

Dr.V.S.Krishna Govt. Degree College (Autonomous), Visakhapatnam

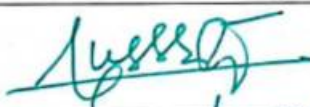
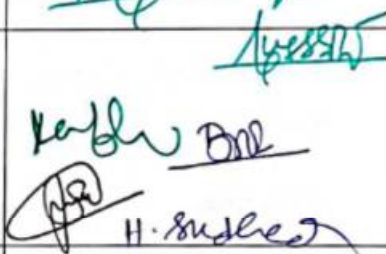
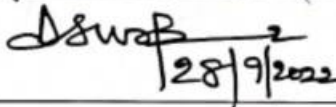
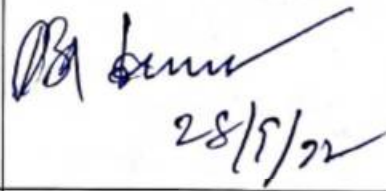
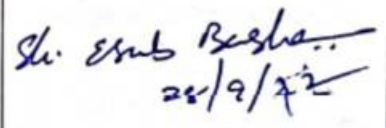
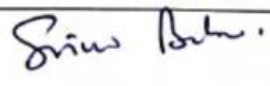
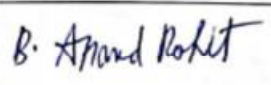
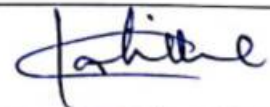
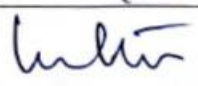

8th Board of Studies: September-2022

Pre-Approval form

Subject: Physics

Department: Physics

In pursuance of conferment of Autonomous status to Dr.V.S.Krishna Govt. Degree College(A). Visakhapatnam by the UGC vide letter No.F22-I/2011 (AC) dated 20.07.2011 from Dr. Manju Singh. Joint Secretary, UGC, New Delhi and Proceedings No. C-II (CDC) /Dr. VSK.Govt.College/BOS/2020 dt.03.08.2022 of the Vice-Chancellor, Andhra University, Visakhapatnam. the 8th **Board of Studies in Physics** Subject is conducted on 28.09.2022 at 10:00 AM with the following members. The Changes were implemented from 2022-23 academic year onwards. The syllabus also is ratified.


MEMBER	NAME& DESIGNATION	SIGNATURE
Head of the Department (Chairman)	Dr. CVSS. Sastry	
Faculty Members	Dr. CVSS. Sastry Dr. P. Latha Sri NVS Bhagavan Sri B. Nageswararao Dr. T. Swarna Latha Sri H. Sudheer	
Subject Expert (University Nominee)	Prof. D.S.V.V.D. Prasad, Dept of Physics, Andhra University.	
Subject Experts (from outside the parent university)	Dr. D.B. Radha Krishna, HoD in Physics, Govt. College for Women (A), Srikakulam, Dr.B.R. Ambedkar University, Srikakulam	
	Sri. Esub Basha Shaik, Lecturer in Physics, Govt. College (A), Rajamahendravaram, E.G. Dist., AKNU	
Representative Member From Industry / Corporate / Allied Area relating to placement	Sri. SRINU BABU Visakhapatnam	
Member from Alumni	Sri Bandi Anand Rohit Visakhapatnam	
Coordinator, IQAC	Dr. Ch. Lalitha	
Academic Coordinator and member secretary, Academic Council	Dr. P. Latha	
Principal and Chairperson, Academic Council	Dr. I. Vijayababu	


RESOLUTIONS ADOPTED BY BOARD OF STUDIES (BoS) OF PHYSICS (2022 -2023)


The Board of studies of Physics Department met on 28.09.2022 and unanimously resolved the following:

Resolved

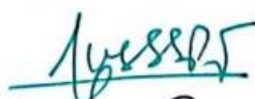





- 1) To continue implementation of the Autonomous Education system in CBCS pattern assuggested by APCHE model as per the staff council resolution.
- 2) To implement the guidelines of the Academic Council.
- 3) To approve the syllabus, model Question Papers and Blue Prints for first, second, third, fourth, fifth and sixth semesters of B.Sc. Degree course in Physics subject.
- 4) To approve the credits allotted and weekly workload proposed for the above syllabus. External evaluation is done for 75 marks and internal evaluation for 25 marks. The average of two mid-term examination marks secured by each student should be taken towards 25% weightage of total 100 marks. The remaining marks of internal assessment is made by conduct of assignment/project/seminar/NSS to be conducted semester wise.
- 5) To approve the continuous internal assessment pattern in accordance with SOP issued by APCCE. At least one-mid/assignment / may be conducted through online, faculty can use technical tools for evaluation and records of every student should be documented for reference.
- 6) To approve the conduct of seminars, webinars, workshops, conferences, symposia, field visits, quiz competitions etc.
- 7) To improve the curriculum as per norms of National Assessment and Accreditation Council (NAAC).
- 8) To encourage the participation of students in community centric activities.
- 9) To encourage students to get trained by JKC in Communication Skills, Analytical Skills and Life Skills etc.
- 10) To improve teacher participation in Research and extension activities.
- 11) To encourage students' participation in e-classes/virtual classes/MOOCs/SWAYAM/ COURSERA/ NPTEL On-line courses etc.
- 12) To make CCE LMS/ MANA TV lessons accessible to students on-line/off-line.
- 13) To conduct remedial coaching for academically weak students and to conduct advanced tutorials for fast learners.


Subject Expert
Affiliated College
28/9/22


Subject Expert
Affiliated College
28/9/22


Subject Expert
University Nominee
28/9/2022

Members-BoS
Dept, of Physics
Dr. V. S. Krishna Govt. Degree College (A),
Visakhapatnam

Dr. V.S. KRISHNA GOVT.DEGREE COLLEGE (A), VISAKHAPATNAM.

**REVISED SYLLABUS FOR CORE COURSES
UNDER CBCS/ SEMESTER SYSTEM**

**(w.c.f. 2022-23 Admitted Batch)
CORE COURSE'S STRUCTURE**

(Scni-I to Scm-IV)

B.Sc. PHYSICS COURSE STRUCTURE UNDER CBCS

r	Semester	Course	Title of the Course	IA	EA	Mark	No.of Hrs /Week	No. of Credits
[1	I	Mechanics, Waves and Oscillations	25	75	100	4	03
			Practical Course-1	-	50	50	2	02
	II	II	Wave Optics	25	75	100	4	03
			Practical Course - II	-	50	50	2	02
	III	III	Heat and Thermodynamics	25	75	100	4	03
			Practical Course - III	-	50	50	2	02
	IV	IV	Electricity, Magnetism and Electronics	25	75	100	4	03
			Practical Course - IV	-	50	50	2	02
V		Modem Physics	25	75	100	4	03	
		Practical Course -V	-	50	50	2	02	
Total No. of Courses : 05 (Five)								

AP STATE COUNCIL OF HIGHER EDUCATION
B.Sc. PHYSICS SYLLABUS UNDER CBCS
(For Mathematics combinations)

First Semester

Course I: Mechanics, Waves and Oscillations

Practical Course 1 (Lab-1)

Second Semester

Course II: Wave Optics

Practical Course II (Lab-2)

Third Semester

Course III: Heat and Thermodynamics

Practical Course III (Lab-3)

Fourth Semester

Course IV: Electricity, Magnetism and Electronics

Practical Course IV (Lab- 4)

Course V: Modern Physics

Practical Course V (Lab-V)

B.Sc. PHYSICS COURSE STRUCTURE UNDER CBCS

<i>Year</i>	<i>Semeste r</i>	<i>Cours c</i>	<i>Title of the Course</i>	<i>Marks</i>	<i>No.ofHrs /Week</i>	<i>No. of Credits</i>
I	I	I	Mechanics, Waves and Oscillations	100	4	03
			Practical Course-1	50	2	02
	II	II	Wave Optics	100	4	03
			Practical Course - II	50	2	02
II	III	III	Heat and Thermodynamics	100	4	03
			Practical Course - III	50	2	02
	IV	IV	Electricity, Magnetism and Electronics	100	4	03
			Practical Course - IV	50	2	02
		V	Modem Physics	100	4	03
			Practical Course -V	50	2	02
Total No. of Courses : 05 (Five)						

ANNEXURE-II CBCS CURRICULAR FRAMEWORK - BACHELOR OF SCIENCE

IES

Support		SEM I		SEM II		SEM III		SEM IV		SEM V		SEM VI			
		Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits		
Languages															
English		4	3	4	3	4	3								
Language (H/T/S)		4	3	4	3	4	3								
Life Skill Courses		2	2	2	2	2+2	2+2								
Skill Development Courses		2	2	2+2	2+2	2	2								
Major 1	Core 1,2,3,&4	4+2	4 + 1	4+2	4 + 1	4+2	4+1	4+2	4 + 1			THIRD PHASE of APPRENTICESHIP Entire Sth / 6th Semester		FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations).	
Major 2	Core 1,2,3, & 4	4+2	4 + 1	4+2	4 + 1	4+2	4+ 1	4+2	4+1						
Major 3	Core 1,2,3,& 4	4+2	4 + 1	4+2	4+1	4+2	4+ 1	4+2	4 + 1						
Major 1	Core -5							4+2	4 + 1						
Major 2	Core-5							4+2	4 + 1						
Major 3	Core -5							4+2	4 + 1						
Major 1	Skill Enhancement Courses (6 & 7)									4+2	4+1				
Major 2	Skill Enhancement Courses (6 & 7)									4+2	4 + 1				
Major 3	Skill Enhancement Courses (6 & 7)									4+2	4+1				
Major 3	Skill Enhancement Courses (6 & 7)									4+2	4+1				
Hrs/W (Academic Credits)		30	25	32	27	32	27	36	30	36	30		12	4	4
Project Work															
Extension Activities (Non															
NCC/NSS/Sports/Extra Curricular									2						
Yoga							1		1						
Extra Credits															
Hrs/W (Total Credits)		30	25	32	27	32	28	36	33	36	30		12	4	4

Table: Main Features of the Courses in the Revised Curricular Framework.

Subject/Course	Hours /Week Theory	Hours / Week Practicals	Total Hours	Credits	Max Marks Internal Assessment	Max Marks University Exam	Total
Life Skills Course	02	-	02	02	-0-	50	50
Skill Development Course	02	-	02	02	-0-	50	50
Language Subject	04	-	04	03	25	75	100
Domain Arts/Commerce Subject	05	-	05	04	25	75	100
Domain Science Subject	04	02	05	05 (4+1)	25	75	100
Mathematics	06	-	06	05	25	75	100

ANNEXURE - II CBCS CURRICULAR FRAMEWORK - BACHELOR OF SCIENCES

<i>Courses</i>	<i>Sem-I</i>	<i>Sem-II</i>	<i>Sem-III</i>	<i>Sem-IV</i>	<i>Sem-V</i>
Life Skill Courses (LSCs)	1 (02)	1 (02)	2(04)		
Skill Development Courses (SDCs)	1 (02)	2(04)	1 (02)		
Language - 1	C-1 (04)	C-2 (04)	C-3 (04)		
Language - 2	C-1 (04)	C-2 (04)	C-3 (04)		
Domain Sub -1	C-1 (06)	C-2 (06)	C-3 (06)	C-4 (06)	SEC-1(06)
				C-5 (06)	SEC-2 (06)
Domain Sub -2	C-1 (06)	C-2 (06)	C-3 (06)	C-4(06) C-5(06)	SEC-1(06) SEC-2 (06)
Domain Sub -3	C-1 (06)	C-2 (06)	C-3 (06)	C-4(06) C-5(06)	SEC-1(06) SEC-2 (06)
Total Hours/Week	30	32	32	36	36

* Figures in parenthesis are hours per week of Core Courses of Science. In respect of Arts and Commerce Courses, the hours per week for Core Courses will be 5.

** SEC-1 and SEC-2 in Sem-V are C-6 and C-7 respectively.

LIST OF LIFE SKILL COURSES (LSCs)

Semester	No. of Courses	Choices	Preferred Teaching Dept.
I	01	Computer Applications	Computers
		Unman Values and Professional Ethics	English/Telugu/Any Dept.
		Entrepreneurship	Commerce
II	01	Information and Communication Technology	Computers
		Indian Culture and Science	History/Telugu
		Elementary Statistics	Statistics/Mathematics/Economics / Commerce
III	02	Health and Hygiene	Zoology/Botany
		Personality Development and Leadership	English/ Any Dept.
		Analytical Skills	Mathematics/Statistics
		Environmental Education	Botany/Zoology/Environmental Sciences/Any Dept.

List of Skill Development Courses (SDCs) along with their Semester-wise allotment with choices. Preferred Teaching Departments are given in the parenthesis.

Sem	No. of Courses	Stream - A (Arts)	Stream - B (Commerce)	Stream - C (Science)
I	01	Tourism Guidance (History)	Secretaryship	Electrical Appliances (Physics)
		Public Relations (Pol. Sei. /English)	InsurancePromotion	Plant Nursery (Botany)
II	02	Journalistic Reporting (English)	Agricultural Marketing	Solar Energy (Physics)
		Survey & Reporting (Economics/History)	Business Communication (English)	Fruit & Vegetable Preservation (Botany)
		Social Work Methods (Pol. Sei.)	Advertising	Dairy Techniques (Zoology)
		Performing Arts (Telugu)	Logistics & Supply Chain	Food Adulteration (Chemistry)
III	01	Financial Markets (Economics)	Online Business	Environment Audit (Chemistry)
		Disaster Management (English /Telugu)	Retailing	Poultry Farming (Zoology)

List of Examiners

S. No.	Name of the Lecturer	Designation and College	Signature
1	Sri S.M. Rafiuddin	Lecturer in Physics, SGA Govt. Degree College, Yellamanchili	
2	Dr. S. Srinivasa Rao	Lecturer in Physics, Mrs. AVN College, Visakhapatnam	
3	Sri T. Niranjan Kumar	Lecturer in Physics, AMAL College, Anakapalli	
4	Sri K. Srimannarayana	Lecturer in Physics, Govt. Degree College (W), Marripalem	
5	Sri Ch. Rambabu	Lecturer in Physics, Govt. Degree College, V. Madugula	
6	Sri B. Nageswararao	Lecturer in Physics, SGA Govt. Degree College, Yellamanchili	
7	Sri K. Venkanna	Lecturer in Physics, Govt. Degree College (M), Srikakulam	
8	Dr. P.L. Saranya	Lecturer in Physics, Govt. College for Women (A), Srikakulam	
9	Dr. P. Latha	Lecturer in Physics, Govt. Degree College, Narsipatnam	
10	Sri M. Rajeswararao	Lecturer in Physics, SVLNS Govt. Degree College, Bheemunipatnam	
11	Sri K. Prabhudas	Lecturer in Physics, Govt. Degree College, Araku	
12	Dr. CVSS Sastry	Lecturer in Physics, Govt. Degree College, Chodavaram	
13	Sri B. Mohanarao	Lecturer in Physics, Govt. Degree College, Sabbavaram	
14	Dr. T. Swama Latha	Lecturer in Physics, Govt. Degree College (M), Srikakulam	
15	Sri NVS Bhagvan	Lecturer in Physics, Govt. Degree College (M), Srikakulam	
16	Sri N. Seshadri Krishna	Lecturer in Physics, Govt. Degree College, Narsipatnam	

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**REVISED SYLLABUS FOR SEMESTER -V
UNDER CBCS/ SEMESTER SYSTEM**

(Implemented from Academic Year: 2020-21)

Domain Subject: PHYSICS

Skill Enhancement Courses (SECs) for Semester V from 2021-22

Structure of SECs for Semester-V

(To choose one pair from the three alternate pairs of SECs)

Univ. Code	Course No. 6&7	Name of Course	Th. Hrs / Week	IE Marks	EE Marks	Credits	Prac Hrs/ Wk	Marks	Credits
	6A	Optical Instruments and Optometry	3	25	75	3	3	50	2
	7A	Optical Imaging and Photography	3	25	75	3	3	50	2

OR

	6B	Low Temperature Physics & Refrigeration	3	25	75	3	3	50	2
	7B	Solar Energy and Applications	3	25	75	3	3	50	2

OR

	6C	Applications of Electricity & Electronics	3	25	75	3	3	50	2
	7C	Electronic Instrumentation	3	25	75	3	3	50	2

Note-1: For Semester-V, for the domain subject Physics, any one of the above three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).

Note-2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the skills embedded in syllabus citing related real field situations.

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B.Sc. PHYSICS SYLLABUS UNDER CBCS

For Mathematics Combinations

[2021-22 Batch onwards]

I Year B.Sc.-Physics:I Semester

Course I: MECHANICS, WAVES AND OSCILLATIONS

Work load:60 hrs per semester

4 hrs/week

Course outcomes:

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

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

SYLLABUS

UNIT-I:

1. Mechanics of Particles (5 hrs)

Review of Newton's Laws of Motion & *Applications, Velocity and acceleration in Cartesian, polar and cylindrical coordinate systems*, Motion of variable mass system, Motion of a rocket, Multistage rocket, Concept of impact parameter, scattering cross-section, Rutherford Scattering-Derivation.

2. Mechanics of Rigid bodies (7 hrs)

Rigid body, *Constrained motion of rotating body*, rotational kinematic relations, Equation of motion for a rotating body, Angular momentum and Moment of inertia tensor, Euler equations & *Applications*, Precession of a spinning top, Gyroscope, Precession of atom and nucleus in magnetic field, Precession of the equinoxes

Unit-II:

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

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, *conservative force as a negative gradient of potential energy, conservation of angular momentum and its examples*, Equation of motion under a central force, Kepler's laws of planetary motion- Proofs, Motion of satellites, Basic idea of Global Positioning System (GPS),

UNIT-III:

4. Relativistic Mechanics (12hrs)

Introduction to relativity, Frames of reference, Galilean transformations, absolute frames, Michelson-Morley experiment, negative result, Postulates of Special theory of relativity, Lorentz transformation, characteristics of central forces variation of mass with velocity-*limiting velocity of a material particle, Rest mass of photon*, Einstein's mass-energy relation & *its verification*

Unit-IV:

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

Simple harmonic oscillator and solution of the differential equation, *characteristics of SHM*, damped harmonic oscillator & *Different damping conditions, Distinction between free and forced vibrations*, Forced harmonic oscillator – Their differential equations and solutions, Resonance & *its examples*, Logarithmic decrement, Relaxation time and Quality factor.

6. Coupled oscillations: (05 hrs.)

Coupled oscillators-Introduction, Two coupled oscillators, Normal coordinates and Normal modes- N-coupled oscillators and wave equation

Unit-V:

7. Vibrating Strings: (07 hrs.)

Transverse wave propagation along a stretched string, General solution of wave equation and its significance, Modes of vibration of stretched string clamped at ends, Overtones and Harmonics, *Laws of transverse vibrations of strings*, Melde's strings.

8. Ultrasonics: (05 hrs.)

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

Dr. V. S. Krishna. Government Degree College (A), Visakhapatnam

B.Sc. PHYSICS SYLLABUS UNDER CBCS

For Mathematics Combinations

[2021-22 Batch onwards]

I Year B.Sc.-Physics:I Semester

Course I: MECHANICS, WAVES AND OSCILLATIONS

Work load:60 hrs per semester

4 hrs/week

☐ BLUE PRINT FOR QUESTION PAPER SETTER

TIME : 3 hrs

Max.Marks :75

Sl.No.	UNIT NO. /CHAPTER NO.		SHORT ANSWER QUESTION S 5 MARKS	ESSAY QUESTIONS 10 MARKS	MARKS ALLOETD TO THE UNIT
1	UNIT I	1. Mechanics of Particles	1/Add problem	1	30
		2. Mechanics of Rigid bodies	1	1	
2	UNIT II	3. Motion in a Central Force Field	1	1+1/(+Add problem)	25
3	UNIT III	4. Relativistic Mechanics	1	1+1	25
4	UNIT IV	5. Undamped, Damped and Forced oscillations:	1 1/problem	1	30
		6. Coupled oscillations:		1	
5	UNIT V	7. Vibrating Strings:	1/(+Add problem)	1	30
		8. Ultrasonics:	1	1	
	Total no. of Questions		8	10	
	Total Marks including Choice				140

- ☐ Note: 1.The question paper setters are requested to kindly adhere to the format given in the above table.
- ☐ 2.The question paper setters are also requested to set the questions based on problems (conceptual or numerical) for a total of 20 marks.

Note:

1. The question paper setters are requested to kindly adhere to the format given in the above table.
2. The question paper setters are requested to follow revised Bloom's Taxonomy model while preparing Question paper.
3. The question paper setters are also requested to set the questions in the following way:
 - a. 75 % of Questions - Memory and Understanding based
 - b. 20 % of Questions – Application, Analysis and Skill based
 - c. 5 % of Questions – Creativity and Evaluation based

□

Dr. V. S. Krishna. Government Degree College (A), Visakhapatnam

B.Sc. PHYSICS SYLLABUS UNDER CBCS

For Mathematics Combinations

[2021-22 Batch onwards]

I Year B.Sc.-Physics:I Semester

Course I: MECHANICS, WAVES AND OSCILLATIONS

Work load:60 hrs per semester

4 hrs/week

MODEL QUESTION PAPER

Time: 3 hrs Maxmarks: 75

SECTION-A

(Essay Type Questions)

Marks: 5x10M = 50M

Answer All questions with internal choice from each Unit

- 1.A. Derive an expression for the velocity of the Motion of a rocket? 6+4
- B. Derive the Euler equations of rotational motion for a rigid body fixed at one end?
- 2.A State and Prove Kepler's 3rd laws of planetary motion? 2+ 5+3
If the earth be one half of its present distance from the sun, What will be the number of days in a year
- B. Define central force? show that central forces are conservative? 2+8
- 3.A Derive Einstein's mass-energy relation?
- B Derive Lorentz transformation equations from special theory of relativity?
- 4.A Obtain the normal modes of two coupled oscillators?
- B Derive the differential equation and its general solution of a damped harmonic oscillator? And Briefly discuss the case of critical damping? 3+3+4
- 5.A Explain the Modes of vibration of stretched string clamped at both ends?
- B. Describe the Production of ultrasonics by Magnetostriction method?

SECTION-B

(ShortAnswerTypeQuestions)

Marks: 5x5M=25M

Answer any five out of the following ten questions

6. A rocket burns 0.02Kg of fuel /sec ejecting it as a gas with a velocity of 10,000 m/sec. What force does the gas exert on rocket?
7. Write short note on Gyroscope?
8. Briefly Explain about Global Positioning System ?
9. State two Postulates of Special theory of relativity?
10. Calculate the amplitude, angular frequency, frequency, time period and initial phase for the simple harmonic oscillation given below
$$y = 0.3 \sin (40\pi t + 1.1)$$
11. What is Relaxation time?
12. Write The Laws of transverse vibrations of strings?
13. Write Applications of ultrasonic waves?

[Note: Question Paper setters are instructed to add Numerical Problems (each of 5 marks) with a maximum weightage of 20 marks either in Section-A or Section-B covering all the five units in the syllabus]

DR VS KRISHNA GOVERNMENT DEGREE COLLEGE VISAKHAPATNAM
B.Sc. PHYSICS SYLLABUS UNDER CBCS
For Mathematics Combinations
[2020-21 Batch onwards]
1 Year B.Sc.-Physics: II Semester
Course-II: WAVE OPTICS

Work load: 60 hrs per semester

4 hrs/week

Course outcomes:

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

- Understand the phenomenon of interference of light and its formation in (1) Lloyd's single mirror due to division of wave front and (ii) Thin films, Newton's rings and Michelson interferometer due to division of amplitude.
- Distinguish between Fresnel's diffraction and Fraunhofer diffraction and observe
- the diffraction patterns in the case of single slit and the diffraction grating
- Describe the construction and working of zone plate and make the comparison of zone plate with convex lens
- Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.
- Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields.
- Explain about the different aberrations in lenses and discuss the methods of minimizing them.
- Understand the basic principles of fibre optic communication and explore the field of Holography and Nonlinear optics and their applications.

B.Sc. PHYSICS SYLLABUS UNDER CBCS

For Mathematics Combinations

[2020-21 Batch onwards]

I Year B.Sc.-Physics: II Semester

Course-II: WAVE OPTICS

Work load:60 hrs per semester

4 hrs/week

UNIT-I Interference of light:(12hrs)

Introduction, Conditions for interference of light, Interference of light by division of wave front: *Young's double slit experiment, Fresnel's biprism experiment, Calculation of thickness of thin transparent sheet* and amplitude, Phase change on reflection- Stokes' treatment, Lloyd's single mirror, Interference in thin films: *Plane parallel films in reflected and transmitted light: cosine law* and wedge- shaped films, colors in thin films, Newton's rings in reflected light- Theory and experiment, Determination of wavelength of monochromatic light, Michelson interferometer and determination of wavelength.

UNIT-II Diffraction of light: (12hrs)

Introduction, Types of diffraction: Fresnel and Fraunhofer diffractions, Distinction between Fresnel and Fraunhofer diffraction, *Distinction between interference and diffraction*, Fraunhofer diffraction at a single slit, *Fraunhofer diffraction due to double slit*, Plane diffraction grating, Determination of wavelength of light using diffraction grating, Resolving power of grating, Fresnel's half period zones, Explanation of rectilinear propagation of light, Zone plate, comparison of zone plate with convex lens. *Phase reversal zone plate and applications of zone plate.*

UNIT-III Polarisation of light:(12hrs)

Polarized light: Methods of production of plane polarized light: *Reflection, refraction*, Double refraction, Brewster's law, Malus law, Nicol prism, Nicol prism as polarizer and analyzer, Quarter wave plate, Half wave plate, *Babinet compensator*, Plane, Circularly and Elliptically polarized light-Production and detection, Optical activity, Laurent's half shade polarimeter: determination of specific rotation, *applications of polarized light*, Basic principle of LCDs.

UNIT-IV Aberrations and Fibre Optics:(12hrs)

Monochromatic aberrations: Spherical aberration, Methods of minimizing spherical aberration, Coma, Astigmatism and Curvature of field, Distortion; Chromatic aberration-the achromatic doublet; Achromatism for two lenses (i) in contact and (ii) separated by a distance. Fibre optics: Introduction to Fibers, different types of fibers: *Step index and graded index fibers, Single mode and multimode fibers and glass and plastic fibers, optical fiber seed crystal preparation methods, optical fiber drawing tower*, rays and modes in an optical fiber, Principles of fiber communication (qualitative treatment only), Advantages of fiber optic communication.

UNIT-V Lasers and Holography:(12hrs)

Lasers: Introduction, Spontaneous emission, stimulated emission, Population Inversion, Laser principle, Einstein coefficients, Types of lasers-He-Ne laser, Ruby laser and *Nd-Yag laser*, Applications of lasers; Holography: Basic principle of holography, *recording and reconstruction of holography*, Applications of holography

REFERENCE BOOKS:

- BSc Physics, Vol.2, Telugu Academy, Hyderabad
- A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand& Co.
- Optics-Murugesan, S.Chand& Co.
- Unified Physics Vol.IIOptics, Jai PrakashNath&Co.Ltd., Meerut
- Optics,F.A. Jenkins and H.G.White, McGraw-Hill
- Optics, AjoyGhatak,TataMcGraw-Hill.
- Introduction of Lasers – Avadhanulu, S.Chand& Co.
- Principles of Optics- BK Mathur, Gopala Printing Press, 19

Practical Course II: Wave Optics

Work load:30hrs

2 hrs/week

Minimum of 6 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 deviationmethod.
6. Determination of wavelength of light using diffraction grating-normal incidencemethod.
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.

Dr V.S.Krishna Govt. Degree College(A), Visakhapatnam

BLUE PRINT (Wave Optics)

1B.Sc. (Physics)- SEM-11/Course 2 Max Marks-75 Time-3Hrs. Credits:4

			SECTION-A	SECTION-B	
UNIT	S.NO.	TOPIC	ESSAY(10MARKS)	SHORT ANSWER (5MARKS)	TOTAL MARKS
I	1	INTERFERENCE OF LIGHT	2	2	30
II	2	DIFFRACTION OF LIGHT	2	2	30
III	3	POLARIZATION OF LIGHT	2	2	30
IV	4	ABERRATIONS AND FIBER OPTICS	2	2	30
V	5	LASERS AND HOLOGRAPHY	2	2	30
		TOTAL QUESTIONS	10	10	150

Note:

- 1.The question paper setters are requested to kindly adhere to the format given in the above table.
2. The question paper setters are requested to follow revised Bloom's Taxonomy model while preparing Question paper.
- 3.The question paper setters are also requested to set the questions in the following way:
 - a. 50 % of Questions - Memory and Understanding based
 - b. 30 % of Questions – Application, Analysis and Skill based
 - c. 20 % of Questions – Creativity and Evaluation based

MODEL QUESTION PAPER | Wave optics|

I B.Sc. (Physics) – SEM-II / Course -2 , Credits : 4

Time: 3 Hrs

Max. Marks: 75

SECTION – A

Answer all Questions of the following [5 X 10 = 50]

1. a) What is a Biprism? Explain about the experiment to determine the wavelength of Monochromatic light using Biprism.[OR]
b) Explain the principle, construction and the working of a Michelson interferometer. Explain also about the various fringes that can be explained with it.
2. a) Explain about the Fraunhofer Diffraction due to a single slit under normal incidence.[OR]
b) Explain the construction and the working of a Zone plate with the necessary theory.
3. a) Explain the construction and the working of a Nicol prism with a neat diagram and Write its uses.[OR]
b) what is Optical Activity? Explain how the specific rotation of a sugar solution is determined using Laurent's Half shade Polarimeter.
4. a) what is Chromatic Aberration? Derive the conditions for Achromatism when two Lenses are (i) in contact (ii) separated by a distance.[OR]
b) What is Spherical Aberration? Explain various methods for the minimisation of Spherical Aberration.
5. a) Explain the principle and the working of Ruby LASER.[OR]
b) Explain the principle and applications of Holography.

SECTION – B

Answer any FIVE Questions of the following [5 X 5 = 25]

6. Sodium light of wavelength 5890 \AA passes through narrow slits 2 mm apart. The interference Pattern is seen at a distance of 1.25 m away from the centre of the slits. Determine the Fringe Width.
7. Explain Colours in Thin films.
8. Calculate the Resolving power of a Grating in second order given that the number of lines on the Grating is 15000.
9. Distinguish between Fraunhofer and Fresnel Diffractions.
10. Write a short note on Double Refraction.
11. For a slab of flint glass the angle of polarization is found to be $62^\circ 24'$. Calculate the refractive index of the flint glass.
12. Explain about Step index and Graded index Optical fibres.
13. Write a short note on Coma.
14. Explain the terms Spontaneous Emission and Stimulated Emission.
15. Obtain the relation between Einstein coefficients.

DR. VS KRISHNA GOVERNMENT DEGREE COLLEGE VISAKHAPATNAM B.Sc.
PHYSICS SYLLABUS UNDER CBCS
For Mathematics Combinations
[2020-21 Batch onwards]
II Year B.Sc Physics: III Semester
Course-III: HEAT AND THERMODYNAMICS

Work load: 60hrs per semester

4 hrs/week

Course outcomes:

- On successful completion of this course, the student will be able to
- Understand the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law. equipartition of energies, mean free path of molecular collisions and the transport phenomenon in ideal gases
- Gain knowledge on the basic concepts of thermodynamics, the first and the second law of thermodynamics, the basic principles of refrigeration, the concept of entropy, thermodynamic potentials and their physical interpretations
- Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency
- Develop critical understanding of concept of Thermodynamic potentials the formulation of
- Maxwell's equations and its applications.
- Differentiate between principles and methods to produce low temperature and liquefy air and also understand the practical applications of substances at low temperatures.
- Examine the nature of black body radiations and the basic theories.

B.Sc. PHYSICS SYLLABUS UNDER CBCS

For Mathematics Combinations

[2020-21 Batch onwards]

II Year B.Sc.-Physics: III Semester

Course-III: HEAT AND THERMODYNAMICS

Work load:60hrs per semester

4 hrs/week

UNIT-I: Kinetic Theory of gases:

(12 hrs)

Kinetic Theory of gases-Introduction, *kinetic interpretation of temperature, average, RMS and most probable velocities*, Maxwell's law of distribution of molecular velocities (qualitative treatment only) and its experimental verification, Mean free path, Degrees of freedom, Principle of equipartition of energy (Qualitative ideas only), Transport phenomenon in ideal gases: viscosity, Thermal conductivity and diffusion of gases.

UNIT-II: Thermodynamics:

(12hrs)

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

UNIT-III: Thermodynamic Potentials and Maxwell's equations:

(12hrs)

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

UNIT-IV: Low temperature Physics:

(12hrs)

Introduction, phase transitions, 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, Liquefaction of air by Linde's method, *Liquefaction of helium by Kapitza's method*, *principal of refrigeration*, vapour compression type, *Working of refrigerator and air conditioning machine*, Production of low temperatures by adiabatic demagnetization (qualitative), Practical applications of substances at low temperatures. *Effect of chloro-fluro carbons on ozone layer.*

UNIT-V: Quantum theory of radiation:**(12 hrs)**

Blackbody and its spectral energy distribution of black body radiation, Kirchoff's law, Wein's displacement law, Stefan-Boltzmann's law and Rayleigh-Jean's law (No derivations), Planck's law of black body radiation-Derivation, Deduction of Wein's law and Rayleigh-Jean's law from Planck's law. *Types of pyrometers-Disappearing filament optical pyrometer*, Solar constant and its determination using Angstrompyroheliometer, Estimation of surface temperature of Sun.

REFERENCE BOOKS:

- ❖ BSc Physics, Vol.2, Telugu Akademy, Hyderabad
- ❖ Thermodynamics, R.C.Srivastava, S.K.Saha&AbhayK.Jain, Eastern Economy Edition.
- ❖ Unified Physics Vol.2, Optics & Thermodynamics, Jai PrakashNath&Co.Ltd., Meerut
- ❖ Fundamentals of Physics. Halliday/Resnick/Walker.C. Wiley India Edition 2007
- ❖ Heat and Thermodynamics -N BrijLal, P Subrahmanyam, S.Chand& Co.,2012
- ❖ Heat and Thermodynamics- MS Yadav, Anmol Publications Pvt. Ltd, 2000
- ❖ University Physics, HD Young, MW Zemansky,FW Sears, Narosa Publishers, New Delhi

Practical Course-III: Heat and Thermodynamics**Work load: 30 hrs****2 hrs/week****Minimum of 6 experiments to be done and recorded**

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

Dr. V.S.KRISHNA GOVERNMENT DEGREE COLLEGE (A) , VISAKHAPATNAM
PHYSICS Hons SYLLABUS (w.c.f. 2020-21)

SEMESTER- III
(HEAT AND THERMODYNAMICS)

BLUE PRINT FOR QUESTION PAPER SETTER

Max Marks-75.

Time-3Hrs.

Credits:4

			SECTION-A	SECTION-B	
UNIT	S.NO.	TOPIC	ESSAY(10MARKS)	SHORT ANSWER (5MARKS)	TOTAL MARKS
I	1	KINETIC THEORY OF GASES	2	2	30
II	2	THERMODYNAMICS	2	2	30
III	3	THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS.	2	2	30
IV	4	LOW TEMPERATURE PHYSICS	2	2	30
V	5	QUANTUM THEORY OF RADIATION	2	2	30
		TOTAL QUESTIONS	10	10	150

Note:

- 1.The question paper setters are requested to kindly adhere to the format given in the above table.
2. The question paper setters are requested to follow revised Bloom's Taxonomy model while preparing Question paper.
- 3.The question paper setters are also requested to set the questions in the following way:
 - a. 50 % of Questions - Memory and Understanding based
 - b. 30 % of Questions – Application, Analysis and Skill based
 - c. 20 % of Questions – Creativity and Evaluation based

Dr VS Krishna Govt. degree College(A) , Visakhapatnam 2021-2022
MODEL QUESTION PAPER | HEAT AND THERMODYNAMICS|

II B.Sc. (Physics) – SEM-III / Course -3 , Credits : 4

Time: 3 Hrs

Max. Marks: 75

Section - A

Answer ALL the following questions

(5X10=50 Marks)

1.a) Derive an expression for Maxwell's Law of distributions of Molecular speeds in a gas?

[OR]

b) Derive the expression for the coefficient of viscosity of gases.

2.a) State and explain the second law of Thermodynamics: Derive an expression for the efficiency of Carnot's Engine?

[OR]

b) Derive an expression for change in entropy when ice changes into water.

3. a) Define the four Thermodynamics potentials Obtain Maxwell's Thermodynamic equations using these potentials?

[OR]

b) Derive the equation for ratio of specific heats (C_p/C_v).

4. a) Derive an expression for Joule-Thomson cooling.

[OR]

b) What is adiabatic demagnetization? How is this principal used in producing low temperature?

5. a) Derive Planck's law of black body radiation. Deduce Wein's and Raleigh-jeans law from it.

[OR]

b) Define solar constant. Describe how it is determined using Angstrom Pyrheliometer?

Section-B

Answer any Five of the following questions

(5X5=25 Marks)

6. Write a short note on "Mean free path" of a molecule in a gas?
7. Calculate the rms velocity of hydrogen at STP.
8. STP & Calculate the efficiency of a Carnot engine working between the temperatures 150°C and 30°C .
9. Delle Boy Show that in a reversible process entropy remains constant
10. Derive Chanius and Clapeyron equation.
- 11 Calculate the temperature of inversion of H_2 given that T_e for H_2 is -239.9°C .
12. Explain Joule Thomson effect
13. Write short notes on the applications of substances at low temperatures
14. Explain how temperature of Sun is determined?
15. If for solar radiation is 4573\AA and Wien's constant $=2.89 \times 10^{-3} \text{ mK}$, calculate the temperature of Sun's photosphere.

Dr. V. S. Krishna. Government Degree College (A), Visakhapatnam
B.Sc. PHYSICS SYLLABUS UNDER CBCS

For Mathematics Combinations

[2021-22 Batch onwards]

II Year B.Sc.-Physics: IV Semester

Course-IV: ELECTRICITY, MAGNETISM AND ELECTRONICS

Work load: 60 hrs per semester

4 hrs/week -----

-----Course outcomes:

Course outcomes:

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

- ❖ Understand the Gauss law and its application to obtain electric field in different cases and formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant.
- ❖ Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.
- ❖ Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.
- ❖ Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.
- ❖ Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor and the comparative study of series and parallel resonant circuits.
- ❖ Describe the operation of p-n junction diodes, Zener diodes, light emitting diodes and transistors.
- ❖ Understand the operation of basic logic gates and universal gates and their truth tables

UNIT-I

1. 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, *Poisson's and Laplace equations* –Equipotential surfaces, Potential due to a (i) dipole (ii) uniformly charged sphere, *Electrostatic potential energy*.

2. Dielectrics: (6 hrs)

Dielectrics-Polar and Non-polar dielectrics. Effect of electric field on dielectrics, *Dielectric properties, electronic polarizability*, Dielectric strength, *Clausius - Mossotti relation*, Capacitance of a parallel plate condenser with dielectric slab between the plates, Electric displacement D, electric polarization P, Relation between D, E and P, Dielectric constant and electric susceptibility. *Applications in electronics*.

UNIT-II

3. Magnetostatics: (6 hrs)

Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Divergence and curl of magnetic field, *Vector Potential*, Ampere's Circuital Law and its application to Solenoid, *Energy Density in Magnetic field*, Hall effect, determination of Hall coefficient and applications.

4. Electromagnetic Induction: (6 hrs)

Faraday's laws of electromagnetic induction, Lenz's law, Self-induction and Mutual induction, *coefficient of coupling*, Self-inductance of a long solenoid, Mutual inductance of two coils, Energy stored in magnetic field, *Transformer - energy losses - efficiency*, Eddy currents and Electromagnetic damping

UNIT-III

5. Alternating currents: (6 hrs)

Alternating current - *Simple DC and AC circuits with R, L and C components*. 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.

6. Electromagnetic waves-Maxwell's equations: (6hrs)

E - M Waves and its properties, Idea of displacement current, Maxwell's Equations-Derivation, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves, Poynting theorem (Statement and proof), *Energy contribution from the E and B fields*.

UNIT-IV

7. Basic Electronic devices: (12 hrs)

Types of semiconductors, PN junction diode, *Fermi levels*, *Reverse and Forward bias*, Zener diode and Light Emitting Diode (LED) and their I-V characteristics, *Luminous efficiency and LED materials*, Zener diode as a regulator- Transistors and its operation, CB, CE and CC configurations, Input and output characteristics of a transistor in CE mode, Relation between alpha, beta and gamma; Hybrid parameters, Determination of hybrid parameters from transistor characteristics; Transistor as an amplifier.

UNIT-V:

8. Digital Electronics: (12 hrs)

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, deMorgan's laws-Statements and Proofs, Basic logic gates, NAND and NOR as universal gates, Exclusive-OR gate, *Ex-NOR gate*, *Combinational Logic*: Half adder and Full adder circuits, *Flip flop circuit*.

Text Reference

- ❖ Electrodynamics, D. J. Griffiths
- ❖ S. S. Puri, Classical Electrodynamics, Tata McGraw Hill 1997
- ❖ J. D. Jackson, Classical Electrodynamics, John Wiley and Sons 1998
- ❖ Electromagnetic Theory and Electrodynamics, Satya Prakash

REFERENCE BOOKS

- ❖ B.Sc. Physics, Vol.3, Telugu Academy, Hyderabad.
- ❖ Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.
- ❖ Electricity and Magnetism, B.D. Duggal and C.L.Chhabra. Shobanlal & Co.
- ❖ Electricity, Magnetism with Electronics, K.K. Tewari, R. Chand & Co.,
- ❖ Electricity and Magnetism, R. Murugesan, S. Chand & Co.
- ❖ Principles of Electronics, V.K. Mehta, S. Chand & Co.,
- ❖ Digital Principles and Applications, A.P. Malvino and D.P. Leach, McGraw Hill Edition.

Practical Course IV: Electricity, Magnetism and Electronics

Workload: 30 hrs

2 hrs/week

Course outcomes (Practicals):

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

- Measure the current sensitivity and figure of merit of a moving coil galvanometer.
- Observe the resonance condition in LCR series and parallel circuit
- Learn how a sonometer can be used to determine the frequency of AC-supply.
- Observe the variation of magnetic field along the axis of a circular coil carrying current using Stewart and Gee's apparatus.
- Understand the operation of PN junction diode, Zener diode and a transistor and their V-I characteristics.
- 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.

Minimum of 6 experiments to be done and recorded

1. Figure of merit of a moving coil galvanometer.
2. LCR circuit series/parallel resonance, Q factor.
3. Determination of ac-frequency – Sonometer.
4. Verification of Kirchhoff's laws and Maximum Power Transfer theorem.
5. Field along the axis of a circular coil carrying current – Stewart & Gee's apparatus.
6. P-N Junction Diode Characteristics
7. Zener Diode – V-I Characteristics
8. Zener Diode as a voltage regulator
9. Transistor CE Characteristics – Determination of hybrid parameters
10. Logic Gates – OR, AND, NOT and NAND gates. Verification of Truth Tables.
11. Verification of De Morgan's Theorems.
12. Construction of Half adder and Full Adders – Verification of truth tables

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 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
- ❖ Industrial/ Field Visits.

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adopted;

- ❖ Theoral and written examinations (Scheduled and surprise tests),
- ❖ Practical assignments and laboratory reports,
- ❖ Observation of practical skills,
- ❖ Efficient delivery using seminar presentations,
- ❖ Vivavoce interviews.

Dr. V.S. KRISHNA GOVERNMENT DEGREE COLLEGE (A), VISAKHAPATNAM**B.Sc. PHYSICS SYLLABUS (w.e.f. 2021-22)****SEMESTER- IV****Physics Course-IV: ELECTRICITY, MAGNETISM AND ELECTRONICS****BLUE PRINT FOR QUESTION PAPER SETTER****TIME: 3 Hrs****Max. Marks: 75**

S. No.	UNIT NO. /CHAPTER NO.		SHORT ANSWER QUESTIONS (5 Marks)	ESSAY QUESTIONS (10 Marks)	MARKS ALLOETD TO THE UNIT
1	UNIT-I	1. Electrostatics	1	1	30
		2. Dielectrics	1	1	
2	UNIT-II	3. Magnetostatics	1	1	30
		4. Electromagnetic Induction	1	1	
3	UNIT-III	5. Alternating currents	1	1	30
		6. Electromagnetic waves- Maxwell's equations	1	1	
4	UNIT-IV	7. Basic Electronic devices	1	2	25
5	UNIT-V	8. Digital Electronics	1	2	25
	Total no. of Questions		8	10	
	Total Marks including Choice				140

Note:

- 1.The question paper setters are requested to kindly adhere to the format given in the above table.
2. The question paper setters are requested to follow revised Bloom's Taxonomy model while preparing Question paper.
- 3.The question paper setters are also requested to set the questions in the following way:
 - a. 75 % of Questions - Memory and Understanding based
 - b. 20 % of Questions – Application, Analysis and Skill based
 - c. 5 % of Questions – Creativity and Evaluation based

Dr. V.S. Krishna Govt. degree College(A), Visakhapatnam 2021-2022

MODEL QUESTION PAPER [Electricity, Magnetism & Electronics]

I B.Sc. (Physics) – SEM-IV / Course -4, Credits: 4

Time: 3 Hrs

Max. Marks: 75

SECTION – A

Answer all Questions of the following

[5 X 10 = 50]

1. (a) Derive expressions for intensity of electric field due to a uniformly charged sphere at a point outside, on the surface and inside the sphere.

ఒక ఏకరీతి ఆవేశిత గోళము వౌలుపల,
ఉపరితలంపై మరియు లోపల ఉన్న బిందువుల వద్ద
వోల్టేజీ యొక్క ప్లస్ తో రేఖీయ రేఖకు సమీకరణము ఉత్పాదించండి.

OR[

-) b (Derive the boundary conditions that are obeyed by the \vec{E} and \vec{D} vectors at the interface of two different dielectrics.

రొండు వేరు వేరు రోదకాలము యలంతర ముఖం వద్ద \vec{E} మరియు \vec{D} సదిశలు పాటించ
సరిహద్దు

షరతులను ఉత్పాదించండి.

2. (a) Explain Biot – Savart law. Derive an expression for the Magnetic Induction at a point on the Perpendicular axis of a circular coil carrying current.

బయోట్-సవర్ట్ నియమమును వివరించండి.

వోల్టేజీ యొక్క ప్లస్ తో రేఖీయ రేఖకు సమీకరణము ఉత్పాదించండి.

తీగ చుట్టూ యొక్క కలంబలక పంపిణీ దైని బిందువు వద్ద అయస్కాంత ప్లస్
రేఖకు

సమాసమును ఉత్పాదించండి.

]

OR[

- (b) State Faraday's Electromagnetic laws of Induction and Lenz's law. Define the

coefficient of self-inductance and derive an expression for it for a long solenoid.

ఫారడే వోల్టేజీ యొక్క ఉత్పాదక రేఖీయ మాలను మరియు లొంగ్ సొలెనాయిడ్
ను తొలపండి.

స్వయం ప్లస్ తో రేఖీయ రేఖకు సమీకరణము ఉత్పాదించండి.

ఉత్పాదించండి.

3. (a) Explain the theory of LCR series resonance circuit with neat diagrams.

LCR శ్రేణి అనునాధవలయం యొక్క కనీస ధౌత్యమును తగుచిత్రములతో వివరించండి.

[OR]

-)b (Derive an equation for the Maxwell's wave equation of electromagnetic waves.

వోల్టేజీ యుద్ధయస్కాంత తరంగాల యొక్క మార్కస్ వాల తరంగ సమీకరణం కొరకు ఒక సమీకరణాన్ని కనుగొనండి.

4. (a) Explain the working of PNP and NPN Transistors in CE configuration with neat diagrams.

ఉమ్మడి ఎమ్మిటర్ వోల్టేజీ సముల PNP మరియు NPN ట్రాన్సిస్టర్ లవనోత్పన్నతగుచేత రములతో వోల్టేజీ వర్తించండి .

[OR]

- (b) Explain the three configurations of a transistor and compare CB and CE configurations.

ట్రాన్సిస్టర్ యొక్క మూడు వోల్టేజీ సములను వోల్టేజీ , ఉమ్మడి బేస్ మరియు ఉమ్మడి ఎమ్మిటర్ వోల్టేజీ సములను సరిపోల్చండి .

5. (a) Explain the functioning of a Half Adder and Full Adder along with Truth tables. అర్థంకలీని మరియు పూర్ణంకలీనిలవనోత్పన్నతగుచేత ట్రికలతో సహా వోల్టేజీ వర్తించండి .

[OR]

- (b) State and prove the two parts of the De Morgan's theorem.

డీమోర్గాన్ థీరమ్ యొక్క రెండు భాగాలను తలపాటానినీ రూపొందించండి .

SECTION – B

Answer any FIVE Questions of the following

[5 X 5 = 25]

6. Deduce the Coulomb's law from Gauss law?

గౌస్ నియమం నుండి కూలుంబ్ నియమాన్ని తీర్చిదిద్దండి?

7. Derive the relation among \vec{D} , \vec{E} and \vec{P} vectors in Dielectrics.

రేడికాలలో \vec{D} ,

\vec{E} మరియు \vec{P} సదిశల మధ్య సంబంధ సమీకరణాన్ని ఉత్పాదించండి .

8. Explain Hall effect and its importance.

హాల్ ఫలితమును వర్తించడానికే రేముఖ్యతను కూడా వర్తించండి .

9. Derive an equation for the Energy stored in magnetic field.

అయస్కాంత క్షేత్రంలో నిల్వ చేయబడిన శక్తి కొరకు ఒక సమీకరణాన్ని కనుగొనండి .

10. Define Q factor in an LCR circuit and Power factor in an A.C. circuit.

LCR వలయంలోని Q కారకము మరియు A.C .

వలయంలోని సామర్థ్య కారకములను నిర్వచించండి .

11. Write the Differential and the Integral forms of the Maxwell's equations.

మార్క్స్ వాలిస్ మరీ కరణాలయ్ మార్క్ కలవకలనమరీయుసంకలనరూపాలను వర్ణించాడు.

12. Explain how a Transistor acts as an Amplifier.

ఒక ట్రాన్సిస్టర్ వర్ధకముగా ఎలా పనిచేస్తుందో వివరించండి.

13. Convert the Binary numbers $(10100)_2$ and $(11001)_2$ to Decimal form.

$(10100)_2$ మరియు $(11001)_2$ ద్వాంశసంఖ్యలను దశాంశసంఖ్యలుగా మార్చండి.

Dr. V. S. Krishna. Government Degree College (A), Visakhapatnam
B.Sc. PHYSICS SYLLABUS UNDER CBCS

For Mathematics Combinations

[2020-21 Batch onwards]

II Year B.Sc.-Physics: IV Semester

Course V: MODERN PHYSICS

Work load:60hrs per semester

4 hrs/week

Course outcomes:

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

- ❖ Develop an understanding on the concepts of Atomic and Modern Physics, basic elementary quantum mechanics and nuclear physics.
- ❖ Develop critical understanding of concept of Matter waves and Uncertainty principle.
- ❖ Get familiarized with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications.
- ❖ Examine the basic properties of nuclei, characteristics of nuclear forces, salient features of nuclear models and different nuclear radiation detectors.
- ❖ Classify Elementary particles based on their mass, charge, spin, half-life and interaction.
- ❖ Get familiarized with the nano materials, their unique properties and applications.
- ❖ Increase the awareness and appreciation of superconductors and their practical applications.

UNIT-I:

1. Atomic and Molecular Physics:(12 hrs)

Drawbacks of Bohr's theory, Sommerfeld's elliptical orbits, Vector atom model and Stern-Gerlach experiment, Quantum numbers associated with it, Pauli's exclusion principle, Angular momentum of the atom, Coupling schemes, Spectral terms and spectral notations, Relation between Magnetic dipole moment and angular momentum of an orbiting electron, Selection rules, Intensity rules, Fine structure of Sodium D-lines, Zeeman effect, Experimental arrangement to study Zeeman effect; Raman effect, Characteristics of Raman effect, Experimental arrangement to study Raman effect, Quantum theory of Raman effect, Applications of Raman effect.

UNIT-II:

2. Matter waves & Uncertainty Principle: (12 hrs)

Wave – particle duality, Matter waves, de Broglie's hypothesis and its Consequences, Wave length of matter waves, Properties of matter waves, Davisson and Germer's experiment, Phase and group velocities, Wave packets, Heisenberg's uncertainty principle for position and momentum & energy and time, Its importance and applications, Illustration of uncertainty principle using diffraction of beam of electrons (Diffraction by a single slit) and photons (Gamma ray microscope), Bohr's principle of complementarity.

UNIT-III:

3. Quantum (Wave) Mechanics:(12 hrs)

Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equations-Derivations, Physical interpretation of wave function, *Probability density*, *Probability current density*, *Operators*, Eigen functions, Eigen values, Application of Schrodinger wave equation to (i) one dimensional potential box of infinite height(Infinite Potential Well) and (ii) one dimensional harmonic oscillator

UNIT-IV:

4. Nuclear Physics:(12 hrs)

Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; *exchange forces*, Nuclear forces: Characteristics of nuclear forces- Yukawa's meson theory; *Radioactivity*, *Radiation Hazards*, *Nuclear fission and fusion*, Nuclear Models: Liquid drop model, The Shell model, Magic numbers; Nuclear Radiation detectors: G.M. Counter, Cloud chamber, Solid State detector; Elementary Particles: Elementary Particles and their classification.

UNIT-V:

5. Nano materials:(7hrs)

Nano materials – Introduction, Electron confinement, Size effect, Surface to volume ratio, *Energy at the nanoscale molecular and atomic size*, Classification of nano materials– (0D, 1D, 2D); *dimensionality and size dependent phenomena*, Quantum dots, Nano wires, Fullerene, CNT, Graphene (Mention of structures and properties), *DOS in quantum wells, quantum wires, and quantum dots*. Distinct properties of nano materials (Mention-mechanical, optical, electrical, and magnetic properties); *Confinement and transport in nanostructure*, Mention of applications of nano materials: (Fuel cells, Phosphors for HD TV, Next Generation Computer chips, elimination of pollutants, sensors)

6. Superconductivity: (5 hrs)

Introduction to Superconductivity, *Zero Resistance*, Experimental results-critical temperature, critical magnetic field, Meissner effect, *Persistent currents*, Isotope effect, *Entropy of superconductors*, Type I and Type II superconductors, BCS theory (elementary ideas only) – *Cooper pairs*, Applications of superconductors, *SQUID*, *recent discoveries on high temperature superconductors*.

REFERENCE BOOKS

- ❖ BSc Physics, Vol.4, Telugu Academy, Hyderabad.
- ❖ Atomic Physics by J.B. Rajam; S.Chand & Co.,
- ❖ Modern Physics by R. Murugesan and Kiruthiga Siva Prasath. S. Chand & Co.
- ❖ Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
- ❖ Nuclear Physics, D.C.Tayal, Himalaya Publishing House.
- ❖ S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publ.Co.)
- ❖ K.K.Chattopadhyay & A.N.Banerjee, *Introd.to Nanoscience and Technology* (PHI Learning Priv.Limited).
- ❖ Nano materials, A K Bandopadhyay. New Age International Pvt Ltd (2007)
- ❖ Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj, BB Rath and J Murday-Universities Press-IIM.

Practical Course-V: Modern Physics

Workload: 30 hrs

2 hrs/week

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

- Measure charge of an electron and e/m value of an electron by Thomson method.
- Understand how the Planck's constant can be determined using Photocell and LEDs.
- Study the absorption of α -rays and β -rays, Range of β -particles and the characteristics of GM counter
- Determine the Energy gap of a semiconductor using thermistor and junction diode.

Minimum of 6 experiments to be done and recorded

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

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(ontopicswherethecontentcanbecompiledby
smalleraspectsanddata(Individuals orgroupsasteams))
- ❖ Fieldstudies(individualobservationsandrecordingsaspersyllabuscontentandrel
atedareas (Individualorteam activity)
- ❖ Study projects (by very small groups of students on selected local real-time
problemspertaining to syllabus or related areas. The individual participation
and contribution ofstudentsshall be ensured(team activity)

GENERAL

- ❖ GroupDiscussion
- ❖ VisittoResearchInstitutions/laboratoriesandrelatedindustries.
- ❖ Field Trips

RECOMMENDEDASSESSMENTMETHODS

Someofthefollowingsuggested assessmentmethodologiescould beadopted;

- ❖ Theoralandwrittenexaminations (Scheduledandsurprisetests),
- ❖ Practicalassignmentsandlaboratoryreports,
- ❖ Efficientdeliveryusingseminarpresentations.
- ❖ Vivavoceinterviews.

Dr. V.S. KRISHNA GOVERNMENT DEGREE COLLEGE (A), VISAKHAPATNAM

B.Sc. PHYSICS SYLLABUS (w.e.f. 2021-22)

SEMESTER- IV

Physics Course – V (MODERN PHYSICS)

BLUE PRINT FOR QUESTION PAPER SETTER

TIME: 3 Hrs

Max. Marks: 75

S. No.	UNIT NO. /CHAPTER NO.		SHORT ANSWER QUESTIONS (5 Marks)	ESSAY QUESTIONS (10 Marks)	MARKS ALLOETD TO THE UNIT
1	UNIT-I	1. Atomicand MolecularPhysics	2	2	30
2	UNIT-II	2. Matterwaves & UncertaintyPrinciple	2	2	30
3	UNIT-III	3. Quantum(Wave) Mechanics	1	2	25
4	UNIT-IV	4. NuclearPhysics	1	2	25
5	UNIT-V	5. Nanomaterials	1	1	30
		6. Superconductivity	1	1	
	Total no. of Questions		8	10	
	Total Marks including Choice				140

Note:

- 1.The question paper setters are requested to kindly adhere to the format given in the above table.
2. The question paper setters are requested to follow revised Bloom's Taxonomy model while preparing Question paper.
- 3.The question paper setters are also requested to set the questions in the following way:
 - a. 75 % of Questions - Memory and Understanding based
 - b. 20 % of Questions – Application,Analysis and Skill based
 - c. 5 % of Questions –Creativity and Evaluation based

Dr. V.S. Krishna Govt. degree College(A), Visakhapatnam 2021-2022

MODEL QUESTION PAPER [Modern Physics]

II B.Sc. (Physics): SEM-IV / Course -5, Credits: 4

Time: 3 Hrs

Max. Marks: 75

SECTION – A

Answer all Questions of the following

[5 X 10 = 50]

1. (a) Explain the experimental arrangement of Stern – Gerlach experiment and also explain how the existence of spin Angular momentum for an electron is confirmed through the experiment with neat diagrams.

స్టెర్న-గెర్లాచ్-ప్రయోగం.

గెర్లాచ్-ప్రయోగం అమరికను వివరించే మరొక వివరణను ఒక ఎలక్ట్రాన్ స్పిన్ కోణీయ ద్రవ్యమంతా.

ఉంటుందని ఈ ప్రయోగము ద్వారా ఎలా నిరూపించావచ్చో తగుచిత్రాలతో వివరించండి.

]

OR[

-) b (Explain Raman effect and explain the experimental arrangement to study it .

రామన్ ఫలితమును వివరించే మరొక వివరణను దానిని అధ్యయనంచేయు ప్రయోగ అమరికను

]

కూడా వివరించండి .

2. (a) Explain Davisson- Germer experiment to prove the existence of Matter waves.

డేవిస్సన్-గెర్మర్ ప్రయోగం.

గెర్మర్-ప్రయోగం ద్వారా ద్రవ్య తరంగాల ఉనికిని ఎలా నిరూపించావచ్చో వివరించండి.

]

OR[

- (b) Explain the construction and working of Gamma Ray microscope to verify

Heisenberg's Uncertainty principle of position and momentum coordinates.

గెమా రే కిరణ సూక్ష్మ దర్శకానికి నిర్మాణము మరియు పనితీరును వివరించు సూక్ష్మము.

ద్రవ్య తరంగ నిరూపకాలకు సంబంధించిన హైసెన్ బర్గ్ నిర్మాణమును ఎలా సరిచూడవచ్చో వివరించండి.

3. (a) Derive Schrodinger's Time dependent and Time Independent wave equations.

ష్రోడింగర్ కాలాధారిత మరియు కాలంపై ఆధారపడని తరంగ సమీకరణాలను ఉత్పాదించండి.

[OR]

-)b (Derive expressions for allowed energy values and the corresponding wave functions for a particle in an infinite one-dimensional potential well.

ఒక ఏకమితీయ అనంత శక్తి మహా ట్రాప్ లోని కణానికి అనుబంధిత కరణీయ తరంగ ఫలములను మరియు సంబంధిత తరంగ ప్రమాణాలను ఉత్పాదించండి.

4. (a) Explain the Liquid drop model of an Atomic nucleus.

పరమాణుకోశం ద్వారా రకరక వర్ణావళిని ఉత్పత్తి చేసే పరికరం.

[OR]

b) (Explain the working of G.M. Counter.

G.M. కౌంటర్ యొక్క పనితీరును వివరించండి.

5. (a) Define Nanomaterials. Explain the Classification, Properties and applications of Nanomaterials.

నానోమీటర్ల స్థాయిలో ఉన్న పదార్థాలను వివరించండి.

నానోమీటర్ల స్థాయిలో ఉన్న పదార్థాలను వర్గీకరించండి, వాటి లక్షణాలు మరియు అనువర్తితలను వివరించండి.

(b) What is Superconductivity? Explain Meisner effect and the other properties of super conductors.

అత్యంత దృఢత్వం ఉన్న పదార్థాలను వివరించండి మరియు వాటి లక్షణాలు మరియు అనువర్తితలను వివరించండి.

SECTION – B

Answer any FIVE Questions

6. Explain L-S coupling and J-J coupling.

L-S సంకర మూలము మరియు J-J సంకర మూలములను వివరించండి.

7. Write any five applications of Raman effect.

రామన్ ఫలితము యొక్క ఐదు అనువర్తితలను వివరించండి.

8. Derive the relation between phase velocity and group velocity.

దశావళి మరియు సమూహ వేగం మధ్య సంబంధాన్ని నిర్వచించండి.

9. Explain the basic postulates of Quantum Mechanics.

క్వాంటం యాంత్రిక శాస్త్రం యొక్క ప్రాథమిక పోస్టులేట్లను వివరించండి.

10. Define the Size effect and Surface to volume ratio of Nanomaterials.

నానోమీటర్ల స్థాయిలో ఉన్న పదార్థాల యొక్క సైజు మరియు ఉపరితల నిష్పత్తిని నిర్వచించండి.

11. Explain the Type I and Type II superconductors.

టైప్ I మరియు టైప్ II సూపర్ కండక్టర్లను వివరించండి.

12. Calculate the de-Broglie wavelength associated with a proton moving with a speed of 5000 m/s.

5000

m/s వేగంతో కదులుతున్న ప్రోటాన్ కు సంబంధించిన దిబ్రోగ్లీ తరంగదైర్ఘ్యంను నిర్వచించండి.

($h = 6.625 \times 10^{-34}$ J-s, $m_p = 1.6726 \times 10^{-27}$ Kg).

13. A Neutron breaks into a proton and an electron. Calculate the Binding energy corresponding to the mass defect in the reaction.

ఒక న్యూట్రాన్ పరోటాన్ మరియు ఎలక్ట్రాన్ లకు విడిచిపెట్టిన శక్తిని నిర్వచించండి.

($m_p = 1.6726 \times 10^{-27}$ Kg, $m_e = 9.11 \times 10^{-31}$ Kg, $m_n = 1.6747 \times 10^{-27}$ Kg).

2)

Dr. V. S. Krishna. Government Degree College (A), Visakhapatnam

B.A.,B.Com.& B.Sc.Programmes
RevisedCBCSw.e.f.2021-22

**SKILL DEVELOPMENT COURSES(SDCs)
SCIENCESTREAM**

ELECTRICALAPPLIANCES

Work load: 30 hrs per semester

Total credits: 02

2 hrs/week

Max. Marks: 50

Course Objectives:

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

- ❖ Understand important elements and parameters of electrical and electronics appliances.
- ❖ Understand key elements of split AC and Refrigerators.
- ❖ Understand domestic house wiring and layout.
- ❖ Basic safety electrical practices.
- ❖ Acquire necessary skills/hands on experience/working knowledge on multimeters, galvanometers, ammeters, voltmeters, ac/dc generators, motors, transformers, single phase and three phase connections, basics of electrical wiring with electrical protection devices.
- ❖ Understand the working principles of different household domestic appliances.
- ❖ Check the electrical connections at house-hold but will also learn the skill to repair the electrical appliances for the general troubleshoots and wiring faults.

Learning Outcomes

- ❖ Repair maintenance of the basic electrical and electronics appliances.
- ❖ Identification to protective devices.
- ❖ Repair and maintenance of the split AC and Refrigerators.
- ❖ Able to do domestic wiring and maintenance.

SYLLABUS

UNIT-I

(6 hrs)

Voltage, Current, Resistance, Capacitance, Inductance, Electrical conductors and Insulators, Ohm's law, Series and parallel combinations of resistors, Galvanometer, Ammeter, Voltmeter, Multimeter, Transformers, Electrical energy, Power, Kilowatt hour (kWh), consumption of electrical power

UNIT-II

(10hrs)

Direct current and alternating current, RMS and peak values, Power factor, Single phase and three phase connections, Basics of House wiring, Star and delta connection, Electric shock, First aid for electric shock, Overloading, Earthing and its necessity, Short circuiting, Fuses, MCB, ELCB, Insulation, Inverter, UPS

UNIT-III

(10hrs)

Principles of working, parts and servicing of Electric fan, Electric Iron box, Water heater, Induction heater, Microwave oven, Refrigerator, Concept of illumination, Electric bulbs, CFL, LED lights, Energy efficiency in electrical appliances, IS codes & IE codes.

Co-curricular Activities (Handson Exercises): (04hrs)

[Any four of the following may be taken up]

1. Studying the electrical performance and power consumption of a given number of bulbs connected in series and parallel circuits.
2. Measuring parameters in combination DC circuits by applying Ohm's Law for different resistor values and voltage sources.
3. Awareness of electrical safety tools and rescue of person in contact with live wire.
4. Checking the specific gravity of lead acid batteries in home UPS and topping-up with distilled water.
5. Identifying Phase, Neutral and Earth on power sockets.
6. Identifying primary and secondary windings and measuring primary and secondary voltages in various types of transformers.
7. Observing the working of transformer under no-load and full load conditions.
8. Observing the response of inductor and capacitor with DC and AC sources.
9. Observing the connections of elements and identify current flow and voltage drops.
10. Studying electrical circuit protection using MCBs, ELCBs
11. Assignments, Model exam, Group discussion, Quiz etc.

Reference Books:

1. A Text book on Electrical Technology, B.L. Theraja, S. Chand & Co.,
2. A Text book on Electrical Technology, A.K. Theraja.
3. Performance and design of AC machines, M.G. Say, ELBS Edn.,
4. Handbook of Repair & Maintenance of domestic electronics appliances; BPB Publications
5. Consumer Electronics, S.P. Bali, Pearson
6. Domestic Appliances Servicing, K.P. Anwer, Scholar Institute Publications

Dr. V. S. Krishna. Government Degree College (A), Visakhapatnam

B.A.,B.Com. & B.Sc.Programmes
RevisedCBCSw.e.f.2021-22

SKILL DEVELOPMENT COURSES (SDCs)
SCIENCESTREAM

ELECTRICALAPPLIANCES

BLUE PRINT FOR QUESTION PAPER SETTER

Max.Marks:50

Time:1½hrs(90Minutes)

S. No.	UNIT NO.	SHORT ANSWER QUESTIONS (5 Marks) SECTION - A	ESSAY QUESTIONS (10 Marks) SECTION - B	MARKS ALLOETD TO THE UNIT
1	UNIT-I	3	2	35
2	UNIT-II	3	2	35
3	UNIT-III	2	1	20
	Total no. of Questions	8	5	
	Total Marks including Choice			90

Note:

- 1.The question paper setters are requested to kindly adhere to the format given in the above table.
2. The question paper setters are requested to follow revised Bloom's Taxonomy model while preparing Question paper.
- 3.The question paper setters are also requested to set the questions in the following way:
 - a. 75 % of Questions - Memory and Understanding based
 - b. 20 % of Questions – Application, Analysis and Skill based
 - c. 5 % of Questions – Creativity and Evaluation based

Dr. V. S. Krishna. Government Degree College (A), Visakhapatnam

B.A., B.Com. & B.Sc. Programmes
Revised CBCS w.e.f. 2021-22

SKILL DEVELOPMENT COURSES (SDCs)
SCIENCE STREAM

ELECTRICAL APPLIANCE

MODEL QUESTION PAPER

Max. Marks: 50

Time: 1½ hrs (90 Minutes)

SECTION-A

(4x5M=20 Marks)

Answer any **four** questions. Each answer carries 5 marks
(Atleast 1 question should be given from each Unit)

1. What is resistance? Explain ohm's law?
2. Write about multimeter?
3. Explain the terms (i) Direct Current (DC) and (ii) Alternating Current (AC)?
4. What is the difference between UPS and Inverter?
5. Write a brief note on electric shock?
6. What is the principle of working of electric bulb?
7. Write a short note on the working of microwave oven?
8. Write a short note on the energy efficiency in electrical appliances?

SECTION- B

(3x10M =30 Marks)

Answer any **three** questions. Each answer carries 10 marks
(Atleast 1 question should be given from each Unit)

9. Distinguish between Electrical conductors and Insulators?
10. What is electrical power? Discuss the consumption of electrical power with an example.
11. Discuss about MCB and ELCB?
12. Explain in detail about single phase and three phase connections?
13. Explain the parts and working of Refrigerator?

Dr. V.S.KRISHNA GOVERNMENT DEGREE COLLEGE (A) , VISAKHAPATNAM

For All B.A., B.Com, B.Sc., Courses

Revised CBCS w.e.f. 2021-22

SKILL DEVELOPMENT COURSES

SYLLABUS OF SOLAR ENERGY

Total 30 hrs (02h/wk),

02 Credits & Max Marks: 50

Learning Outcomes:

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

1. *Acquire knowledge on solar radiation principles with respect to solar energy estimation.*
2. *Get familiarized with various collecting techniques of solar energy and its storage*
3. *Learn the solar photovoltaic technology principles and different types of solar cells for energy conversion and different photovoltaic applications.*
4. *Understand the working principles of several solar appliances like Solar cookers, Solar hot water systems, Solar dryers, Solar Distillation, Solar greenhouses*

UNIT-I–Solar Radiation: (8hrs)

Sun as a source of energy, *Sun Structure*, Solar radiation, Solar radiation at the Earth's surface, *direct, diffuse and total radiations*. Measurement of Solar radiation-Pyroheliometer, Pyranometer, Sunshine recorder, Prediction of available solar radiation, Solar energy-Importance, Storage of solar energy, Solar pond

UNIT-II–Solar Thermal Systems: (10 hrs)

Principle of conversion of solar radiation into heat, Collectors used for solar thermal conversion: Flat plate collectors and Concentrating collectors, *Evacuated Tube collector*, Solar Thermal Power Plant, Solar cookers, Solar hot water systems-*natural and forced circulation types*., Solar dryers, Solar Distillation, Solar greenhouses.

UNIT-III–Solar Photovoltaic Systems: (12 hrs)

Conversion of Solar energy into Electricity - Photovoltaic Effect, Solar photovoltaic cell and its working principle, Different types of Solar cells, *Measurement of I-V characteristics of solar cell*, Series and parallel connections, Photovoltaic applications: Battery chargers, domestic lighting, street lighting and water pumping, *Types of solar PV systems [Grid Connected, Stand-alone Systems, Hybrid Systems]*

Dr. V.S.KRISHNA GOVERNMENT DEGREE COLLEGE (A) , VISAKHAPATNAM

PHYSICS Hons SYLLABUS (w.e.f. 2021-22)

AP State Council Of Higher Education

BA,B.Com and B.Sc Programs

SKILL DEVELOPMENT COURSE

SOLAR ENERGY

BLUE PRINT FOR QUESTION PAPER SETTER

TIME : 90 min

Max. Marks :50

Sl.No.	UNIT NO. /CHAPTER NO.		SHORT ANSWER QUESTIONS 5 MARKS	ESSAY QUESTIONS 10 MARKS	MARKS ALLOETD TO THE UNIT
1	UNIT I	1.Solar Radiation	3	2	35
2	UNIT II	2. Solar Thermal System	3	2	35
3	UNIT III	3.Solar PV System	2	1	20
	Total Marks including Choice				90

Note: 1. The question paper setters are requested to kindly adhere to the format given in the above table.

Note:

1. The question paper setters are requested to kindly adhere to the format given in the above table.
2. The question paper setters are requested to follow revised Bloom's Taxonomy model while preparing Question paper.
3. The question paper setters are also requested to set the questions in the following way:
 - a. 75 % of Questions - Memory and Understanding based
 - b. 20 % of Questions – Application, Analysis and Skill based
 - c. 5 % of Questions – Creativity and Evaluation based

Dr V S KRISHNA GOVERNMENT DEGREE COLLEGE(A)
VISAKHAPATNAM

(Implemented from Academic Year 2020-21) PROGRAMME: FOUR YEAR B.Sc. (Hons)

Domain Subject: PHYSICS

Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus with Learning Outcomes, References, Co-curricular Activities & Model Q.P. Pattern)

Structure of SECs for Semester-V

(To choose one pair from the three alternate pairs of SECs)

Univ. Code	Course No. 6&7	Name of Course	Th. Hrs / Week	IE Marks	EE Marks	Credits	Prac Hrs/ Wk	Marks	Credits
	6A	Optical Instruments and Optometry	3	25	75	3	3	50	2
	7A	Optical Imaging and Photography	3	25	75	3	3	50	2

OR

	6B	Low Temperature Physics & Refrigeration	3	25	75	3	3	50	2
	7B	Solar Energy and Applications	3	25	75	3	3	50	2

OR

	6C	Applications of Electricity & Electronics	3	25	75	3	3	50	2
	7C	Electronic Instrumentation	3	25	75	3	3	50	2

Note-1: For Semester-V, for the domain subject Physics, any one of the above three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).

Note-2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the skills embedded in syllabus citing related real field situations.

Dr V S KRISHNA GOVERNMENT DEGREE COLLEGE(A) VISAKHAPATNAM

Course Code:

Four-year B.Sc. (Hons) Domain Subject: **PHYSICS** IV Year B. Sc.(Hons) – Semester – V

Max Marks: 100+50

Course 6A: OPTICAL INSTRUMENTS AND OPTOMETRY

[Skill Enhancement Course (Elective), Credits: 05]

I. Learning Outcomes: Students at the successful completion of the course will be able to:

1. Understand the construction and working principles of various optical instruments used in daily life.
2. Acquire a critical knowledge on the various defects of eye and their correcting methods with suitable lenses.
3. Demonstrate skills of using biological microscope through hands on experience.
4. Understand the various techniques used in optometry and computer based eye testing.
5. Comprehend the various applications of microscopes and telescopes.

II. Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training, Unit tests etc.)*

UNIT-I OPTICAL MICROSCOPES (10hrs)

Introduction to Microscopes, Need of a Microscope, Different types of microscopes and their uses, Simple microscope-Construction, Magnifying power, normal adjustment; Compound microscope-Construction, Magnifying power, normal adjustment, Phase contrast microscope-Operating principle, Travelling microscope-Construction, working and uses

UNIT-II TELESCOPES (10hrs)

Introduction to Telescopes, Different types of Telescopes and their uses, Refracting Telescopes and Reflecting telescopes, Construction, working and magnifying power of Astronomical Telescope and Terrestrial Telescopes, Binoculars – working principle and applications.

UNIT-III APPLICATIONS OF OPTICAL INSTRUMENTS (10hrs)

Introductory ideas and applications of various microscopes viz., (i) Optical microscopes (Compound microscope, Stereo microscope, Confocal microscope) (ii) Electron microscopes (TEM, SEM), (iii) Scanning Probe microscope (iv) Scanning Acoustic microscope and (v) X-ray microscope.

Introductory ideas and applications of various telescopes viz., (i) Optical telescopes (ii) Radio telescopes (iii) Solar telescopes (iv) Infrared telescope (v) Ultraviolet telescope (vi) X-ray telescope and (vii) Gamma ray telescope

UNIT-IV OPTICAL VISION (10hrs)

Introduction to optical Vision, Eye as an optical instrument, Formation of image in the eye and the camera, Ophthalmic lenses, Power of the lenses, Far point and near points, Myopia and Hypermetropia defects, Removal of defects in vision using ophthalmic lenses, Contact lenses-Working principle, Different types of Contact lenses.

UNIT-V OPHTHALMIC TECHNIQUES AND OPTOMETRY (10hrs)

Ophthalmoscope and keratometer and their working principles, Evaluation of eye disorders, Guidelines for standardized eye chart preparation, Simple phoropter and its working

principle and its uses, Checking the power of lenses, Principles of Computer based eye testing

References:

1. Optics and Optical Instruments: An Introduction by B. K. Johnson, Dover Publications.
2. Modern Optical Instruments and their construction by or ford Henry-Publisher: Biblio Life, LLC.
3. A Text Book of Optics by Brj Lal and N.Subramanyam, S.Chand & Co.
4. Practical Optics by Menn Naftly, Elsevier Science Publishing.
5. Applications of Optics in daily life | CK-12 Foundation. <https://flexbooks.ck12.org> >
6. Web sources suggested by the teacher concerned and the college librarian including Reading material.

Course 6A: Optical Instruments and Optometry –

PRACTICAL SYLLABUS (30 Hrs. Max Marks: 50)

IV. Learning Outcomes: On successful completion of this practical course, student shall be able to:

1. List out, identify and handle various equipments like binoculars, telescopes and microscopes.
2. Learn the procedures of operation of various optical instruments.
3. Demonstrate skills on testing the power of lenses, improving the resolution of telescopes and microscopes.
4. Acquire skills in observing and measuring the power, focal length and different refractive errors of eye.
5. Perform some techniques related to testing the blood and other biological samples.
6. Understand the technique of operation of Computer eye testing and evaluation.

V. Practical (Laboratory) Syllabus: (30 hrs)

1. Evaluation of magnifying power of simple microscope.
2. Measurement of reflection and transmission coefficient of certain materials using a microscope.
3. Resolving power of telescope
4. Determination of radii of different capillary tubes using travelling microscope.
5. Refractive index of a liquid (water) using (i) concave mirror and (ii) convex lens and a plane mirror.
6. Removal of refractive errors of eye using combination of lenses.
7. Determination of power of a convex lens by finding its focal length.

VI. Lab References:

1. A Practical Guide to Experimental Geometrical Optics by Yuriy A. Garbovskiy-Cambridge Univ. Press
2. <https://physics.columbia.edu/sites/default/files/content/Lab%20Resources/1292%20Lab%20Manual.pdf>
3. https://www.lnmiit.ac.in/Department/Physics/uploaded_files/lab-manual.pdf
4. Basic Optics Experiments -<http://www.phys.unm.edu> > Optics Lab > Basics
5. A Practical Guide to Experimental Geometrical Optics by Yuriy A. Garbovskiy, Anatoliy V. Glushchenko, Cambridge Univ. Press
6. Web sources suggested by the teacher concerned.
http://www.phy.olemiss.edu/~thomas/web/lab/Optics_lab_Items/Telescope_Microscope_PROCED_Spring_2018.pdf

VII. Co-Curricular Activities

(a) Mandatory: (Training of students by teacher in field related skills: (lab: 10 + field: 05))

1. **For Teacher:** Training of students by the teacher (if necessary, by a local expert) in laboratory/field for a total of not less than 15 hours on the field techniques/skills on the familiarization of various optical instruments available in the laboratory; construction of different types of telescopes and their comparison in construction, operation and their

utility and limitations; the details of construction of eye and various defects in the eye sight, emerging techniques in the design of eye lenses including contact lenses and making the student to understand on the testing of a biological sample using a clinical microscope

For Student: Students shall (individually) visit and observe the functioning of optical instruments at any one of the following places /centres like (a) pathological laboratory **or** (b) a local ophthalmologist **or** (c) a local optician to understand the various types of eye lenses **or** (d) a local computer based eye testing centre **or** (e) an optician, who fixes contact lenses **or** (f) a local cinema theatre **or** (g) a planetarium. Student shall write the observations and submit a hand-written Fieldwork/Project work not exceeding 10 pages in the given format to the teacher.

2. Max marks for Fieldwork/Project work: 05.
3. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements.*
4. Unit tests (IE).

(b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments (including technical assignments like identifying tools in the lens grinding, frame fitting, lens cleaning culture and other operational techniques with safety and security, IPR)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in optical instruments and optical lenses, contact lenses.
5. Making a model microscope and measuring its magnification.
6. Making a simple astronomical telescope using two convex lenses.
7. Checking the power of your spectacles or lenses at home.
8. Students shall take up making their own (i) Telescope and (ii) Binoculars with the accessories available at home.

<https://paksc.org/pk/science-experiments/physics-experiments/how-to-make-astronomical-telescope>

<https://kids.nationalgeographic.com/nature/article/make-a-telescope>

<https://learning-center.homesciencetools.com/article/how-to-make-a-telescope-optical-science-project/>

<http://scipop.iucaa.in/Amateurs/telemaking.html>

9. Collection of material/figures/photos related to various types of lenses and their power.
10. Visit to any eye research laboratories, if available
11. Invited lectures and presentations on related topics by field/industrial experts

Dr V S KRISHNA GOVERNMENT DEGREE COLLEGE(A) VISAKHAPATNAM

Course Code:

Four-year B.Sc. (Hons) Domain Subject: **PHYSICS** IV Year B. Sc.(Hons) – Semester – V

Max Marks: 100+50

Course 7A: OPTICAL IMAGING AND PHOTOGRAPHY

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes: Students after successful completion of the course will be able to:

1. Identify the different types of cameras and camera lenses according to different purposes.
2. Identify and understand the focal length of the different types of lenses
3. Acquire a critical knowledge on natural and artificial sources of light and their application in photography.
4. Demonstrate skills of camera usage especially Digital Cameras.
5. Understand the various Image development and editing techniques.
6. Comprehend the concept of different types of common shooting techniques.

II. Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training, Unit tests etc.)*

Unit-I: INTRODUCTION TO PHOTOGRAPHY:

(10 hrs)

Photography-Introduction, Working principle of a camera, Image formation in simple camera and human eye, Types of cameras , Pin-hole camera , Single Lens Reflex (SLR) camera, Twin Lens Reflex (TLR) camera , Digital Single-lens reflex camera (DSLR), Digital camera, Drone flying cameras, Care and maintenance of camera, Factors influencing choice of camera

Unit-II: DIGITAL PHOTOGRAPHY:

(10 hrs)

Different types of Digital cameras and their parts, Working of DSLR camera, Types of lenses-Normal, Wide angle, telephoto, Zoom lenses, Digital Image formation, Digital camera image sensors, Size of the image, Depth of focus, Depth of field, Exposure time, Aperture, Shutter speed, ISO, filters, knowledge on pixels and their uses , resolution, Camera accessories

Unit-III: PHOTOGRAPHIC LIGHT SOURCES:

(10 hrs)

Need for the light in photography, Light sources- Natural light, Sun light, Moon light, Ambient light, Artificial light sources-Flood light, Spot light, Halogen light, Halogen flash light, Digital lights, Exposure, Studio photography

Unit-IV: PHOTOGRAPHIC SHOOTING TECHNIQUES:

(10 hrs)

Significance and role of Camera lens in photo shooting, Arrangement of lenses in a Camera-Positioning, Techniques involved in the use of DSLR cameras, Usage of Filters, Techniques of Photomicrography, High speed Photography with motor driven camera, Basic ideas on Underwater Photography, Medical Photography, Astronomical Photography, Infra-Red (IR) Photography, Ultra Violet (UV) Photography and Forensic Photography.

Unit-V : PHOTO MANIPULATION :

(10 hrs)

Developing and printing the photographs, equipment and materials used in developing and printing, image mixing and printing, Image editing through image editing software's like Adobe Photoshop – Adjustment of Brightness, Contrast, Tonal and Colour Values, Factors influencing

quality of digital image, Methods of storing and processing, Image transportation through Pendrive, CD, HDD and CLOUD [Internet]

III Reference Books:

1. Object and image; An introduction to photography by George M Craven, PHI
2. An Introduction to Digital Photo Imaging Agfa, 1994
3. Advance Photography by M. Langford.
4. Digital Photography-A hands on Introduction by Phillip Krejcarek, Delmer Publishers
5. Multimedia – An Introduction by John Villamil, PHI
6. <https://www.adobe.com/in/creativecloud/photography/discover/dslr-camera.html>
7. Web sources suggested by the teacher concerned and the college librarian including reading material.

Course 7A: Optical Imaging and Photography

PRACTICAL SYLLABUS (30 Hrs, Max Marks: 50)

IV. Learning Outcomes: On successful completion of this practical course, student shall be able to:

1. List out, identify and understand various image formation techniques including Eye.
2. Learn the procedures of using Analog and Digital cameras.
3. Demonstrate the focusing techniques of Analog and Digital cameras.
4. Acquire skills in the editing and development of photos and videos.
5. Perform some experimental skills related to images, videos using the equipment available in the lab or in a local studio.

V. Practical (Laboratory) Syllabus: (30 hrs)

1. Construction of a simple pin hole Camera and study it's working.
2. Capture an image using a Digital Camera and apply editing techniques.
3. Understanding various image formats and convert one image format into other (For ex: JPEG to BMP)
4. Convert a video stream into image stream by using a suitable editing software.
5. Evaluate the number of pixels and size of digital Image.
6. Comparison of the quality of a 8-bit, 16-bit and 32 bit images.
7. Perform the reduction and enlargement of a given Digital Image.
8. Change the appearance of an image by applying the filters (For ex: from the IR image of the given digital Image by suitable IR filter)

VI. Lab References:

1. DSLR Photography for Beginners by Brian Black
2. The Art of Photography by Bruce Barnbaum
3. Photoshop for Photographers by John Slavio
4. <https://www.youtube.com/channel/UCwWyFRy2l6aUFMsRemP51Sw>. You Tube resource.
5. <https://www.udemy.com/course/complete-photography-course/>
6. Web sources suggested by the teacher concerned.

VII. Co-Curricular Activities

(a) **Mandatory:** (Training of students by teacher in field related skills: (lab: 10 + field: 05):

1. **For Teacher:** Training of students by the teacher (if necessary, by a local expert) in laboratory/field for not less than 15 hours on the field techniques/skills of Image formation

by using lenses and mirrors. Also to make students to understand the construction, operation and the Physics principles involved in a normal Camera and Digital Camera.

2. **For Student:** Students shall (individually) visit a local Photo studio or any such facility in a university/research organization/private and observe (i) the operation of different digital cameras, compact and SLR and in taking photographs using different types of lenses by varying aperture, shutter speed for still camera, video camera, CCTV and spy camera **or** (ii) the use of natural light, tungsten light, fluorescent light, electronic flash reflectors, exposure meters, studio flash and its accessories **or** (iii) the usage of various lighting techniques for different lenses and will do practice on special areas of photography in outdoor and indoor conditions **or** (iv) the different processes viz., audio video recording, mixing, editing, dubbing of sound, using different types of microphones **or** (v) the handling of the digital video cameras, DVD, HDD, accessories and exposure to take different common shots, dimension of images and movements as per requirement **or** (v) the computer system by digital editing software, printing the photographs taken by digital cameras and the image transportation to the storage media, sending photographs through E- mail and Scanning the photographs, capture frames and analysis of images and record their observations and submit a hand-written Fieldwork/Project work not exceeding 10 pages in the given format to the teacher.
3. Max marks for Fieldwork/Project work: 05.
4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements.*
5. Tests (IE).

(b) Suggested Co-Curricular Activities:

1. Training of students by a related skilled person from a Photo studio.
2. Assignments (including technical assignments like identifying the tools & techniques involved in photography and handling, operational techniques of different Cameras with safety and security)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques related to Image formation and Photographic Techniques.
5. Practice taking outdoor photographs with a digital camera in (i) Black & White and (ii) Colour in the following conditions:
Landscapes – Street / Building – Sculpture – Insect / Animal movement – Industrial plant (outside view) – Children, birds (close up / long shot / model photography)- slow and fast moving objects-Night photography etc.
6. Shooting of different areas and topics such as sports, wildlife, modeling, drama, documentary, serial, story board making, news, interview, seminar/ workshop, industrial, live broadcasting, musical event, advertisement, etc.
7. Collection of material/figures/photos related to various components of a Camera, writing and organizing them in a systematic way in a file.
8. Visits to any local Photo Studio or any Lab in universities, research organizations, private firms, etc.
9. Invited lectures and presentations on related topics by field/industrial experts.

Dr V S KRISHNA GOVERNMENT DEGREE COLLEGE(A) VISAKHAPATNAM

Course Code:

Four-year B.Sc. (Hons) Domain Subject: **PHYSICS** IV Year B. Sc.(Hons) – Semester – V
Max Marks: 100+50

Course 6B: LOW TEMPERATURE PHYSICS & REFRIGERATION

(Skill Enhancement Course (Elective), Credits: 05)

- I. Learning Outcomes:** Students after successful completion of the course will be able to
1. Identify various methods and techniques used to produce low temperatures in the Laboratory.
 2. Acquire a critical knowledge on refrigeration and air conditioning.
 3. Demonstrate skills of Refrigerators through hands on experience and learns about refrigeration components and their accessories.
 4. Understand the classification, properties of refrigerants and their effects on environment.
 5. Comprehend the applications of Low Temperature Physics and refrigeration.

II. Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training, Unit tests etc.)*

UNIT-I PRODUCTION OF LOW TEMPERATURE (10 hrs)

Production of low temperatures-Introduction, Freezing mixtures, Joule-Thomson effect, Regenerative cooling, Different methods of liquefaction of gases, liquefaction of air, Production of liquid hydrogen and nitrogen, Adiabatic demagnetization, Properties of materials at low temperatures, Superconductivity

UNIT-II MEASUREMENT OF LOW TEMPERATURE (10 hrs)

Gas thermometer and its correction and calibration, Secondary thermometers, resistance thermometers, thermocouples, Vapour pressure thermometers, Magnetic thermometers, Advantages and drawbacks of each type of thermometer.

UNIT-III PRINCIPLES OF REFRIGERATION (10 hrs)

Introduction to Refrigeration- Natural and artificial refrigeration , Stages of refrigeration, Types of refrigeration - Vapor compression and vapor absorption refrigeration systems, Refrigeration cycle and explanation with a block diagram, Introductory ideas on air-conditioning.

Refrigerants-Introduction, Ideal refrigerant, Properties of refrigerant, Classification of refrigerants, commonly used refrigerants, Eco-friendly refrigerants

UNIT-IV COMPONENTS OF REFRIGERATOR (10 hrs)

Refrigerator and its working, Block diagram, Coefficient of Performance (COP), Tons of refrigeration (TR) and Energy Efficiency Ratio (EER), Refrigerator components: Types of compressors, evaporators and condensers and their functional aspects, defrosting in a refrigerator, Refrigerant leakage and detection

UNIT-V APPLICATIONS OF LOW TEMPERATURE & REFRIGERATION (10 hrs.)

Applications of Low temperatures: Preservation of biological material, Food freezing, liquid nitrogen and liquid hydrogen in medical field, Superconducting magnets in MRI- Tissue ablation (cryosurgery) - Cryogenic rocket propulsion system.

Applications of refrigeration: Domestic refrigerators, Water coolers, Cold storages, Ice plants, Food preservation methods, Chemical and Process industries, Cold treatment of metals, Construction field, Desalination of water, Data centers.

III. References:

1. Heat and Thermodynamics by Brij Lal & N. Subramanyam, S. Chand Publishers.
 2. Thermal Physics by S C Garg, R M Bansal & C K Ghosh, McGrawHill Education, India
 3. Heat and Thermodynamics by M M Zemansky, McGrawHill Education (India).
 4. Low-Temperature Physics by Christian E. & Siegfried H., Springer.
 5. Thermal Engineering by S. Singh, S. Pati, Ch:18 Introduction to Refrigeration.
 6. The Physics Hyper Text Book. Refrigerators. <https://physics.info/refrigerators/>
 7. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi
 8. A course in Refrigeration and Air Conditioning by S.C. Arora and S. Domkundwar, Dhanpatrai and sons, Delhi
 9. [https://trc.nist.gov/cryogenics/Papers/Review/2017-Low Temperature Applications and Challenges.pdf](https://trc.nist.gov/cryogenics/Papers/Review/2017-Low%20Temperature%20Applications%20and%20Challenges.pdf)
 10. <https://nptel.ac.in/content/storage2/courses/112105129/pdf/RAC%20Lecture%203.pdf>
 11. Other Web sources suggested by the teacher concerned and the reading material.
- <https://nptel.ac.in>

Course 6B: Low Temperature Physics & Refrigeration

PRACTICAL SYLLABUS (30 Hrs. Max Marks: 50)

IV. Learning Outcomes: On completion of practical course, student shall be able to

1. List out, identify and handle equipment used in refrigeration and low temperature lab.
2. Learn the procedures of preparation of Freezing Mixtures.
3. Demonstrate skills on developing various Freezing mixtures and materials and their applications in agriculture, medicine and day to day life.
4. Acquire skills in observing and measuring various methodologies of very low temperatures
5. Perform some techniques related to Refrigeration and Freezing in daily life.

V. Practical (Laboratory) Syllabus: (30 hrs. Max marks: 50)

1. Record the Principles and applications of Refrigerators and Freezers.
2. Measure the temperatures below Melting point of Ice using a thermometer available in the Lab.
3. Make a freezing mixture by adding different salts viz., Sodium chloride, Potassium Hydrate (KOH), Calcium chloride to ice in different proportions and observe the temperature changes.
4. Study the operation of a refrigerator and understand the working of different parts.
5. Study the properties of refrigerants like chlorofluorocarbons-hydrochlorofluoro- carbons and record the lowest temperatures obtained.
6. Consider a simple faulty refrigerator and try to troubleshoot the simple problems by understanding its working.
7. Understand the practical problem of filling the Freon Gas into the Refrigerator.
8. Get the Liquid Nitrogen or Liquid Helium from nearby Veterinary Hospital and measure their temperatures using chromel-alumel thermocouple or mercury thermometer and observe their physical properties like colour, smell etc and precautions to be taken for their safe handling.
9. Preparation of freeze drying food with Dry ice and liquid nitrogen

10. Preparation of freeze drying food with liquid nitrogen

VI. Lab References:

1. Experimental techniques in low temperature physics by Guy White, Philip Meeson.
2. Experimental low-temperature physics by A. Kent, Macmillan physical science series 3. Physics and Chemistry at Low Temperatures by Leonid Khriachtchev.
<https://www.routledge.com/Physics-and-Chemistry-at-Low-Temperatures/Khriachtchev/p/book/9789814267519>
4. Practical Cryogenics .<http://research.physics.illinois.edu/bezryadin/links/practical%20Cryogenics.pdf>
5. Freeze-Drying, 3rd Edition by Peter Haseley, Georg-Wilhelm Oetjen, Wiley (e-Book)
6. Web sources suggested by the teacher concerned.

VII. Co-Curricular Activities:

(a) Mandatory: *(Training of students by teacher in field related skills: (lab:10 + field: 05)*

1. **For Teacher:** Training of students by the teacher in the in the laboratory/field for a total of not less than 15 hours on the techniques/skills of Low Temperature Production, methods used and applications of Low temperatures and refrigeration in day to day life and other applications in medicine and industry.
2. **For Student:** Student shall (individually) visit (i) a small ice plant or a cold storage plant (ii) Air Conditioner (AC) repair shop or (iii) Refrigerator repair shop to understand the construction, working principle and the trouble shooting of these devices after interacting with the technicians. **Or** Student shall observe the various thermodynamic processes taking place while working with the refrigerator and observe the leak detection in refrigeration system by different methods, air removal and charging of a refrigeration unit and testing of a refrigeration system to find out the Refrigerating capacity/Ton of refrigeration (TR) and the Power input. **Or** Student shall identify the refrigerant cylinder by color coding and standing pressure. **Or** Student shall visit the freezer aisle of a supermarket and observes the bags of different frozen fruits. Student shall write the observations and submit a hand-written Fieldwork/Project work not exceeding 10 pages in the given format to the teacher.
3. Max marks for Fieldwork/Project work: 05.
4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements.*
5. Unit tests (IE).

(b) Suggested Co-Curricular Activities

1. Training of students by related Factory, industrial experts.
2. Assignments (including technical assignments like identifying tools in Refrigerators, Freezers and their handling, operational techniques with safety and security)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in Low Temperatures and applications.
5. Collection of material/figures/photos related to substances used in Freezing Mixtures, their Properties and availability etc., writing and organizing them in a systematic way in a file.
6. Visits to Ice plants and labs in universities, research organizations, private firms, etc.
7. Making your own mini refrigerator at home
8. Build your own water cooler with the materials available at home.
9. Making hand launched liquid nitrogen rockets

10. Experiments with Liquid nitrogen and strawberry/ banana/ lemon/ onion/ mushroom/ egg etc. (*To be tried under professional supervision only*).
11. Invited lectures and presentations on related topics by field/industrial experts
12. Identification of different Ozone-depleting substances (ODS) that damage the ozone layer in the upper atmosphere.
13. Demonstration to illustrate the greenhouse effect and the role of carbon dioxide as a greenhouse gas using plastic water bottles, flood light lamp, beakers and temperature sensors and observe the temperature changes. <https://edu.rsc.org/experiments/modelling-the-greenhouse-effect/1543.article>
<https://sealevel.jpl.nasa.gov/files/archive/activities/ts1hiac1.pdf>

Dr V S KRISHNA GOVERNMENT DEGREE COLLEGE(A) VISAKHAPATNAM

Course Code:

Four-year B.Sc. (Hons) Domain Subject: **Physics** IV Year B. Sc.(Hons) – Semester – V

Max Marks: 100+50

Course 7B: Solar Energy and Applications

[Skill Enhancement Course (Elective), Credits: 05]

I. Learning Outcomes: After successful completion of the course, the student will be able to:

1. Understand Sun structure, forms of energy coming from the Sun and its measurement.
2. Acquire a critical knowledge on the working of thermal and photovoltaic collectors.
3. Demonstrate skills related to callus culture through hands on experience
4. Understand testing procedures and fault analysis of thermal collectors and PV modules.
5. Comprehend applications of thermal collectors and PV modules.

II. Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training, Unit tests etc.)*

Unit - I: BASIC CONCEPTS OF SOLAR ENERGY (10hrs)

Spectral distribution of solar radiation, Solar constant, zenith angle and Air-Mass, standard time, local apparent time, equation of time, direct, diffuse and total radiations. Pyrheliometer - working principle, direct radiation measurement, Pyranometer-working Principle, diffuse radiation measurement, Distinction between the two meters.

Unit - II: SOLAR THERMAL COLLECTORS (10hrs)

Solar Thermal Collectors-Introduction, Types of Thermal collectors, Flat plate collector – liquid heating type, Energy balance equation and efficiency, Evacuated tube collector, collector overall heat loss coefficient, Definitions of collector efficiency factor, collector heat-removal factor and collector flow factor, Testing of flat-plate collector, solar water heating system, natural and forced circulation types.

Concentrating collectors, Solar cookers, Solar dryers, Solar desalinators.

Unit - III: FUNDAMENTALS OF SOLAR CELLS (10hrs)

Semiconductor interface, Types, homo junction, hetero junction and Schottky barrier, advantages and drawbacks, Photovoltaic cell, equivalent circuit, output parameters, conversion efficiency, quantum efficiency, Measurement of I-V characteristics, series and shunt resistance, their effect on efficiency, Effect of light intensity, inclination and temperature on efficiency

Unit -IV: TYPES OF SOLAR CELLS AND MODULES (10 hrs)

Types of solar cells, Crystalline silicon solar cells, I-V characteristics, poly-Si cells, Amorphous silicon cells, Thin film solar cells-CdTe/CdS and CuInGaSe₂/CdS cell configurations, structures, advantages and limitations, Multi junction cells – Double and triple junction cells. Module fabrication steps, Modules in series and parallel, Bypass and blocking diodes

Unit – V: SOLAR PHOTOVOLTAIC SYSTEMS (10hrs)

Energy storage in PV systems, Energy storage modes, electrochemical storage, Batteries, Primary and secondary, Solid-state battery, Molten solvent battery, lead acid battery and dry batteries, Mechanical storage – Flywheel, Electrical storage –Super capacitor

III. References:

1. Solar Energy Utilization by G. D. Rai, Khanna Publishers

2. Solar Energy- Fundamentals, design, modelling and applications by G.N. Tiwari, Narosa Publications, 2005.
3. Solar Energy-Principles of thermal energy collection & storage by S.P. Sukhatme, Tata McGraw Hill Publishers, 1999.
4. Science and Technology of Photovoltaics, P. Jayarama Reddy, CRC Press (Taylor & Francis Group), Leiden & BS Publications, Hyderabad, 2009.
5. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
6. Web sources suggested by the teacher concerned and the college librarian including reading material.
 - (a) https://courses.edx.org/c4x/DelftX/ET.3034TU/asset/solar_energy_v1.1.pdf
 - (b) [https://www.sku.ac.ir/Datafiles/BookLibrary/45/John%20A.%20Duffie,%20William%20A.%20Beckman\(auth.\)-Solar%20Engineering%20of%20Thermal%20Processes,%20Fourth%20Edition%20\(2013\).pdf](https://www.sku.ac.ir/Datafiles/BookLibrary/45/John%20A.%20Duffie,%20William%20A.%20Beckman(auth.)-Solar%20Engineering%20of%20Thermal%20Processes,%20Fourth%20Edition%20(2013).pdf)

Course 6B: Solar Energy and Applications – Practical (lab) work (30 hrs, Max Marks:50)

IV. Learning Outcomes : On successful completion of this practical course, student shall be able to:

1. List out and identify various components of solar thermal collectors and systems, solar photovoltaic modules and systems.
2. Learn the procedures for measurement of direct, global and diffuse solar radiation, I - V characteristics and efficiency analysis of solar cells and modules.
3. Demonstrate skills acquired in evaluating the performance of solar cell / module in connecting them appropriately to get required power output.
4. Acquire skills in identification and elimination of the damaged panels without affecting the output power in a module / array.
5. Perform procedures and techniques related to general maintenance of solar thermal and photovoltaic modules.

V. Practical (Laboratory) Syllabus: (30 hrs) (Max.50 Marks)

1. Measurement of direct radiation using pyrliometer.
2. Measurement of global and diffuse radiation using pyranometer.
3. Evaluation of performance of a flat plate collector
4. Evaluation of solar cell / module efficiency by studying the I – V measurements.
5. Determination of series and shunt resistance of a solar cell / module.
6. Determination of efficiency of two solar cells / modules connected in series.
7. Determination of efficiency of two solar cells / modules connected in parallel.
8. Study the effect of input intensity on the performance of solar cell / module.
9. Study the influence of cell / module temperature on the efficiency.
10. Study the effect of cell / module inclination on the efficiency.

VI. Lab References:

1. Solar Photo voltaic- Alab training manual, C.S. Solanki et al., Foundation Books Publishers, 2012.
2. Laboratory Manual on Solar thermal experiments, HP Garg, TC Kandpal, Narosa Publishing House 2000.
3. Web sources suggested by the teacher concerned.
<https://renewablelab.niu.edu/experiments/solarPanel> Development of simple solar hot water collector:
<https://www.youtube.com/watch?v=WP8H5IOTwYU>
<https://www.instructables.com/Solar-Water-Heater-From-Scratch/>

VII. Co-curricular Activities:

- (a) Mandatory:** (Training of students by teacher in field related skills: (lab:10 + field: 05) 1.
For Teacher: Training of students by the teacher in the in the laboratory/field for not less

than 15 hours on the field techniques/skills related to measurement of direct, diffused and global solar radiation; demonstration of procedures used in the performance evaluation of solar flat plate collectors, solar photovoltaic cells and modules measurement of different parameters in the calculation of efficiency.

2. **For Student:** Students shall visit to solar thermal and photovoltaic laboratories in universities/research organizations/ nearby industries to observe and understand the techniques and procedures used for evaluation of solar collector, solar cell and module efficiencies. They shall write their observations and submit to the teacher hand-written Fieldwork/Project work not exceeding 10 pages in the given format.
3. Max marks for Fieldwork/Project work: 05.
4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements.*
5. Unit tests (IE).

(b) Suggested Co-Curricular Activities

1. Training of students by related industrial/ technical experts using guest lectures/ invited talks.
2. Assignments (including technical assignments like identifying components of a solar hot water and solar photovoltaic systems and their handling, operational techniques and maintenance procedures with safety and security)
3. Seminars, Group discussions, Quiz, Debates etc. on related topics.
4. Preparation of videos on thermal and photovoltaic systems and technical procedures.
5. Collection of brochures/figures/photos related to products and applications of solar energy and organizing them in a systematic way in a file.
6. Making a (i) solar panel (ii) solar light (iii) solar cooker (iv) solar oven (v) solar inverter at Home.
7. Visits to nearby solar thermal system as well as solar photovoltaic power stations, firms, research organizations etc.

Dr V S KRISHNA GOVERNMENT DEGREE COLLEGE(A) VISAKHAPATNAM

Course Code: Four-

year B.Sc. (Hons)

Domain Subject: **PHYSICS IV** Year B. Sc.(Hons) – Semester – V

Max Marks: 100+50

Course 6C: APPLICATIONS OF ELECTRICITY & ELECTRONICS

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes: Students after successful completion of the course will be able to:

1. Identify various components present in Electricity& Electronics Laboratory.
2. Acquire a critical knowledge of each component and its utility (like resistors, capacitors, inductors, power sources etc.).
3. Demonstrate skills of constructing simple electronic circuits consisting of basic circuit elements.
4. Understand the need & Functionality of various DC & AC Power sources.
5. Comprehend the design, applications and practices of various electrical & Electronic devices and also their trouble shooting.

II. Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training, Unit tests etc.)*

Unit-I INTRODUCTION TO PASSIVE ELEMENTS (10 hrs.)

Passive and Active elements-Examples, **Resistor**-Types of Resistors, Color coding - Applications of a Resistor as a heating element in heaters and as a fuse element. **Capacitor**-Types of Capacitors, Color coding, Energy stored in a capacitor, Applications of Capacitor in power supplies, motors(Fans) etc., **Inductor**-Types of Inductors, EMF induced in an Inductor, Applications of Inductor, Application of choke in a fan and in a radio tuning circuit, Series resonance circuit as a Radio tuning circuit.

Unit-II Power Sources (Batteries) (10 hrs.)

Types of power sources-DC & AC sources, Different types of batteries, Rechargeable batteries –Lead acid batteries, Ni-MH batteries, Li-ion batteries- Li-PO batteries, Series, Parallel& Series-Parallel configuration of batteries, Constant Voltage source-Constant Current Source-Applications of Current sources & Voltage sources, SMPS used in computers.

Unit-III Alternating Currents (10 hrs)

A.C Power source-Generator, Construction and its working principle, Transformers- Construction and its working principle, Types of Transformers-Step-down and Step-up Transformers, Relation between primary turns and secondary turns of the transformer with emf., Use of a Transformer in a regulated Power supplies, Single phase motor –working principle, Applications of motors(like water pump, fan etc.).

Unit-IV Power Supplies (Skill Based) (10 hrs.)

Working of a DC regulated power supply, Construction of a 5 volts regulated power supply, Design of a step-down (ex: 220-12V) and step-up (ex: 120-240V) transformers- Simple Design of FM Radio circuit using LCR series resonance (tuning) circuit, Checking the output voltage of a battery eliminator using a MultiMate.(Trouble shooting), Design of a simple 5 volts DC charger, Power supply for computers(SMPS)

Unit-V Applications of Electromagnetic Induction (10 hrs.)

DC motor –Construction and operating principle, Calculation of power, voltage and current in a DC motor, Design of a simple Motor (for example Fan) with suitable turns of coil-DC generator-Construction, operating principle and EMF equation, Construction of a simple DC generator, Difference between DC and AC generators

III. 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.

Course 6C: Applications of Electricity & Electronics–

PRACTICAL SYLLABUS (30 hrs, Max Marks:50)

IV. Learning Outcomes: On successful completion of this practical course, student shall be able to:

1. List out, identify and handle various equipment in Electrical & Electronics laboratory.
2. Learn the procedures of designing simple electrical circuits.
3. Demonstrate skills on the utility of different electrical components and devices.
4. Acquire the skills regarding the operation, maintenance and troubleshooting of various Devices in the lab.
5. Understand the different applications of Electromagnetic induction.

V. Practical (Laboratory) Syllabus: (30 hrs, Max marks:50)

1. Acquainting with the soldering techniques
2. Design and Construction of a 5 Volts DC unregulated power supply
3. Construction of a Step down Transformer and measurement of its output voltage. And to compare it with the calculated value.
4. 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.
5. Use the Digital Multimeter and Analog Multimeter to measure the output voltage of an AC & DC power supply and also the voltage and frequency of a AC signal using CRO.
6. Use the Multimeter to check the functionality of a Diode and Transistor. Also test whether the given transistor is PNP or NPN.
7. Construct a series electric circuit with R, L and C having an AC source and study the frequency response of this circuit. Find the Resonance Frequency.
8. Construct a Parallel electric circuit with R, L & C having an AC source and study the frequency response of this circuit .Find the resonant frequency.
9. Test whether a circuit is a Open circuit or Short Circuit by measuring continuity with a Multimeter and record your readings.

VI. 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.

VI. Co-Curricular Activities:

- (a) **Mandatory:** (Training of students by teacher in field related skills: (lab:10 + field: 05)

1. **For Teacher:** Training of students by the teacher (if necessary, by a local expert) in laboratory/field for not less than 15 hours on the understanding of various electronic & electrical components and devices. And also understand the functional knowledge of these components and devices so that the student can safely handle these electronic components.
2. **For Student:** Students shall (individually) visit a local Radio, TV or Mobile repair shop to understand the testing and soldering techniques and different electronic components in the devices that we use daily life. And also to understand the troubleshooting and working of domestic appliances such as cell phone chargers, fan, electric iron, heater, inverter, micro oven, washing machine etc. (Or) Students shall also visit the Physics/Electronics or Instrumentation Labs of nearby local institutions and can get additional knowledge by interacting with the technical people working there. (Or) Students shall also visit the local motor winding shop to understand the motor winding and working of different types of motors. After the observations, a hand-written Fieldwork/Project work not exceeding 10 pages in the given format to be submitted to the teacher.
3. Max marks for Fieldwork/Project work: 05.
4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements.*
5. Unit tests (IE).

(b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments (including technical assignments like identifying various electrical and electronic components & devices and their handling, operational techniques with safety and security)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in Electrical & Electronic Appliances in daily life.
5. Collection of material/figures/photos related to Electrical products like Heaters, Motors, Fans etc. and writing and organizing them in a systematic way in a file.
6. Visits to nearby electrical or electronic industries or laboratories in universities, research organizations, private firms, etc.
7. Invited lectures and presentations on related topics by field/industrial experts

Dr V S KRISHNA GOVERNMENT DEGREE COLLEGE(A) VISAKHAPATNAM

Course Code:

Four-year B.Sc. (Hons) Domain Subject: **PHYSICS** IV Year B. Sc.(Hons) – Semester – V

Max Marks: 100+50

Course 7C: ELECTRONIC INSTRUMENTATION

[Skill Enhancement Course (Elective), Credits: 05]

I. Learning Outcomes: Students after successful completion of the course will be able to:

1. Identify various facilities required to set up a basic Instrumentation Laboratory.
2. Acquire a critical knowledge of various Electrical Instruments used in the Laboratory.
3. Demonstrate skills of using instruments like CRO, Function Generator, Multimeter etc. through hands on experience.
4. Understand the Principle and operation of different display devices used in the display systems and different transducers
5. Comprehend the applications of various biomedical instruments in daily life like B.P. meter, ECG, Pulse oxymeter etc. and know the handling procedures with safety and security.

II. Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training, Unit tests etc.)*

UNIT-I INTRODUCTION TO INSTRUMENTS (10 hrs)

Types of electronic Instruments- Analog instruments & Digital Instruments, DC Voltmeter and AC Voltmeter, Construction and working of an Analog Multimeter and Digital Multimeter (Block diagram approach), Sensitivity, $3\frac{1}{2}$ display and $4\frac{1}{2}$ display Digital multimeters, Basic ideas on Function generator

UNIT-II OSCILLOSCOPE (10 hrs)

Cathode Ray Oscilloscope-Introduction, Block diagram of basic CRO, Cathode ray tube, Electron gun assembly, Screen for CRT, Time base operation, Vertical deflection system, Horizontal deflection system, Use of CRO for the measurement of voltage (DC and AC), frequency, phase difference, Different types of oscilloscopes and their uses, Digital storage Oscilloscope

UNIT-III TRANSDUCERS (10 hrs)

Classification of transducers, Selection of transducers, Resistive, capacitive & inductive transducers, Resistive and capacitive touch screen transducer used in mobiles, Displacement transducer-LVDT, Piezoelectric transducer, Photo transducer, Digital transducer, Fibre optic sensors

UNIT-IV DISPLAY INSTRUMENTS (10 hrs)

Introduction to Display devices, LED Displays, Seven Segment Displays, Construction and operation (Display of numbers), Types of SSDs (Common Anode & Common Cathode type), Limitations of SSDs, Liquid Crystal Displays, Principle and working of 2x16 display and 4x16 LCD modules, Applications of LCD modules.

UNIT-V BIOMEDICAL INSTRUMENTS (10 hrs)

Basic operating principles and uses of (i) Clinical thermometer (ii) Stethoscope (iii) Sphygmomanometer (iv) ECG machine (v) Radiography (vi) Ophthalmoscope (vii) Ultrasound scanning (viii) Ventilator (ix) Pulse oxymeter (x) Glucometer, Basic ideas of CT scan and MRI scan

III 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 by Mandeep Singh, PHI Learning.
4. Biomedical Instrumentation and Measurements by Leslie Cromwell ,Prentice Hall India.
5. Electronic Measurements and Instrumentation by Kishor, K Lal, Pearson, New Delhi
6. Electrical and Electronic Measurements by Sahan, A.K., Dhanpat Rai, New Delhi
7. Electronic Instruments and Measurement Techniques by Cooper, W.D. Halfbrick, A.B., PHI Learning, New Delhi
8. Web sources suggested by the teacher concerned and the college librarian including reading material.

Course 7C: Electronic Instrumentation– PRACTICAL SYLLABUS

(30 Hrs. Max Marks: 50)

IV. Learning Outcomes: On successful completion of this practical course, student shall be able to:

1. List out, identify and handle various equipment in Instrumentation Laboratory or Electronic Laboratory.
2. Learn the construction, operational principles of various instruments.
3. Demonstrate skills on handling, Maintenance & trouble shooting of different instruments used in the Labs.
4. Acquire skills in observing and measuring various electrical and electronic quantities.
5. Perform some techniques related to Biomedical Instrumentation and measurement of Certain physiological parameters like body temperature, B.P. and sugar levels etc.

V. Practical (Laboratory) Syllabus: *(30 hrs. Max marks: 50)*

1. Familiarisation of digital multimeter and its usage in the measurements of (i) resistance (ii) current, (iii) AC & DC voltages and for (i) continuity test (ii) diode test and (iii) transistor test
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. Display the letters **a** to **h** on a single Seven Segment Display module by applying voltages.
6. Measurement of body temperature using a digital thermometer and list out the error and corrections.
7. Measurement of Blood Pressure of a person using a B.P. meter and record your values and analyze them.
8. Get acquainted with an available ECG machine and study the ECG pattern to understand the meaning of various peaks
9. Observe and understand the operation of a Digital Pulse oxymeter and measure the pulse rate of different people and understand the working of the meter.

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 Sloop, & Joseph G. Sloop, McGraw-Hill Education.

6. Web sources suggested by the teacher concerned. **VII. Co-Curricular Activities**

(a) Mandatory:*(Training of students by teacher in field related skills: (lab:10 + field:05)*

1. **For Teacher:** Training of students by the teacher in the in the laboratory/field for not less than 15 hours on the field techniques/skills of understanding the operation, Maintenance and utility of various electrical and electronic instruments both in the Laboratory as well as in daily life.

For Student: Students shall (individually)visit a local electrical and electronics shop or small firm to familiarize with the various electrical and electronic instruments available in the market and also to understand their functionality, principle of operation and applications as well as the troubleshooting of these instruments.(Or) Student shall visit a diagnostic centre and observe the ECG machine and the ECG pattern(Or) Student shall visit a diagnostic centre and observe the CT scan and MRI scan.(Or) Student shall visit a mobile smart phone repair shop and observe the different components on the PCB(Motherboard), different ICs (chips) used in the motherboard and trouble shooting of touch screen in smart phones.

Observations shall be recorded in a hand-written Fieldwork/Project work not exceeding 10 pages in the given format to be submitted to the teacher.

2. Max marks for Fieldwork/Project work: 05.

3. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements.* 4. Unit tests (IE)

(b) Suggested Co-Curricular Activities

1. Training of students by related industrial / technical experts.
2. Assignments (including technical assignments like identifying different measuring instruments and tools and their handling, operational techniques with safety and security.
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Making your own stethoscope at home.
5. Making seven segment display at home.
6. Preparation of videos on tools and techniques in various branches of instrumentation.
7. Collection of material/figures/photos related to products of Measuring Instruments, Display Modules and Biomedical Instruments and arrange them in a systematic way in a file.
8. Visits to Instrumentation Laboratories of local Universities or Industries like Cement, Chemical or Sugar Plants etc. or any nearby research organizations, private firms, etc. 9. Invited lectures and presentations on related topics by Technical /industrial experts
