: Modern physics

Section-A

Answer the following: (5X10=50M)

1 a) Explain briefly the salient features of vector atom model. Explain the quantum numbers Associated with vector atom model (CO1, L1)

OR

b) What is Raman effect? Describe the experimental arrangement to study Raman effect in liquids. Write any two applications of Raman effect.(CO1, L1)

2. a) What are matter waves? Describe the Davisson and Germer experiment on electron diffraction (CO2, L2)

OR

b) State and explain Heisenberg's uncertainty principal. Describe an experiment for verification
of uncertainty principle.(CO2, L2)

3 a) Derive Schrodinger time dependent wave equation.(CO3, L1)

OR

b) Derive an expression for energy offree particle in one dimensional box of infinite height.(CO3, L2)

4. a) Write Liquid drop model (CO4, L2)

OR

b) Write a detailed note on elementary particles (CO4, L2)

5. a) Derive Bragg's X ray diffraction condition. (CO5, L1)

OR

b) What is super conductivity? Give a qualitative description ofthe BCS theory. Write any three applications of super conductors(CO5, L1)

Section-B

Answer any **THREE** of the following: (3X5=15M)

6. Explain the coupling schemes (CO1, L1)
7. Write the properties ofmatter waves.(CO2, L1)
8. State the basic postulates of Quantum mechanics.(CO3, L1)
9. Write any three properties of nucleus (CO5, L2)
10. Explain Meissner effect.(CO5, L1)

Section-C

Answer any **TWO** of the following: (2X5=10M)

11. If the uncertainty in position of an electron is $4x10^{-10}$m. Calculate the uncertainty in its momentum.
(CO1, L3)

12. Find the kinetic energy of an electron whose de-Broglie wavelength is 0.3A°. (Mass of electron = 9.1 X 10^{-31} kg, Planck's constant h = 6.6 X 10^{-34} J-s) (CO2, L3)
13. Find the least energy of an electron moving in the dimension in an infinitely high potential box of width 1 A° (given mass of electron = 9.1 X 10^{-31}kg, Planck's constant h = 6.6 X 10^{-34} J-s)(CO3, L3)
14. Compute the approximate nuclear radius of Al^{27}. (Given r_0 = 1.2 fermi) (CO4, L3)

A. G & S.G. SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE VUYYURU-521165.

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Title of the Paper: MODERN PHYSICS

(PRACTICALS)

Offered to: B.Sc. (MPC&MPCs)
Course Type: Core (L) PHYP**01**
Year of Introduction: 2020-21 **Year of Revision: NIL** **Percentage of Revision: NIL**
Semester: III **Credits: 02**
Hours Taught: 30 hrs. per Semester **Max.Time**: 2 Hours

Course Description

In this course students would be able to understand Basic experiments of modern physics such as: Determination of Plank's and Boltzmann's constants, Determination of Range of β-particles, energy gap of semiconductor, Photo electric effect and determination of e/m

Objectives:

The primary objective of this course is to provide the fundamental knowledge and able to write down the band theory of Solids

Describe the characteristics of semiconductors on the basis of band theory of solids

Relate Cosmic activity and the environmental effect on the earth‟s surface

COURSE OUTCOMES

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

CO1 Measure the charge of an electron ande/m value of an electron by Thomson method.

CO2 Understand how the Planck's constant can be determined using Photocell and LEDs.

CO3 Study the absorption of α-rays and β-rays, Range of β-particles and the characteristics of GM counter

CO4 knowledge of Energy gap of a semiconductor using thermistor and junction diode.

List of experiments

1. Determination of M & H.
2. Energy gap of a semiconductor using junction diode.
3. Energy gap of a semiconductor using thermistor
4. Verification of inverse square law of light using photovoltaic cell.
5. Determination of the Planck's constant using LEDs of at least 3 different colours.
6. e/m of an electron by Thomson method.
7. Determination of Planck's Constant (photocell).
8. Analysis of powder X-ray diffraction pattern to determine properties of crystals.
9. GM counter characteristics
10. Determination of work function of material of filament of directly heated vacuum diode.
11. Study of absorption of α-rays.
12. Study of absorption of β-rays.
13. Determination of Range of β-particles.

Note :

1. 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