ADUSUMILLI GOPALAKRISHNAIAH & SUGAR CANE GROWERS
SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE, VUYYURU
An Autonomous College in the Jurisdiction of Krishna University, Machilipatnam
NAAC reaccredited at 'A 'level

DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING

2024-2025

I, III & V SEMESTERS

Dt : 13-09-2024

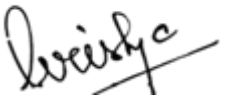
ADUSUMILLI GOPALAKRISHNAIAH & SUGAR CANE GROWERS SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE, VUYYURU-521165, KRISHNA Dt., A.P. (AUTONOMOUS).

DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING :- 13th September 2024

The Board of studies meeting of Department of **PHYSICS** was convened at 11:30 AM on 13/09/2024 in on-line mode under the chairmanship of Sri J. Hareesh Chandra, Head of the Department .The members present have discussed various aspects such as changes to be made in the syllabi, scheme of Evaluation and Blue print both for theory and practical papers for I, III & V semesters for the academic year 2024-2025.

The following members were present.

S.No	Name	Designation	signature
1.	**Sri J. Hareesh Chandra** Head, Department of Physics A.G&S.G.S Degree College Vuyyuru .	**Chairman**	
2	**Prof. M. Rami Reddy** Department of Physics ACHARYA NAGARJUNA UNIVERSITY	**University Nominee**	
3.	**Dr. P.Venkata Ramana** H.O.D, Dept. of Physics Sri DNR Govt Degree college for women, Palakol,West Godavari .	**Subject Expert**	
4.	**Dr. T. Srinivasa Krishna,** Associate Professor , Head, Department of Physics, P.B. Siddhartha College, Vijayawada	**Subject Expert**	
5.	**Sri I. Chitti Babu** Representative from Industry, Sub Divisional Engineer, BSNL,Vijayawada .	Industrialist	
6.	**Sri B. Dileep Kumar** Lecturer in Physics, IIIT, NUZIVID.	Alumini	
7.	**Sri M. Sateesh** Lecturer in Physics , A.G & S.G.S Degree College, Vuyyuru	Member	

Agenda of B.O.S Meeting

1. To review and recommend the syllabi (Theory & Practical) for First Semester of B.Sc. Honours in Physics Major for the academic year 2024 -2025.
2. To Frame and Recommend the syllabi (Theory & Practical) for Third Semester of II B.Sc. Honours in Physics Major for the academic year 2024 - 2025.
3. To Review and recommend the syllabi (Theory & Practical) for V Semester of III B.Sc Physics for the academic year 2024 - 2025.
4. To review and recommend the Model question paper, Blue Print and Guidelines for Question paper setters for I, III semesters of B.Sc. Honours in Physics Major & V Semesters of III B.Sc. Physics for the academic year 2024 - 2025.
5. To introduce Value Added Course (Non-Credits) on " Nano technology " for III Semester of II B.Sc. Honours Physics for the academic year 2024 – 2025.
6. To recommend the teaching and evaluation methods to be followed under Autonomous status.
7. Any other matter.

Chairman
(J. Hareesh Chandra)

RESOLUTIONS

The following Resolutions are made in Board of studies in Physics for UG Programs of Odd - semester to recommend to the Academic Council for its approval .

1. It is resolved to implement the same syllabi of 2023-24 (Theory & Practical) for First Semester of B.Sc. Honours Physics Major for the academic year 2024-2025 also without any changes as recommended by BOS members.
2. It is resolved to implement the newly framed syllabus based on APSCHE syllabus (Theory & Practical), for III Semester of II B.Sc. Honours Physics Major for the academic year 2024-2025.
3. It is resolved to continue the same syllabus (Theory & Practical), for V Semester of III B.Sc. MPCs for the academic year 2024- 2025.
4. It is resolved and recommended to follow Question paper pattern with MCQ model under the guidelines of APSCHE for Core papers of Physics Major in First Semester in the academic year 2024-2025.
5. It is resolved to continue the same Model question paper, Blue Print and Guidelines for Question paper setters for V Semester of III B.Sc. Physics for the academic year 2024-2025.
6. It is resolved to introduce Value Added Course (Non-Credits) on " Nano technology" for III Semester of II B.Sc. Honours Physics for the academic year 2024 - 2025.
7. It is resolved to implement the following Teaching and Evaluation methods to be followed under Autonomous status.

Evaluation procedure :

Internal Assessment Examination:

- Out of maximum 100 marks in each paper for I B.Sc. Physics Major of B.Sc. Honours,30 marks are allocated for internal assessment.
- Out of these 30 marks, 20 marks are allocated for Announced tests (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/activity.
- Out of maximum 100 marks in each paper for III Semester of II B. Sc Physics Major, 30 marks shall be allocated for internal assessment.
- Out of these 30 marks, 20 marks are allocated for announced tests (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 for assignment and remaining 5 marks for attendance. There is no pass minimum for internal assessment for III Semester.

- Out of maximum 100 marks in each paper for V Semester of III B.Sc.Physics, 30 marks shall be allocated for internal assessment.
- Out of these 30 marks, 20 marks are allocated for announced tests (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 allocated for assignment/seminar and reaming 5 marks for attendance. There is no pass minimum for internal assessment for V Semester.

Semester – End Examination:

- The maximum mark for I semester – End examination shall be 70 marks and duration of the examination shall be 3 hours.
- 70 marks are allocated for I Semester of First B.Sc. Physics Major of B.Sc.Honours in Semester End Examination. 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"
- 70 marks are allocated for III Semester of second B.Sc. Physics in Semester End Examination. 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"
- 70 marks are allocated for V Semester of III B.Sc. MPCs in Semester End Examination. Even though the candidate is absent for two IA exams / obtain zero marks, the external marks are considered (if the candidate gets 40/75) and the result shall be declared as "PASS".

Chairman

(J. Hareesh Chandra)

Course Structure

SEMESTER – I

Course Code	Title of the Course	Instruction Hours per week	No.of Credits	Evaluation		
				CIA MARKS	SEE	
					SEE MARKS	Core/LSC/ SDC/MDC Elective/ Cluster
23SCIT11	Essentials and Applications of Mathematical, Physical and Chemical Sciences	5	4	30	70	CORE
23SCIT12	Advances in Mathematical, Physical and Chemical Sciences	5	4	30	70	CORE

SEMESTER – III

Course Code	Title of the Course	Instruction Hours per week	Credits	Evaluation		
				CIA MARKS	SEE	
					MARKS	Core/LSC/SDC/ MDC/Elective/Cluster
23PHMAL231	WAVE OPTICS	3	3	30	70	CORE
23PHMAP231	WAVE OPTICS **LAB**	2	1	15	35	LAB
23PHMAL232	HEAT And THERMODYNAMICS	3	3	30	70	CORE
23PHMAP232	HEAT And THERMODYNAMICS **LAB**	2	1	15	35	LAB
23PHMAL233	ELECTRONIC DEVICES And CIRCUITS	3	3	30	70	CORE
23PHMAP233	ELECTRONIC DEVICES And CIRCUITS **LAB**	2	1	15	35	LAB
23PHMAP234	ANALOG AND DIGITAL ELECTRONICS	3	3	30	70	CORE
23PHMAP234	ANALOG AND DIGITAL ELECTRONICS **LAB**	2	1	15	35	LAB
23PHMIL231	WAVE OPTICS **(MINOR)**	3	3	30	70	CORE
23PHMIP231	WAVE OPTICS **LAB (MINOR)**	2	1	15	35	LAB
PHYVAC05	Nano technology	Value added course For III Semester of II B.Sc. Honours Physics(Non-Credits)				

SEMESTER - V

Course Code	Title of the Course	Instruction Hours per week	Credits	Evaluation		
				CIA MARKS	SEE	
					MARKS	Core/LSC/ SDC/MDC Elective/ Cluster
PHYSET01	Applications of Electricity and Electronics	3	3	30	70	CORE
PHYSEP01	Applications of Electricity and Electronics - **Lab**	3	2	10	40	LAB
PHYSET02	Electronic Instrumentation	3	3	30	70	CORE
PHYSEP02	Electronic Instrumentation - **Lab**	3	2	10	40	LAB

A.G & S.G. SIDDHARTHA DEGREE COLLEGE OFARTS & SCIENCE, Vuyyuru-521165

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

Title of the Paper: Essentials and Applications of Mathematical, Physicaland Chemical Sciences

Semester: I

Course Code	**23SCIT11**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	4	CIA Marks	30
No. of Lecture Hours / Week	5	Semester End Exam Marks	70
Total Number of Lecture Hours	75	Total Marks	100
Year of Introduction : 2023 - 24	Year of Offering: 2024 - 25	Year of Revision :-----	Percentage of Revision: 0 %

Course Objective:

The objective of this course is to provide students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences. The course aims to develop students' critical thinking, problem-solving, and analytical skills in these areas, enabling them to apply scientific principles to real-world situations.

Learning outcomes:

1. Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.
2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations
3. To explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to connect their knowledge of chemistry to daily life.
4. Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.
5. To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and counter measures.

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
Essentials and Applications of Mathematical, Physical and Chemical Sciences		
I	**Essentials of Mathematics** Complex Numbers: Introduction of the new symbol i – General form of a complex number – Modulus- Amplitude form and conversions Trigonometric Ratios: Trigonometric Ratios and their relations – Problems on calculation of angles Vectors: Definition of vector addition – Cartesian form – Scalar and vector product and problems Statistical Measures: Mean, Median, Mode of a data and problems.	9 H
II	**Essentials of Physics :** **Definition and Scope of Physics- Measurements and Units - Motion of objects- Newton's laws of motion - Laws of Thermodynamics and Significance- Acoustic waves, Electromagnetic Spectrum- Electric and Magnetic fields- coloumb's law, Behaviour of atomic and nuclear particles- Electrons, protons, Neutrons,Wave-particle duality, uncertainty principle -Theories and understanding of universe-Big bang theory** .	9 H
III	**Essentials of Chemistry** Definition and Scope of Chemistry- Importance of Chemistry in daily life - Branches of chemistry and significance- Periodic Table- Electronic Configuration, chemical changes, classification of matter, Biomolecules- carbohydrates, proteins, fats and vitamins.	9 H
IV	**Applications of Mathematics, Physics & Chemistry** Applications of Mathematics in Physics & Chemistry: Calculus , Differential Equations & Complex Analysis Application of Physics in Industry and Technology : Physics for Electronics and Semiconductor Industry, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring and Sustainable Technologies. Application of Chemistry in Industry and Technology: Chemical Manufacturing, Pharmaceuticals and Drug Discovery, Materials Science, Food and Beverage Industry.	9 H

V	**Essentials of Computer Science**: Milestones of computer evolution - Internet, history, Internet Service Providers, Types ofNetworks, IP, Domain Name Services, applications. Ethical and social implications: Network and security concepts- Information Assurance Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques- Privacy and Data Protection.	9 H

Reference Books

1. Functions of one complex variable by John.B.Conway, Springer- Verlag.
2. Elementary Trigonometry by H.S.Hall and S.R.Knight
3. Vector Algebra by A.R.Vasishtha, Krishna Prakashan Media(P)Ltd.
4. 4.Basic Statistics byB.L.Agarwal, New age international Publishers
5. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
6. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
7. Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway andJohn W. Jewett Jr.
8. Physics for Technology and Engineering" by John Bird
9. Chemistry in daily life by Kirpal Singh
10. Chemistry of bio molecules by S. P. Bhutan
11. Fundamentals of Computers by V. Raja Raman
12. Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson

STUDENT ACTIVITIES

Unit II : Essentials of Physics

1. Concept Mapping

- Divide students into groups and assign each group one of the topics.
- Students will create a concept map illustrating the key concepts, relationships, and applications related to their assigned topic.
- Encourage students to use visual elements, arrows, and labels to represent connections and interdependencies between concepts.

2. Laboratory Experiment

- Select a laboratory experiment related to one of the topics, such as motion of objects or electric and magnetic fields.
- Provide the necessary materials, instructions, and safety guidelines for conducting the experiment.
- Students will work in small groups to carry out the experiment, collect data, and analyze the results.
- After the experiment, students will write a lab report summarizing their findings, observations, and conclusions.

Unit IV : Applications of Mathematics, Physics & Chemistry

1: Interdisciplinary Case Studies

- Divide students into small groups and provide them with interdisciplinary case studies that involve the interdisciplinary application of mathematics, physics, and chemistry.
- Each case study should present a real-world problem or scenario that requires the integration of concepts from all three disciplines.

2: Design and Innovation Project

- Challenge students to design and develop a practical solution or innovation that integrates mathematics, physics, and chemistry principles.

- Students can choose a specific problem or area of interest, such as renewable energy, environmental conservation, or materials science.

3. Laboratory Experiments

- Assign students laboratory experiments that demonstrate the practical applications of mathematics, physics, and chemistry.
- Examples include investigating the relationship between concentration and reaction rate, analyzing the behavior of electrical circuits, or measuring the properties of materials.

4. Mathematical Modeling

- Present students with real-world problems that require mathematical modeling and analysis.

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

I SEMESTER END EXAMINATIONS

PAPER – I **MODEL PAPER** **Course Code: 23SCIT11**

Title of the paper : Essentials and Applications of Mathematical, Physical and Chemical Sciences

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

I Semester End Examinations will be conducted in objective Mode

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

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

Title of the Paper: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Semester: I

Course Code	23SCIT12	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	4	CIA Marks	30
No. of Lecture Hours / Week	5	Semester End Exam Marks	70
Total Number of Lecture Hours	75	Total Marks	100
Year of Introduction : 2023 - 24	Year of Offering: 2024 - 25	Year of Revision : -----	Percentage of Revision: 0 %

Course Objective:

The objective of this course is to provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences. The course aims to broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Learning outcomes

1. Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems.
2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations.
3. Understand the different sources of renewable energy and their generation processes
4. Understand the principles and techniques used in computer-aided drug design and drug delivery systems
5. Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications.
6. Understand and convert between different number systems, such as binary, octal, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics.

Syllabus

Unit	Learning Units	Lecture Hours
	Advances in Mathematical, Physical and Chemical Sciences	
I	**Advances in Basics Mathematics** Straight Lines: Different forms – Reduction of general equation into various forms –Point of intersection of two straight lines Limits and Differentiation: Standard limits – Derivative of a function –Problems on product rule and quotient rule Integration: Integration as a reverse process of differentiation – Basic methods of integration Matrices: Types of matrices – Scalar multiple of a matrix – Multiplication of matrices –Transpose of a matrix and determinants	9hrs
II	**Advances in Physics** **Renewable energy : Generation - solar energy - photovoltaic cells, Dye sensitized solar cells(DSSC), energy storage - Hydrogen fuel cell, Photo electrical chemical cell and energy efficient materials and devices .** **Recent advances in the field of nanotechnology: Quantum dots, Basic structure of quantum dots, Recent advances in biophysics- recent advances in medical physics.**	9hrs
III	**Advances in Chemistry** Computer aided drug design and delivery, nano sensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal - Catalysis method.	9hrs
IV	**Advanced Applications of Mathematics, Physics & Chemistry** Mathematical Modelling applications in physics and chemistry Application of Renewable energy: Grid Integration and Smart Grids Application of Nanotechnology: Nano medicine Application of biophysics: Biophysical Imaging, Biomechanics-Biomechanics in sports, Biomechanics in prosthetic Rehabilitation, Neurophysics Application of medical physics : Radiation Therapy, Nuclear medicine Solid waste management, Environmental remediation- Green Technology, Water treatment.	9hrs
V	**Advanced Applications of computer Science :** Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check and CRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.	9 hrs

Reference Books

1. Coordinate Geometry by S.L.Lony, Arihant Publications
2. Calculus by Thomas and Finny, Pearson Publications
3. Matrices by A.R.Vasishtha and A.K.Vasishtha, Krishna Prakashan Media(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter

6. "Nanotechnology: Principles and Applications" by Sulabha K. Kulkarni and Raghvendra A. Bohara.
7. "Biophysics: An Introduction" by Rodney Cotterill
8. "Medical Physics: Imaging" by James G. Webster
9. "Shape Memory Alloys: Properties and Applications" by
10. Dimitris C. Lagoudas
11. Nano materials and applications by M.N.Borah
12. Environmental Chemistry by Anil.K.D.E.
13. Digital Logic Design by Morris Mano
14. Data Communication & Networking by Bahrouz Forouzan.

STUDENT ACTIVITIES

UNIT II : ADVANCES IN PHYSICS

1. Case Studies

- Provide students with real-world case studies related to renewable energy, nanotechnology,biophysics, medical physics, or shape memory materials.
- Students will analyze the case studies, identify the challenges or problems presented, andpropose innovative solutions based on the recent advances in the respective field.
- They will consider factors such as energy generation, energy storage, efficiency, sustainability, materials design, biomedical applications, or technological advancements.

2. Experimental Design

- Assign students to design and conduct experiments related to one of the topics: renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials.
- They will identify a specific research question or problem to investigate and design an experiment accordingly.
- Students will collect and analyze data, interpret the results, and draw conclusions based on their findings. They will discuss the implications of their experimental results in the context of recent advancesin the field.

3. Group Discussion and Debate

- Organize a group discussion or debate session where students will discuss the ethical, social, and environmental implications of the recent advances in renewable energy, nanotechnology, biophysics, medical physics, and shape memory materials.

- Assign students specific roles, such as proponent, opponent, or moderator, and provide them with key points and arguments to support their positions.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS AND CHEMISTRY

1: Mathematical Modeling Experiment

- Provide students with a mathematical modelling experiment related to one of the topics. For example, in the context of renewable energy, students can develop a mathematical model to optimize the placement and configuration of solar panels in a solar farm.
- Students will work in teams to design and conduct the experiment, collect data, and analyze the results using mathematical models and statistical techniques.
- They will discuss the accuracy and limitations of their model, propose improvements, and interpret the implications of their findings in the context of renewable energy or the specific application area.

2. Case Studies and Group Discussions

- Assign students to analyze case studies related to the applications of mathematical modelling in nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.
- Students will discuss the mathematical models and computational methods used in the case studies, analyze the outcomes, and evaluate the effectiveness of the modelling approach.
- Encourage group discussions on the challenges, ethical considerations, and potential advancements in the field.
- Students will present their findings and engage in critical discussions on the advantages and limitations of mathematical modelling in solving complex problems in these areas.

3. Group Project

- Assign students to work in groups to develop a group project that integrates mathematical modelling with one of the application areas: renewable energy, nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.
- The project could involve developing a mathematical model to optimize the delivery of radiation therapy in medical physics or designing a mathematical model to optimize waste management practices. Students will plan and execute their project, apply mathematical modelling techniques, analyzethe results, and present their findings and recommendations.
- Encourage creativity, critical thinking, and collaboration throughout the project.

UNIT V: Advanced Applications of computer Science

1. Students must be able to convert numbers from other number system to binary numbersystems
2. Identify the networking media used for your college network
3. Identify all the networking devices used in your college premises.

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

I SEMESTER END EXAMINATIONS

PAPER – II **MODEL PAPER** **Course Code: 23SCIT12**

Title of the paper: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

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

I Semester End Examinations will be conducted in objective Mode

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

NAAC reaccredited at "A" level

Autonomous - ISO 9001 – 2015 Certified

Title of the Paper : WAVE OPTICS

Semester: III **Offered to: II B.Sc. Major(Physics)**

Course Code		23PHMAL231	
Title of the Course		**WAVE OPTICS**	
Offered to: (Programme/s)		**B. Sc H Physics**	
Course Category:	**MAJOR/MINOR**	**Course Relates to:**	**GLOBAL**
Type of the Course:		EMPLOYABILITY	

Credits	**3**	CIA Marks	**30**
No. of Lecture Hours / Week	**3**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**60**	Total Marks	**100**
Year of Introduction : 2024 - 25	Year of Offering: 2024 – 25	Year of Revision: NIL	Percentage of Revision: NIL

Course Description:

This course explores wave optics, covering the principles of interference, diffraction, polarization, and aberrations. Topics include Fresnel's Bi-Prism, Newton's rings, diffraction gratings, and methods to produce and analyze polarized light. It also delves into laser technology and holography, emphasizing practical applications in wavelength determination, optical devices, and advanced imaging techniques.

Course Aims and Objectives:

S. NO	COURSE OBJECTIVES
1	To help students to understand the nature of light, its propagation and interaction with matter which is essential to constantly emerging newest technologies.
2	To create interest among the students about the modern communication systems by studying wave optics
3	Students will be able to understand applications of interference, diffraction, lasers in real life situations.

Course Outcomes

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

CO NO	COURSE OUTCOME
CO1	Understand the phenomenon of interference of light and its formation in (i) Lloyd's single, Newton's rings and Michelson interferometer
CO2	Distinguish between Fresnel's diffraction and Fraunhofer diffraction and observe the diffraction patterns in the case of a single slit and the diffraction grating
CO3	Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.
CO4	Gain knowledge of various types of optical fibers
CO5	Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields

Course Structure :

Unit	Learning Units	Lecture Hours
I	**Interference of light** **A) Division of Wavefront:** Introduction, Conditions for the interference of light, Interference of light by division of wavefront and amplitude, Fresnel's Bi-Prism-Determination of Wavelength of Light, Phase change on reflection- Stokes' treatment. **B) Division of Amplitude**: Cosine law - colours in thin films, Newton's rings in reflected light-Determination of wavelength of monochromatic light, Michelson interferometer and determination of wavelength.	12
II	**Diffraction of light** **A) Fraunhofer Class**: Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit, N-slits (No derivation), 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 convex lens.	12
III	**Polarisation of light** **A) Polarized light**: Methods of production of plane-polarized light - Polarisation by reflection (Brewster's law), Malus law,	12

	Double refraction, Nicol prism, Nicol prism as polarizer and analyzer **B) Types and production of polarized Light**: Quarter wave plate, Half wave plate, Optical activity, Idea of Plane, circular & Elliptical polarized light (Concept only), Laurent's half shade polarimeter : determination of the specific rotation.	
IV	**Aberrations**: **A)** Monochromatic aberrations - Spherical aberration, Methods of minimizing spherical aberration, Coma, Astigmatism, - minimization methods, **B)** Chromatic aberration-the achromatic doublet; Achromatism for two lenses (i) in contact and (ii) separated by adistance.	12
V	**Lasers and Holography** **A) Lasers** Introduction, Spontaneous emission, stimulated emission, Population Inversion, Laser principle, Einstein coefficients, Ruby, He-Ne laser - Applications of lasers. **B) Holography** Basic principle and construction of holography, Applications of holography	12

Text BOOKS:

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

REFERENCE BOOKS:

1. A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand&Co.
2. Optics-Murugesan, S. Chand & Co.
3. Optics, F.A. Jenkins and H.G. White, McGraw-Hill
4. Optics, Ajoy Ghatak, Tata McGraw-Hill.
5. Introduction of Lasers – Avadhanulu, S. Chand &Co.
6. Principles of Optics- BK Mathur, Gopala Printing Press,1995

***

SEMESTER -END QUESTION PAPER STRUCTURE

Course Code & Title of the Course:	**23PHMAL231 (WAVE OPTICS)**
Offered to:	**B.Sc H Physics**
Category:	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions (20 Marks)

Answer All questions. Each question carries 4 Marks.

1 (a) What are the conditions for interference of light? (CO1, L3)

OR

(b) In a Newton's ring experiment, the diameter of the 10th dark ring is 0.433 cm. Find the wavelength of the incident light, if the radius of curvature of the lens is 80 cm. (CO1, L3)

2 (a) Distinguish between Fraunhofer and Fresnel diffraction. (CO2, L3)

OR

(b) A diffraction grating has 15 cm of the surface ruled with 6000 lines per cm, Evaluate the resolving power of grating in the first order. (CO2, L3)

3 (a) State the Brewster and Malus law. (CO3, L3)

OR

(b) A half wave plate is constructed for a wavelength of $6000A^0$. Find the value of the wavelength of light for which this plate works as a quarter wave plate. (CO3, L3)

4 (a) Explain spherical aberrations. (CO4, L3)

OR

(b) Derive the condition for Achromatism for when two lenses are separated by distance. (CO4, L3)

5 (a) Write the applications of LASERS. (CO5, L3)

OR

(b) Write the applications of holography. (CO5, L3)

Section B: Long Answer Questions (50 Marks)

Answer All questions. Each question carries 10 Marks.

6. a) Describe the experimental arrangement for observation Fresnel Bi prism experiment. (CO2, L2)

(OR)

b) Describe Newton's rings method for measuring the wave length of monochromatic light with necessary theory. (CO1, L2)

7. a) What is diffraction? Explain the Fraunhoffer diffraction due to single slit with intensity distribution. (CO2, L3)

(OR)

b) Describe the construction and working of zone plate. Derive the equation for its focal length. (CO2, L3)

8 a) Describe the construction and working of Nicol prism. Explain how it can be used as polarizer and analyser. (CO3, L1)

(OR)

b) What is specific rotation? Describe how specific rotation of sugar solution can be determined experimentally. (CO3, L2)

9 a) Explain about COMA and ASTIGMATISM. (CO4, L1)

(OR)

b) Define chromatic aberration, Derive the condition for Achromatism for when two lenses are in contact. (CO1, L2)

10 a) What is LASER? Explain the construction and working of Ruby laser with neat diagram. (CO5, L2)

(OR)

b) Explain the basic principle and construction of holography. (CO5, L2)

Note:

- Short answer questions assess foundational knowledge (Remembering, Understanding and Apply).
- This structure emphasizes a focus on higher-order thinking skills (Understand, Application, Analysis, and Evaluation) in the long answer section.
- Consider including a mix of question types within each section to ensure a comprehensive assessment.

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

NAAC reaccredited at "A" level

Autonomous - ISO 9001 – 2015 Certified

Title of the Paper : WAVE OPTICS LAB

Semester: III **Credits : 1** **Offered to: II B.Sc. Major(Physics)**

Course Code		**23PHMAP231**	
Title of the Course		**WAVE OPTICS**	
Year of Introduction:	**2024-25**	**Semester:**	**3**
Type of the Course:		**EMPLOYABILITY & SKILL DEVELOPMENT**	
Pre-requisites, if any		**BASIC KNOWLEDGE OF OPTICS**	

Course outcomes (Practical):

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 Ringsexperiment, diffraction gratingetc.
2. Understand the principle of working of polarimeter and the measurement of specific rotatory power of sugarsolution
3. Know the techniques involved in measuring the resolving power of telescope and dispersive power of the material of theprism.
4. Be familiar with the determination of refractive index of liquid by Boy's methodand the determination of thickness of a thin wire by wedgemethod.

Minimum of 7 experiments to be done and recorded

1. Determination of radius of curvature of a given convex lens-Newton's rings.
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-hallow prism
9. Determination of thickness of a thin wire by wedge method
10. Determination of refractive index of liquid-Boy's method.

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

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

Title of the Paper : HEAT AND THERMODYNAMICS

Semester: III **Offered to: II B.Sc. Major(Physics)**

Course Code	23PHMAL232
Title of the Course	**HEAT AND THERMODYNAMICS**
Offered to: (Programme/s)	**B. Sc H Physics**
Type of the Course:	EMPLOYABILITY
Pre-requisites, if any	BASIC KNOWLEDGE

Credits	**3**	CIA Marks	**30**
No. of Lecture Hours / Week	**3**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**60**	Total Marks	**100**
Year of Introduction : 2024 - 25	Year of Offering: 2024 – 25	Year of Revision: NIL	Percentage of Revision: NIL

Course Description:

The course makes the students able to understand the basic physics of heat and temperature and their relation with energy, work, radiation and matter. The students also learn how laws of thermodynamics are used in a heat engine to transform heat into work. The course contains the study of laws of thermodynamics, thermodynamic description of systems, thermodynamic potentials, and kinetic theory of gases.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Understand the kinetic theory of gases and transport phenomena, including viscosity, thermal conductivity, and diffusion.
2	Explore thermodynamic principles, including entropy, thermodynamic potentials, and their applications in various processes.
3	Learn the fundamentals of low-temperature physics and radiation laws, with a focus on blackbody radiation and methods of measuring radiation.

COURSE OUTCOMES

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

CO NO	COURSE OUTCOME
CO1	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 processes.
CO2	Understand the microscopic behaviour of molecules, interactions, and the concepts of transport phenomena of heat transfer, mass transfer, and momentum transfer.
CO3	Use kinetic theory of gases to derive expressions for the pressure of an ideal gas, heat capacities of solids and gases, and transport properties
CO4	Understand very low temperatures like the concept of Joule Thomson effect, Liquefaction of gases, and the properties at very low temperatures.
CO5	Ability to evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations. Examine the nature of black body radiations and the basic theories.

UNIT-I: Kinetic Theory of gases: (12 hrs)

1.1 **Kinetic Theory of gases**-Introduction, Maxwell's law of distribution of molecular velocities, Mean free path, Degrees of freedom, Principle of equipartition of energy (Qualitative ideas only),

1.2 Transport phenomenon in ideal gases: viscosity, Thermal conductivity and diffusion of gases.

UNIT-II: Thermodynamics:

2.1 Introduction to Thermodynamics (12 hrs)

Introduction- Isothermal and Adiabatic processes - Work done in these processes, Heat engines - Reversible and irreversible processes, Carnot's engine and its efficiency, Second law of thermodynamics, Carnot's theorem, Thermodynamic scale of temperature

2.2 Entropy

Entropy and its Physical significance, change in entropy in reversible and irreversible processes; Entropy and disorder-Entropy of Universe; Temperature-Entropy (T-S) diagram and its uses

UNIT-III:

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

3.1 Thermodynamic potentials-Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy and their significance, Derivation of Maxwell's thermodynamic relations from thermodynamic potentials,

3.2 Applications of Maxwell's thermodynamic relations: (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)

4.1 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

4.2 Production of low temperature : Adiabatic demagnetization (Qualitative), Principle of Refrigeration, effects of chloro and fluoro carbons on ozone layer.

UNIT-V:

5.1 Radiation Laws: (7 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.

5.2 Measurement of Radiation (5 hrs)

Pyrometers: Angstrom pyrheliometer and determination Solar constant, Estimation of the surface temperature of Sun.

TEXT BOOKS

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

Model Question Paper

Title of the Paper : HEAT AND THERMODYNAMICS

Section-A

Answer the following Questions: (5X4=20M)

1. (A). Write a note mean free path. (CO1, L1)

   (OR)

   (B). Explain the second law of thermodynamics in terms of entropy. (CO2, L2)

2. (A). Prove $C_p - C_v = R$ (CO3, L3)

   (OR)

   (B). Write the principle of refrigeration. (CO4, L3)

3. (A). How did you find the solar constant? (CO5, L2)

   (OR)

   (B). Find the R.M.S velocity of hydrogen at N.T.P and at C? (CO1, L3)

4. (A). Calculate the efficiency of a reversible engine that operates between the temperatures 200^0 C and 120^0 C? (CO1, L3)

   (B). Calculate the temperature inversion of helium gas. Given a=3.44 $x10^{-3}$ ntm^4/mol^2 and b = 0.023 $x10^{-3}$ m^3 /mol. (CO1, L3)

5. (A). Find the wavelength at which maximum energy is radiated by a black at a temperature of 227^0 C and Wien's constant is $2.877x10^{-3}$ mk. (CO1, L3)

   (OR)

   (B) Calculate the temperature of the sun from the following data S= 1.34 kW/m^2, radius of the sun = $7.92X10^5$km. Distance of the sun from the earth = $1.5X10^5$km and Stefan's constant =$5.7X10^{-8}$ $Wm^{-2}K^{-4}$

Section-B

Answer the following: (5X10=50M)

1 (A) Derive an expression for Maxwell's law of distribution of molecular speeds in a gas. (CO1, L1)

(OR)

(B) Define coefficient of viscosity. On the basis of kinetic theory of gases, derive an expression for the coefficient of viscosity. (CO1, L1)

2 (A) Describe the working of Carnot's reversible engine and derive an expression for its efficiency. (CO2, L2)

(OR)

(B) What are reversible and irreversible processes? How does the entropy change in each of these processes? (CO2, L2)

3 (A) Define the four thermodynamic potentials. Obtain Maxwell's thermodynamic equations using these potentials. (CO3, L3)

(OR)

(B) State and explain the Joule-kelvin effect. Obtain an expression for Joule-kelvin coefficient. (CO3, L3)

4 (A) What is adiabatic demagnetization? How is this principle used in producing low temperatures? (CO3, L2)

(OR)

(B) Explain Joule-kelvin effect. Derive an expression for Joule-Thompson cooling. (CO4, L2)

5 (A) Derive the Planck's formula for the distribution of energy in black body radiation. (CO5, L2)

(OR)

(B) What is a pyrometer? Describe the construction and working of Angstrom pyrheliometer (CO5, L2)

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

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

Title of the Paper : HEAT AND THERMODYNAMICS LAB

Semester: III **Credits : 1** **Offered to: II B.Sc. Major(Physics)**

Course Code		**23PHMAP232**	
Title of the Course		**HEAT AND THERMODYNAMICS LAB**	
Year of Introduction:	**2024-25**	**Semester:**	**3**
Type of the Course:		**EMPLOYABILITY & SKILL DEVELOPMENT**	
Pre-requisites, if any		**BASIC KNOWLEDGE OF HEAT**	

Course Description

Students would gain practical knowledge about heat and radiation, thermodynamics, thermo emf, RTD etc. and perform various experiments.

Course Objectives:

1. The primary objective of this course is to provide the fundamental knowledge to understand the behaviour of thermal systems.
2. This course provides a detailed necessary transfer through solids, fluids, and experimental analysis, including the application and heat vacuum.
3. 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.

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

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

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

Title of the Paper : ELECTRONIC DEVICES AND CIRCUITS

Semester: III **Offered to: II B.Sc. Major (Physics)**

Course Code	**23PHMAL233**
Title of the Course	**ELECTRONIC DEVICES AND CIRCUITS**
Offered to: (Programme/s)	**II B.Sc. H PHYSICS**
Type of the Course:	**EMPLOYABILITY**

Credits	**3**	CIA Marks	**30**
No. of Lecture Hours / Week	**3**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**60**	Total Marks	**100**
Year of Introduction : 2024 - 25	Year of Offering: 2024 – 25	Year of Revision: NIL	Percentage of Revision: NIL

Course Description:

This course provides an in-depth study of electronic devices and circuits, covering the fundamentals of P-N junction diodes, transistors, and their biasing techniques. It also explores advanced power electronic devices, photoelectric devices, and power supplies. Key topics include diode characteristics, transistor configurations, FETs, MOSFETs, rectifiers, and filter circuits, emphasizing their practical applications in electronics.

Course Aims and Objectives:

S. NO	COURSE OBJECTIVES
1	To introduce semiconductor devices such as the P.N. junction diode, Zener diode, and tunnel and their characteristics, operations, circuits, and applications.
2	To introduce PNP and NPN transistor operation and various modes of operations, characteristics, relations and their Hybrid parameters.
3	To analyse and interpret FET and MOSFET circuits for small signals at low and high Frequencies
4	To study the characteristics of different Photoelectric devices
5	To study the different types of Rectifiers & filters

UNIT I: PN JUNCTION DIODES

P-N junction Diode, Formation of the depletion region, Forward and Reverse bias - Reverse saturation current, Zener diode - V-I characteristics, Zener diode as Voltage Regulator, Tunnel Diode- working, V-I characteristics, Advantages and Disadvantages of P-N, Zener & Tunnel diodes.

UNIT –II: TRANSISTOR AND ITS BIASING: (D.C)

Transistor construction, working of PNP and NPN Transistors, Active, Cut off, and Saturation conditions, Configurations of Transistor - CB, CE, and CC, Input and Output Characteristics of CE configurations. Relation between α, β and γ relation, Hybrid parameters of a Transistor and equivalent circuit,

UNIT III: TRANSISTORS & POWER ELECTRONIC DEVICES

BJT Transistor Biasing -Need for biasing, BJT biasing- methods, basic stability, fixed bias, collector-to-base bias, self-bias, Stabilization against variations in V_{BE}, I_c, and β, Stability factors, (S,S',S''), Bias compensation, Thermal runaway, Thermal stability.

FET-Construction, Working, drain and transfer characteristics. MOSFET- enhancement, depletion MOSFET, construction and working, Characteristics of MOSFET, applications of MOSFET.

UNIT IV: PHOTO ELECTRIC DEVICES:

Light-emitting diodes (LEDs) - Construction, working, characteristics and Applications, Photodiode - Construction, working characteristics and Applications,

Phototransistors - Construction, working and characteristics, Applications, LDR-Structure and operation, Applications.

UNIT-V: POWER SUPPLIES:

Rectifiers: Half wave, full wave, bridge rectifier, derivations of characteristics of rectifiers.

Filters -Inductor filter(Series inductor), Capacitor filter(Stunt inductor), π Filter, comparison of various filter circuits in terms of ripple factors.

SEMESTER - END QUESTION PAPER STRUCTURE

Course Code & Title of the Course:	**23PHMAL233 ELECTRONIC DEVICES & CIRCUITS**
Offered to:	**II B.Sc. H PHYSICS**
Category:	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions (20 Marks)

Answer All questions. Each question carries 4 Marks.

Q1 (a) Show that Zener diode can work as a voltage regulator

OR

(b) What are the advantages and disadvantages of PN Junction Diode

Q2 (a) Explain the input and output characteristics of CE configuration

OR

(b) Write a short on Hybrid parameters of a Transistor.

Q3 (a) Explain collector-to-base biasing.

OR

(b) Write any five applications of MOSFET.

Q4 (a) Write a short note on structure and operation of Phototransistor.

OR

(b) Mention any four applications of Photodiode.

Q5 (a) Explain the construction and working of a Half wave rectifier.

OR

(b) Explain the working of capacitor filter.

Section B: Long Answer Questions (50 Marks)

Answer All questions. Each question carries 10 Marks.

Q6 (a) Explain the construction and working and V-I characteristics of a PN Junction diode

OR

(b) Discuss the working of a Tunnel diode. Explain its V-I characteristics.

Q7 (a) Describe the construction & working of a NPN Transistors. Explain its Active, Cut-off and Saturation conditions.

OR

(b) Define the terms α, β *and* γ terms of a transistor and obtain the relation between them.

Q8 (a) Explain the construction, working drain and transfer characteristics of a FET

OR

(b) Explain the need for biasing. Explain various methods of Biasing.

Q9 (a) Discuss the construction, working & characteristics of Light - emitting diodes.

OR

(b) Describe the construction, working & characteristics of a photo transistor.

Q10 (a) With a circuit diagram, explain the construction & working of a bridge rectifier

OR

(b) Explain the construction & working of an inductor and II filter.

Note:

- Short answer questions assess foundational knowledge (Remembering, Understanding and Apply).
- This structure emphasizes a focus on higher-order thinking skills (Understand, Application, Analysis, and Evaluation) in the long answer section.
- Consider including a mix of question types within each section to ensure a comprehensive assessment.

SEMESTER - III COURSE : ELECTRONIC DEVICES AND CIRCUITS LAB

Practical Credits: 1 2 hrs/week

COURSE OBJECTIVE: The course objectives for a practical course in Electronic Devices and Circuits might provide hands-on experience with the fundamental principles of electronic devices and circuits.

LEARNING OUTCOMES:

1. Understand the principles of electronic devices and circuits and their applications in real-world scenarios.
2. Analyze and design electronic circuits using diodes, transistors, and operational amplifiers.
3. Understand the importance of biasing and stability in electronic circuits and how to achieve them.
4. Develop the skills to design and analyze amplifier circuits and to understand the concept of feedback and its application in electronic circuits.
5. Analyze and design simple oscillators, power supplies, and filters.
6. Gain hands-on experience with electronic test equipment such as multimeters, oscilloscopes, and function generators.
7. Develop skills in circuit construction, measurement, and testing.
8. Learn how to troubleshoot and diagnose electronic circuit problems.
9. Understand the safety procedures for working with electronic circuits and equipment.

Minimum of 6 experiments to be done and recorded

1. V-I Characteristics of junction diode
2. V-I Characteristics of Zener diode
3. Transistor characteristics – CB configuration
4. Transistor characteristics – CE configuration
5. FET input and output characteristics
6. UJT characteristics
7. LDR characteristics
8. Full wave and Bridge rectifier with filters

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

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

Title of the Paper : ANALOG AND DIGITAL ELECTRONICS

Semester: III **Offered to: II B.Sc. Major (Physics)**

Course Code	**23PHMAL234**
Title of the Course	**ANALOG AND DIGITAL ELECTRONICS**
Type of the Course:	**EMPLOYABILITY & SKILL DEVELOPMENT**

Credits	**3**	CIA Marks	**30**
No. of Lecture Hours / Week	**3**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**60**	Total Marks	**100**
Year of Introduction : 2024 - 25	Year of Offering: 2024 – 25	Year of Revision: NIL	Percentage of Revision: NIL

Course Description:

This lab course provides hands-on experience with operational amplifiers, number systems, logic gates, arithmetic circuits, data processing circuits, and sequential logic circuits. Students will explore basic differential amplifiers, internal Op-Amp blocks, and applications such as voltage followers and amplifiers. They will learn binary-to-decimal conversions, Boolean algebra, and logic gate operations. The course covers arithmetic circuits like adders and subtractors, as well as multiplexers, demultiplexers, decoders, and encoders. Sequential logic circuits, including various types of flip-flops, are also examined. The lab emphasizes practical skills and foundational knowledge essential for understanding and applying electronic circuit principles.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Study internal blocks, characteristics, and applications of operational amplifiers, including inverting/non-inverting amplifiers, comparators, integrators, and differentiators.
2	Convert between binary/decimal systems, apply Boolean algebra, and work with basic logic gates like NAND, NOR, and exclusive-OR.
3	Create and analyze half/full adders and subtractors, and 4-bit binary adders/ subtractors.
4	Build and understand multiplexers, de multiplexers, decoders, and encoders for data processing.
5	Design and convert RS, SR, JK, D, T, and Master-Slave flip-flops for sequential circuits and code converters.

Course Outcomes

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

CO NO	COURSE OUTCOME
CO1	Understand Op-Amps
CO2	Gain the knowledge of Number Systems and Logic Gates
CO3	Design Arithmetic Circuits
CO4	Implement Data Processing Circuits
CO5	Design and convert Sequential Logic Circuits

UNIT-I: OPERATIONAL AMPLIFIERS – I (12Hours)

1 (a) Operational Amplifiers: Basic differential amplifiers, Op-Amp supply voltage, IC identification, Internal blocks of Op-Amp.

1 (b) Characteristics of ideal and practical Op-Amp (IC 741) its parameter offset voltages and currents, CMRR, slew rate, concept of virtual ground.

Unit-II OPERATIONAL AMPLIFIERS-II (12Hours)

2 (a) Applications of Op-Amp: Op-Amp as a voltage follower, Inverting amplifier, non-inverting amplifier, and voltage follower.

2 (b) Summing amplifier, difference amplifier, comparator, integrator, Differentiator.

UNIT-III: NUMBER SYSTEMS, CODES AND LOGIC GATES (12Hours)

a) Number systems - Conversion of binary to decimal system and vice versa. Binary addition and subtraction (1's and 2's complement methods).BCD code and Gray code - Conversions

b) Logic Gates: Basic logic gates, NAND and NOR as universal gates, exclusive-OR gate, Laws of Boolean algebra - Simplification of Boolean Expressions using Boolean Laws, De Morgan's laws-statement and proof.

UNIT-IV: ARITHMETIC CIRCUITS & DATA PROCESSING CIRCUITS (12 hrs)

a) Half Adder and Full Adder, Half and Full Subtractor, 4-bit binary Adder/ Subtractor.

b) Multiplexers - 2 to 1, 4 to 1 and 8 to 1 multiplexer, De-multiplexers: 1 to 2, 1 to 4Demultiplexer, Decoders: 1 of 2, 2 of 4 decoders, Encoders: 4 to 2, 8 to 3 Encoder,

UNIT-V: SEQUENTIAL LOGIC CIRCUITS & CODE CONVERTERS (12 hrs)

5(a) Sequential digital circuits : Flip-flops, RS, Clocked SR, JK.

5(b) D, T, Master-Slave, Flip-flop, Conversion of Flip-flops.

SEMESTER -END QUESTION PAPER STRUCTURE

Course Code & Title of the Course:	**ANALOG AND DIGITAL ELECTRONICS (23PHMAL234)**
Offered to:	**B.Sc (H) Physics**
Category:	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions (20 Marks)

Answer All questions. Each question carries 4 Marks.

1. (A) Write a short note on the slew rate and concept of virtual ground of an OP-AMP.

(OR)

(B) Draw the block diagram of an OP-Amp.

2. (A) Explain how an OP Amp acts as a voltage follower.

(OR)

(B) Draw the summing amplifier using an OP-Amp and explain its operation

3. (A) Explain how the NAND gate can act as a universal gate

(OR)

(B) Explain the procedure of 2's complement of binary addition

4. (A) (i) Convert $(625)_{10}$ into a binary number

(ii) Convert $(110111)_2$ into decimal number

(OR)

(B) Show that the logic expression $\overline{AB}(A+B)=\bar{A}B+A\bar{B}$

5. (A) Explain about RS flip flop?

(OR)

(B) Explain about Master-Slave flip flop?

Section B: Long Answer Questions (5X10=50 Marks)

Answer All questions. Each question carries 10 Marks.

6. (A) What is an Operational amplifier? Give the comparison between ideal practical OP-Amp.

(OR)

(B) Briefly explain basic differential amplifiers and also explain about IC identification of an OP-Amp.

7. (A) Explain inverting and non-inverting amplifiers and obtain the expression for their output voltages

(OR)

(B) Explain how the operational amplifier acts as an Integrator and Differentiator

8. (A) State and prove De Morgan Laws

(OR)

(B) Explain logic gates with truth tables

9. (A) Explain the construction and working of half and full adders with truth tables

(OR)

(B) Distinguish between the multiplexer and De-multiplexers. Explain about 8:1 Multiplexer.

10. (A) Draw the logic circuits and truth tables of JK, Clocked RS flip flops

(OR)

(B) Explain the conservation of RS to JK & JK to T flip-flops

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

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

Title of the Paper : ANALOG AND DIGITAL ELECTRONICS LAB

Semester: III **Credits : 1** **Offered to: II B.Sc. Major(Physics)**

Course Code		**23PHMAP234**	
Title of the Course		**ANALOG AND DIGITAL ELECTRONICS**	
Year of Introduction:	**2024-25**	**Semester:**	**3**
Type of the Course:		**EMPLOYABILITY & SKILL DEVELOPMENT**	
Pre-requisites, if any		**BASIC ELECTRONICS**	

Course Description:

This lab course provides hands-on experience with operational amplifiers, number systems, logic gates, arithmetic circuits, data processing circuits, and sequential logic circuits. Students will explore basic differential amplifiers, internal Op-Amp blocks, and applications such as voltage followers and amplifiers. They will learn binary-to-decimal conversions, Boolean algebra, and logic gate operations. The course covers arithmetic circuits like adders and subtractors, as well as multiplexers, de multiplexers, decoders, and encoders. Sequential logic circuits, including various types of flip-flops, are also examined. The lab emphasizes practical skills and foundational knowledge essential for understanding and applying electronic circuit principles.

Course Aims and Objectives:

S. NO	COURSE OBJECTIVES
1	Study internal blocks, characteristics, and applications of operational amplifiers, including inverting/non-inverting amplifiers, comparators, integrators, and differentiators.
2	Convert between binary/decimal systems, apply Boolean algebra, and work with basic logic gates like NAND, NOR, and exclusive-OR.
3	Create and analyze half/full adders and subtractors, and 4-bit binary adders/subtractors.
4	Build and understand multiplexers, de multiplexers, decoders, and encoders for data processing.
5	Design and convert RS, SR, JK, D, T, and Master-Slave flip-flops for sequential circuits and code converters.

Course Outcomes

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

CO NO	COURSE OUTCOME
CO1	Understand Op-Amps
CO2	Gain the knowledge of Number Systems and Logic Gates
CO3	Design Arithmetic Circuits
CO4	Implement Data Processing Circuits
CO5	Design and convert Sequential Logic Circuits

ANALOG AND DIGITAL ELECTRONICS LAB

1. To study the operational amplifier as an inverting feedback amplifier with verifying gain
2. To study the operational amplifier as a non-inverting feedback amplifier with verifying gain
3. To study operational amplifiers as an adder
4. To study operational amplifiers as a subtractor
5. To study operational amplifiers as a differentiator
6. To study operational amplifier as an integrator
7. Logic Gates- OR, AND, NOT and NAND gates. Verification of Truth Tables.
8. Verification of De Morgan's Theorems.
9. Construction of Half adder and Full adders-Verification of truth tables
10. Flip flops
11. Multiplexer and De-multiplexer
12. Encoder and Decoder

***

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

NAAC reaccredited at "A" level

Autonomous - ISO 9001 – 2015 Certified

Title of the Paper : WAVE OPTICS (MINOR)

Semester: III **Offered to: II Major (CS)**

Course Code	**23PHMIL231**
Title of the Course	**WAVE OPTICS**
Offered to: (Programme/s)	**II Major (CS)**
Type of the Course:	EMPLOYABILITY

Credits	**3**	CIA Marks	**30**
No. of Lecture Hours / Week	**3**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**60**	Total Marks	**100**
Year of Introduction : 2024 - 25	Year of Offering: 2024 – 25	Year of Revision: NIL	Percentage of Revision: NIL

Course Description:

This course explores wave optics, covering the principles of interference, diffraction, polarization, and aberrations. Topics include Fresnel's Bi-Prism, Newton's rings, diffraction gratings, and methods to produce and analyze polarized light. It also delves into laser technology and holography, emphasizing practical applications in wavelength determination, optical devices, and advanced imaging techniques.

Course Aims and Objectives:

S. NO	COURSE OBJECTIVES
1	To help students to understand the nature of light, its propagation and interaction with matter which is essential to constantly emerging newest technologies.
2	To create interest among the students about the modern communication systems by studying wave optics
3	Students will be able to understand applications of interference, diffraction, lasers in real life situations.

Course Outcomes

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

CO NO	COURSE OUTCOME
CO1	Understand the phenomenon of interference of light and its formation in (i) Lloyd's single, Newton's rings and Michelson interferometer
CO2	Distinguish between Fresnel's diffraction and Fraunhofer diffraction and observe the diffraction patterns in the case of a single slit and the diffraction grating
CO3	Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.
CO4	Gain knowledge of various types of optical fibers
CO5	Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields

Course Structure :

Unit	Learning Units	Lecture Hours
I	**Interference of light** **A) Division of Wave front:** Introduction, Conditions for the interference of light, Interference of light by division of wave front and amplitude, Fresnel's Bi-Prism-Determination of Wavelength of Light, Phase change on reflection- Stokes' treatment. **B) Division of Amplitude**: Cosine law - colours in thin films, Newton's rings in reflected light-Determination of wavelength of monochromatic light, Michelson interferometer and determination of wavelength.	12
II	**Diffraction of light** **A) Fraunhofer Class**: Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit, N-slits (No derivation), 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 convex lens.	12
III	**Polarisation of light** **A) Polarized light**: Methods of production of plane-polarized light - Polarisation by reflection (Brewster's law), Malus law,	12

	Double refraction, Nicol prism, Nicol prism as polarizer and analyzer **B) Types and production of polarized Light**: Quarter wave plate, Half wave plate, Optical activity, Idea of Plane, circular & Elliptical polarized light (Concept only), Laurent's half shade polarimeter : Determination of the specific rotation.	
IV	**Aberrations**: **A)** Monochromatic aberrations - Spherical aberration, Methods of minimizing spherical aberration, Coma,Astigmatism, -minimization methods, **B)** Chromatic aberration-the achromatic doublet; Achromatism for two lenses (i) in contact and (ii) separated by a distance.	12
V	**Lasers and Holography** **A) Lasers** Introduction, Spontaneous emission, stimulated emission, Population Inversion, Laser principle, Einstein coefficients, Ruby, He-Ne laser - Applications of lasers. **B) Holography** Basic principle and construction of holography, Applications of holography	12

Text BOOKS:

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

REFERENCE BOOKS:

7. A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand&Co.
8. Optics-Murugesan, S. Chand & Co.
9. Optics, F.A. Jenkins and H.G. White, McGraw-Hill
10. Optics, Ajoy Ghatak, Tata McGraw-Hill.
11. Introduction of Lasers – Avadhanulu, S. Chand &Co.
12. Principles of Optics- BK Mathur, Gopala Printing Press,1995

***

SEMESTER -END QUESTION PAPER STRUCTURE

Course Code	**23PHMIL231**
Offered to:	**II Major (CS)**
Category:	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions (20 Marks)

Answer All questions. Each question carries 4 Marks.

1 (a) What are the conditions for interference of light? (CO1, L3)

OR

(b) In a Newton's ring experiment, the diameter of the 10th dark ring is 0.433 cm. Find the wavelength of the incident light, if the radius of curvature of the lens is 80 cm. (CO1, L3)

2 (a) Distinguish between Fraunhofer and Fresnel diffraction. (CO2, L3)

OR

(b) A diffraction grating has 15 cm of the surface ruled with 6000 lines per cm, Evaluate the resolving power of grating in the first order. (CO2, L3)

3 (a) State the Brewster and Malus law. (CO3, L3)

OR

(b) A half wave plate is constructed for a wavelength of $6000A^0$. Find the value of the wavelength of light for which this plate works as a quarter wave plate. (CO3, L3)

4 (a) Explain spherical aberrations. (CO4, L3)

OR

(b) Derive the condition for Achromatism for when two lenses are separated by distance. (CO4, L3)

5 (a) Write the applications of LASERS. (CO5, L3)

OR

(b) Write the applications of holography. (CO5, L3)

Section B: Long Answer Questions (50 Marks)

Answer All questions. Each question carries 10 Marks.

6. a) Describe the experimental arrangement for observation Fresnel Bi prism experiment. (CO2, L2)

(OR)

b) Describe Newton's rings method for measuring the wave length of monochromatic light with necessary theory. (CO1, L2)

7. a) What is diffraction? Explain the Fraunhoffer diffraction due to single slit with intensity distribution. (CO2, L3)

(OR)

b) Describe the construction and working of zone plate. Derive the equation for its focal length. (CO2, L3)

8 a) Describe the construction and working of Nicol prism. Explain how it can be used as polarizer and analyser. (CO3, L1)

(OR)

b) What is specific rotation? Describe how specific rotation of sugar solution can be determined experimentally. (CO3, L2)

9 a) Explain about COMA and ASTIGMATISM. (CO4, L1)

(OR)

b) Define chromatic aberration, Derive the condition for Achromatism for when two lenses are in contact. (CO1, L2)

10 a) What is LASER? Explain the construction and working of Ruby laser with neat diagram. (CO5, L2)

(OR)

b) Explain the basic principle and construction of holography. (CO5, L2)

Note:

- Short answer questions assess foundational knowledge (Remembering, Understanding and Apply).
- This structure emphasizes a focus on higher-order thinking skills (Understand, Application, Analysis, and Evaluation) in the long answer section.
- Consider including a mix of question types within each section to ensure a comprehensive assessment.

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

NAAC reaccredited at "A" level

Autonomous - ISO 9001 – 2015 Certified

Title of the Paper : WAVE OPTICS LAB (MINOR)

Semester: III **Credits : 1** **Offered to: II Major (CS)**

Course Code		**23PHMIP231**	
Title of the Course		**WAVE OPTICS LAB**	
Year of Introduction:	**2024-25**	**Semester:**	**3**
Type of the Course:		**EMPLOYABILITY & SKILL DEVELOPMENT**	
Pre-requisites, if any		**BASIC KNOWLEDGE OF OPTICS**	

Course outcomes (Practical):

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

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

Minimum of 7 experiments to be done and recorded

1. Determination of radius of curvature of a given convex lens-Newton's rings.
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-hallow prism
9. Determination of thickness of a thin wire by wedge method
10. Determination of refractive index of liquid-Boy's method.

A.G & S.G. SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE, Vuyyuru-521165
NAAC reaccredited at "A" level
(Autonomous)

Title of the Paper: Applications of Electricity And Electronics

Semester : V **YEAR: III B.Sc (MPCs)**

Course Code	**PHYSET01**	**Course Delivery Method**	**Class Room / Blended Mode - Both**
Credits	**3**	**CIA Marks**	**30**
No. of Lecture Hours / Week	**3**	**Semester End Exam Marks**	**70**
Total Number of Lecture Hours per semester	**45**	**Total Marks**	**100**
Year of Introduction: 2022-23	**Year of Offering: 2024 -25**	**Year of Revision: 2023-24**	**Percentage of Revision : nil**
CLASS :	**III B.Sc (MPCS)**		

Course Objectives:

- To help students to understand the principles and laws of electricity which isessential to constantly emerging newest technologies
- To create interest among the students about the communication systems bystudying electricity and electronics
- Students will be able to understand applications of passive elements, AC, DCcircuits and power supplies

Course Outcomes:

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

CO1 Understand the types of resistors, Inductors and capacitors and itsapplications

CO2 Distinguish between AC and DC sources and understand about the batteriesand Network theorems for DC circuits

CO3 Explain the working principle and construction of Generators and transformers

CO4 Learn the applications of EM induction and power supplies

SYLLABUS

Unit	Learning Units	Lecture Hours
I	**UNIT-I: INTRODUCTION TO PASSIVE ELEMENTS** **a) Passive elements** Resistor - Types of Resistors, Color coding, Combination of Resistors – Series combination (Voltage division), Parallel combination (Current division), Ohms Law and its limitation. Inductor - Principle, Types of Inductors. Capacitor - Principle, Charging and discharging of a Capacitor, Types of Capacitors. **b) Applications of Passive elements:** Applications of a Resistor as a heating element in heaters and as a fuse element. Applications of Inductors, Application of choke in a fan and in a radio tuning circuit, Series resonance circuit as a Radio tuning circuit. Applications of Capacitor in power supplies, motors (Fans).	9
II	**UNIT-II: POWER SOURCES (BATTERIES)** **a) Power sources:** Types of power sources-DC & AC sources, Different types of batteries, Rechargeable batteries - Lead acid batteries, Li-ion batteries, Series, Parallel & Series-Parallel configuration of batteries **b) Network Theorems for DC circuits** Thevenin's theorem, Norton's theorem, Maximum Power transfer theorem, Constant Voltage source - Constant Current Source-Applications of Current sources & Voltage sources.	9
III	**UNIT-III: ALTERNATING & DIRECT CURRENTS** **a)** A.C Generator, Construction and its working principle, DC Generator, Construction and its working principle, advantages and disadvantages, Differences between DC and AC generators **b)** Transformers- Construction and its working principle, Open circuit and short circuit tests, Types of Transformers - Step-down and Step-up Transformers, Relation between primary and secondary turns of the transformer with emf, Use of Transformer in a regulated Power supply	9
IV	**UNIT-IV: MODULATION CIRCUITS** (Skill Based) **a) Amplitude modulation:** Amplitude modulation, modulation index, Waveforms, Power relations, AM transmitter, AM Receiver, Demodulation, Diode detector **b) Frequency modulation:** Frequency modulation, modulation index, Waveforms, FM Transmitter, FM Receiver	9
V	**Unit-V: Applications of EM Induction & Power Supplies (Skill Based)** **a)** DC motor – Construction and operating principle, Calculation of power, voltage and current in a DC motor, Design of a simple Motor (Fan) with suitable turns of coil **b)** Working of a DC regulated power supply, Construction of 5 volts regulated power supply, Design of a step-down (ex:220-12V) and step-up (ex:120-240V) transformers.	9

TEXT BOOKS

BSc Unified Physics: Applications of Electricity & Electronics, S.L Gupta & Sanjeev Gupta

References:

1. Grob's Basic Electronics by Mitchel Schultz , TMH or McGraw Hill
2. Electronic and Electrical Servicing by Ian Robertson Sinclair, John Dunton, Elsevier Publications
3. Troubleshooting Electronic Equipment by R.S.Khandapur ,TMH
4. Web sources suggested by the teacher concerned and the college librarian including reading material.

Model Question Paper
APPLICATIONS OF ELECTRICITY & ELECTRONICS
Section A

Answer ALL questions 5X10=50M

1. A) Briefly explain the different types of resistors and capacitors. (CO1, L3)

(OR)

B) Write a note on applications of passive elements. (CO1, L2)

2 A) Describe Li ion batteries. (CO2, L2)

(OR)

B) Briefly explain the Thevenin's theorem with equivalent circuit. (CO2, L2)

3 A) Explain the construction and working principle of AC generator. (CO3, L2)

(OR)

B) Explain the construction and working principle of Transformers. (CO3, L2)

4 A) What is amplitude modulation? Explain. (CO4, L2)

(OR)

B) What is frequency modulation? Explain. (CO4, L2)

5 A) Explain the construction and operating principle of DC motor. (CO5, L2)

(OR)

B) Explain the working of DC regulated power supply. (CO5, L2)

Section B

Answer ANY FIVE of the following **5X4=20M**

6. What is Ohm's law? (CO1, L1)
7. Explain the Series resonance circuit as a Radio tuning circuit. (CO1, L2)
8. Explain series-parallel configuration of batteries. (CO2, L2)
9. Write the applications of current and voltage sources. (CO2, L1)
10. Distinguish between DC and AC generators. (CO3, L2)
11. Explain the use of a Transformer in a regulated Power supply. (CO3, L1)
12. Explain the concept of demodulation. (CO4, L2)
13. Write a note on transmitters and receivers. (CO4, L1)
14. Explain the measurement of power, current and voltage in DC motor. (CO5, L2)
15. Write a short note on step-down and step-up transformers. (CO5, L1)

Course : Applications of Electricity & Electronics LAB

PRACTICAL (Laboratory) SYLLABUS *(Max Marks:50)*

Course Code	**PHYSEP01**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**2**	CIA Marks	**10**
No. of Lecture Hours / Week	**2**	Semester End Exam Marks	**40**
Total Number of Lecture Hours	45	Total Marks	**50**
Year of Introduction : 2022 - 23	Year of Offering: 2024 - 25	Year of Revision: NIL	Percentage of Revision: NIL

EXPERIMENTS LIST

Minimum SIX experiments are to be done and recorded

1. Measurement of R using Color coding of Resistors and measurement of R using multimeter - Resistors of different values, Multimeters
2. Connect two or three resistors or capacitors or inductors and measure the Series, Parallel Combination values using a Multimeter and compare the values with the calculated values - Capacitors of different values
3. Use the Digital Multimeter and Analog Multimeter to measure the output voltage of an AC & DC power supply - Digital Multimeters, Analog Multimeters
4. Draw the characteristics of FET
5. Construct a series electric circuit with R, L and C having an AC source and study the frequency response of this circuit Using Function generator
6. Construct a Parallel electric circuit with R, L & C having an AC source and study the frequency response of this circuit using Function generator
7. Efficiency of Transformer.
8. Verification of Network Theorems – Thevenin's theorem, Norton's theorem
9. AM Generation Kit
10. FM generation Kit

Lab References:

1. Laboratory Manual for Introductory Electronics Experiments by Maheshwari, L.K. Anand, M.M.S., New Age International (P) Ltd.
2. Electricity-Electronics Fundamentals: A Text-lab Manual by Paul B. Zbar, Joseph Sloop, & Joseph G. Sloop , McGraw-Hill Education
3. Laboratory Manual Basic Electrical Engineering by Umesh Agarwal, Notion Press
4. Basic Electrical and Electronics Engineering by S.K. Bhattacharya , Pearson Publishers.
5. Web sources suggested by the teacher concerned.

Note :

1. Eight experiments are to be done and recorded in the lab. These experiments will be evaluated in CIA.
2. For certification minimum of 6 (Six) 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
VUYYURU-521165.
NAAC Reaccredited at 'A' level
Autonomous -ISO 9001 – 2015 Certified

Domain Subject: **PHYSICS**

Title of the Paper : ELECTRONIC INSTRUMENTATION **Semester: V**

Offered to : III B.Sc (MPCs) **Course Type:** Core (TH)

Course Code	**PHYSET02**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**3**	CIA Marks	**30**
No. of Lecture Hours / Week	**3**	Semester End Exam Marks	**70**
Total Number of Lecture Hours per semester	**45**	Total Marks	**100**
Year of Introduction : 2022-23	Year of Offering: 2024-25	Year of Revision: 2023-24	Percentage of Revision : NIL

Course Objectives:

- Explain basic concepts and definitions in measurement.
- Describe the bridge configurations and their applications.
- Elaborate discussion about the importance of electronic instruments

COURSE OUTCOMES

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

CO1 Understand the basic measurements of Instruments (accuracy, precision, range, resolution, sensitivity and errors). Understand the theory, working principle, specifications and significance of Multimeter.

CO2 Describe the function of basic building blocks of Cathode Ray Oscilloscope. Measure the appropriate parameters (Voltage, Time Period, Frequency and Phase angle)

CO3 Understand the A/D & D/A converters and display instruments

CO4 Gain knowledge about amplifiers, oscillators and biomedical instruments

CO5 Understand the fundamental theory of Transducers and bridges

SYLLABUS

Unit	Learning Units	Lecture Hours
I	**UNIT-I INTRODUCTION TO INSTRUMENTS** **a)** Basic of measurements: Instruments accuracy, precision, sensitivity, resolution, range, types of errors, Classification of Instruments, Analog instruments & Digital Instruments, Construction and working of an Analog Multimeter and Digital Multimeter (Block diagram approach) **b)** DC Voltmeter and AC Voltmeter, Sensitivity, Sources of errors in the Measurement of resistance, voltage and current, Specifications of multimeter and their significance, Basic ideas on Function generator (brief explanation).	9
II	**UNIT-II OSCILLOSCOPE** **a)** Cathode ray oscilloscope – Principle and block diagram of CRO - Cathode Ray Tube – functioning – various controls **b)** Applications CRO: Measurement of voltage (dc and ac), frequency& time period, Different types of oscilloscopes and their uses, Digital storage Oscilloscope	9
III	**UNIT-III TRANSDUCERS AND BRIDGES** **a)** Classification of Transducers, Resistive, Capacitive & Inductive transducers, Piezoelectric transducer, Photo transducer. b) DC bridge – Wheatstone's bridge, AC Bridges - Measurement of Inductance and Capacitance – Maxwell's bridge .	9
IV	**UNIT-IV ADC AND DAC & DISPLAY INSTRUMENTS** **a)** A/D & D/A converters - Binary ladder, A/D converters – continuous type, integrating type, successive approximation type. b)Introduction to Display devices, LED Displays, Seven Segment Displays, Construction and operation (Display of numbers).	9
V	**UNIT-V OPERATIONAL AMPLIFIERS** **A)** Differential amplifier, IC-741 identification, internal blocks of OP-AMP. Characteristics of ideal and practical op-amp, inverting and non-inverting configuration. B) Applications of op-amp (IC-741): summing and difference amplifiers, differentiator and integrator	9

Reference Books:

1. Electronic Instrumentation by H.S.Kalsi ,TMH Publishers
2. Electronic Instrument Hand Book by Clyde F. Coombs ,McGraw Hill
3. Introduction to Biomedical Instrumentation byMandeep Singh, PHI Learning.
4. Electronic Instrumentation – WD Cooper
5. Electrical and Electronic Instrumentation – AK Sawhany
6. A text book in electrical technology by B.L.Thereja (S.Chand&Co)
7. *Biomedical Instrumentation* and Measurements by Leslie *Cromwell ,Prentice Hall India*.
8. Electronic Measurements and Instrumentation by Kishor, K Lal, Pearson, New Delhi
9. Electrical and Electronic Measurements by Sahan, A.K., Dhanpat Rai, New Delhi
10. Electronic Instruments and Measurement Techniques by Cooper, W.D. Halfrick, A.B., PHI Learning, New Delhi
11. Web sources suggested by the teacher concerned and the college librarian including reading material.

Course : Electronic Instrumentation – PRACTICAL SYLLABUS

Practical (Laboratory) Syllabus: *(Max Marks:50)*

Course Code	**PHYSEP02**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**2**	CIA Marks	**10**
No. of Lecture Hours / Week	**2**	Semester End Exam Marks	**40**
Total Number of Lecture Hours	**45**	Total Marks	**50**
Year of Introduction : 2022 - 23	Year of Offering: 2024 - 25	Year of Revision: NIL	Percentage of Revision: NIL

Minimum SIX experiments are to be done and recorded

1. Familiarization of digital multimeter and its usage in the measurements of (i) resistance (ii) current, (iii) AC & DC voltages
2. Measure the AC and DC voltages, frequency using a CRO and compare the values measured with other instruments like Digital multimeter.
3. Formation of Sine, Square wave signals on the CRO using Function Generator and measure their frequencies. Compare the measured values with actual values.
4. Display the numbers from 0 to 9 on a single Seven Segment Display module by applying voltages.
5. Summing amplifier
6. Difference amplifier
7. Integrator
8. Differentiator
9. Display the letters **a** to **h** on a single Seven Segment Display module by applying voltages.

.

VI. Lab References:

1. Electronic Measurement and Instrumentation by J.P. Navani. ,S Chand & Co Ltd
2. Principles of Electronic Instrumentation by A De Sa, Elsevier Science Publ.
3. Electronic Measurements and Instrumentation by S.P.Bihari, YogitaKumari, Dr. Vinay Kakka, Vayu Education of India .
4. Laboratory Manual For Introductory Electronics Experiments by Maheshwari, New Age International (P) Ltd., Publishers.
5. Electricity-Electronics Fundamentals: A Text-lab Manual by Paul B. Zbar ,Joseph
6. Sloop, & Joseph G. Sloop , McGraw-Hill Education.

Web sources suggested by the teacher concerned.

A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE (AUTONOMOUS), VUYYURU.

(Accredited at "A" Grade by NAAC, Bangalore)

MODEL QUESTION PAPER

III B.Sc , SEMESTER- V	**PAPER CODE : PHYSEP02**
PAPER TITLE : ELECTRONIC INSTRUMENTATION **ACADEMIC YEAR-2024-2025**	

Time: 3Hours Maximum marks: 70

MODEL PAPER

Section A

Answer ALL questions **(5x 10 = 50M)**

1. A) Define error. Mention different types of Errors. Explain any three types of errors associated with measurements. (CO1, L2)

   (OR)

   B) What is a multimeter? What are the advantages of analog multimeter? How do we measure voltage using analog multimeter? (CO1, L2)

2 A) Describe the principle and working of CRO. (CO2, L3)

   (OR)

   B) Write a brief note on different types of oscilloscopes and their uses. (CO2, L2)

3 A) Explain in brief Piezoelectric transducer. (CO3, L2)

   (OR)

   B) Discuss about Wheatstone's bridge. (CO3, L2)

4 A) Explain A/D and D/A converters. (CO4, L2)

   (OR)

   B) Discuss about various display devices. (CO4, L2)

5 A) What is an op-amp? Explain Inverting and Non-Inverting configuration. (CO5, L2)

   (OR)

   B) Explain Integrator and Differentiator using op-amp. (CO5, L2)

Section B

Answer any FIVE of the following **(5X4=20M)**

6. Distinguish between accuracy and precession of a measurement. (CO1, L1)
7. What are the uses of function generator? (CO1, L1)
8. Write a short note on photo transducer. (CO2, L1)
9. What are the various applications of CRO? (CO2, L1)
10. Explain any two specifications of CRO. (CO3, L2)
11. Distinguish between DC and AC bridges. (CO3, L2)
12. Explain A/D Converter using successive approximation type. (CO3, L2)
13. Explain LED display systems. (CO4, L2)
14. Explain summing and difference amplifier? (CO5, L2)
15. What are the ideal characteristics of op-amp? (CO5, L1)

`

VALUE ADDED COURSE

OFFERED BY

THE DEPARTMENT OF PHYSICS

DURING : 2024 -2025

A.G. & S.G. Siddhartha Degree College of Arts & Science

Vuyyuru-521165, Krishna District, Andhra Pradesh(AUTONOMOUS)

Value Added Course

DEPARTMENT OF PHYSICS

Title : NANO TECHNOLOGY **COURSE CODE: PHYVAC05**

SYLLABUS FOR VALUE ADDED COURSE

UNIT –I :

Introduction to Nano science, Role of particle size , Basic concept of quantum well, quantum wire and quantum dot.

UNIT –II :

Types of Nano materials – Nano clusters, Solid solutions, Thin film, Nano composites (Metal Oxide and Polymer based), Core Shell

UNIT – III :

Types of Nano materials, Applications of Nano materials

A.G. & S.G. Siddhartha Degree College of Arts & Science

Vuyyuru-521165, Krishna District, Andhra Pradesh (AUTONOMOUS)

Value Added Course

DEPARTMENT OF PHYSICS

Title : NANO TECHNOLOGY **COURSE CODE: PHYVAC05** **MAX.MARKS : 50**

MODEL QUESTION PAPER

SECTION –A

ANSWER ANY TWO QUESTIONS. EACH QUESTION CARRIES TEN MARKS (2X10=20M)

1) **Explain about Introduction of Nano science .**
2) **Explain about Basic concepts of quantum well .**
3) **Explain about Nano clusters.**
4) **Explain about Types of Nano materials .**

SECTION –B

ANSWER ANY FIVEQUESTIONS. EACH QUESTION CARRIES SIX MARKS (5X6=30M)

1) **Role of particle size**
2) **Quantum wire**
3) **Quantum dot.**
4) **Thin film**
5) **Applications of Nano materials**
6) **Solid solutions**
7) **Nano composites**
8) **Core Shell**

A.G. & S.G. Siddhartha Degree College of Arts & Science

Vuyyuru-521165, Krishna District, Andhra Pradesh (AUTONOMOUS)

Value Added Course

DEPARTMENT OF PHYSICS

Title : NANO TECHNOLOGY **COURSE CODE: PHYVAC05** **MAX.MARKS : 50**

BLUE PRINT FOR VALUE ADDED COURSE

TYPE OF QUESTION	MARKS	` SCHEME
SECTION – A ESSAY QUESTIONS	Two questions are to be answered out of FOUR Each question carries 10 marks 2x10=20 M	Answer any two questions
SECTION –B SHORT ANSWER QUESTIONS	Five questions are to be answered out of EIGHT Each question carries 6 marks 5x6 =30 M	Answer any Five questions