# SRI A.S.N.M. GOVERNMENT COLLEGE (AUTONOMOUS) PALAKOL, W.G.Dt. - 534260

**BOARD OF STUDIES 2023-24** 

*Held onSeptember* 14<sup>th</sup> 2023



## **DEPARTMENT OF PHYSICS**

Sri A.S.N.M. Government College (A)

Palakol, W.G.Dt.

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#### PROCEEDINGS OF THE PRINCIPAL, SRI A S N M GOVERNMENT DEGREE COLLEGE(A) PALAKOL – ANDHRA PRADESH

#### Present; Dr.T.Raja Rajeswari, M.Sc., Ph.D

#### <u>RC.NO.</u>

Sub: Sri A.S.N.MGDC(A) Pkl - Conduct of BoS Meetings for the Academic Year 2023-2024 – Regarding.

Ref: 1. MinutesofIQAC meetingdated

2. Resolutions adopted in Staff Council Meeting held on

\*\*\*

#### **ORDER:**

With reference to the subject cited, the lecturers-in-Charge of all the departments are hereby informed toconduct their respective Board of Studies (BoS) meetings, both UG & PGseparately, before 30<sup>th</sup> July 2023.

ofResolution 3citedunderRef. all Inpara2 1. thedepartmentsarehereby informed tomeetInternalQuality Assurance cell with prior appointment to discuss the quality enhancement measures of departments such aschanges/reforms toexistingprogrammes/courses initiatedor tobe initiatedor and (ifany)tobeintroduced otherwise new programmes alongwithjustificationbefore actualconductofBoardsofStudies.

Youarealsoinformedtointimatethedateofyour**BOS**meetingwel linadvancetothesubjectexperts/University nominee/Industrial Nominee/members of **BOS**/Student nominee concerned to get their valuableviews and suggestions in thedeliberations toframe theconcretesyllabifor your subjects keeping inview theobjectivesofthecollegeandinterestofthestakeholders.Thedatesh ouldalsobeindicatedtoAcademicCell/IQACinadvance. You are further suggested to utilize the academic autonomy in incorporating the additional modules in thesyllabi andidentifythepedagogicalstrategiestoimplementthesame.

# Pleasenote that your BoS documents hould contain the following contents in or der

- a) ProceedingsofthePrincipalpertainingtoBoS
- b) CompositionofBoS
- c) Tableshowingthe AllocationofCredits in the following table for both theory and Lab in case ofsciencesubjects

S.No	Semester	TitleoftheCourse(Pape r)	Hrs./week	Max.Marks(SEE)	Marksin CIA	Credits

- d) Resolutionsadopted in the meeting with detailed discussion that took placed urin gthe meeting.
- e) TableshowingMemberspresentwithsignatures
- f) ListofExaminers&Papersetters
- g) Syllabusforeachcourse(boththeory&PracticalincaseofScien cesubjects)followedbymodelquestionpapers(theory&pract ical) andallocation ofCIA(50 marks)foreachcourse.
- ${\rm h}) \quad {\rm POattainmentdata} ({\rm CO-POmapping}) for 2019-22 batch$

You are requested to submit a separate document regarding addition/deletion of specific topics from thesyllabusin each course (paper)with justification, if any in the Proforma supplied by IQAC through e-mail.

All the *new certificate courses* proposed for the calendar year 2022, Seminars/ workshops, field visits, study tours, on job trainings, internships for 2022-23 should be placed before the respective Board and get themapproved.

Youarealsorequestedtosubmit2hardcopies&2softcopies(CDs) ofBoSdocumenttotheIQACandsettlethebills aftercompletionoftheBoSmeeting.

*Important Note:* All the HoDs should submit a detailed record of discussions transpiredbetween themembersduringtheBOSmeetingintheBoSdocument.

## PRINCIPAL

## SRIASNM GDC (A)

### PALAKOL

Copyto:

- 1. Lecturers-in-Chargeofallthedepartments
- 2. File

## PROCEEDINGS OF THE PRINCIPAL, SRI A S N M GOVERNMENT DEGREE COLLEGE(A) PALAKOL – AP

#### Present; Dr.T.Raja Rajeswari, M.Sc., Ph.D

#### <u>R.C.No:</u>

#### **SUB**: SRI A S N M GDC(A) PALAKOL- UG Boards of Studies (BoS)-Nominationof Members–Orders issued

**REF:**1.UGCGuidelinesforAutonomousColleges-2018.

#### ORDER:

ThePrincipal,*SRI A S N M GDC(A) PALAKOL* ispleasedtoconstituteUGBoardsofStudies in Physics for framing the syllabi in Physics subject for all semesters duly following thenormsof theUGCAutonomousguidelines.

S.No	NameoftheNominee	Designation
1	K.Bhadrachalam	Chairman
	Lecturer In-Charge/HoD,	
	Department of	
	Computerscience&PhysicsSRI A S N M	
	GDC(A) PALAKOL	
2	AllFacultyMembersoftheDepartment	Members
	Dr. B. Sandhya Sri,	
3	Associate Professor in Physics	SubjectExpert
	Govt.Degree College, Avanigadda	
	Smt.D.Vijaya Sri,	
4	Lecturer in Physics,	SubjectExpert
	Government College for women(A),	
5	Dr.A P.V.APPA RAU	
	Principal, TN COLLEGE, W.G.Dist	UniversityNominee
6.	Sri B.K.Malleswara Rao	Alumni
	Principal, Sri A S N M GJC, Palakol	
_	P.Bhanu SrilliB.Sc	StudentNominee
7.		

The above members are requested to attend the BoS meeting on 27-10-2021 and share

their valuable views, and suggestions on the following functionaries.

- a) Preparesyllabiforthesubjectkeepinginviewtheobjectivesofth ecollege,interestofthestakeholders and National requirement for consideration and approval of the IQAC and AcademicCouncil
- b) Suggestmethodologiesforinnovativeteachingandevaluationtechniques
- c) Suggest the panelofnamestothe Academic Councilforappointment of Examiners
- d) Coordinateresearch,teaching,extensionandotheractivities in the department of the College.

PRINCIPAL

SRI ASNM GDC (A),PALAKOL

## Sri A.S.N.M. Government College (A)

## Palakol, W.G.Dt.

## (Accredited by NAAC with grade B+")

## **DEPARTMENT OF PHYSICS**

### BOARDOFSTUDIESMEETING:14-09-23

The Board of studies meeting of DEPARTMENT **OF PHYSICS** was convened at 10.00 A.M under the Chairmanship of, **K .BadrachalamIn-charge** of theDepartment. The members present have discussed various aspects such as changes to be made in theSyllabi, Scheme of Evaluation and Blue print both for theory and practical papers,Departmentalactivities for 2022-23, Estimated Budget proposals-2022-23 for implementing them effectively duringALLsemestersforthe academicyear2022-23.

S.No	Name	Designation	Signature
1	<b>K .Badrachalam</b> Lecturer in charge/HODDepartmentofphysics SRI ASNM GDC(A),PALAKOL	Chairman	
2	All Faculty Members of the Departm ent	Members	
3	<b>Dr. B. Sandhya Sri,</b> Associate Professor, Govt. Degree College, Avanigadda, Krishna Dt	Subjectexpert	
4	<b>Smt.D.Vijaya Sri,</b> Lecturer in Physics, Government college for women(A) Guntur	Subjectexpert	

## ListofBoardOfStudies MembersPresent

5	<b>Dr.A.P.V.Apparao,</b> Principal Sri Y N College(A), Narsapur West Godavari District	UniversityNominee	
6	Sri A.Malleswara Rao Principal, Sri A S N M GJC, Palakol	Alumni	
7	Kum.P.Jahnavi IIIB.Sc	Student	

S.No	Nameofthefaculty	Signature
1.		
2.		

# AGENDA

1.Syllabus design as per the UGC guidelines and APSCHE framework for I, II, III, IV, V

and VI Semester(Both Theory and Practical).

2. Single Major /minor System syllabus design for 2023-24 admitted batch.

3. CBCS syllabus design for 2021-22 and 2022-23 admitted batch. With the scheme of evaluation

of 40 and SEE 60 marks for 2022-23 admitted batch and 25 ,75 marks for 2021-22 admitted batch

- 4. Additional Inputs in the Curriculum.
- 5. Internal and External assessment pattern.

6. Following the Allocation of Credit for all semesters of B.Sc.Programas perprevious

academicyear Offering one "Community Project" as a credit course to I & II year students during summervacation and Internship for III Year students in V/VI Semester

7. Departmentalactivities for 2023-24 academic year.

8. Certificate courses offered by the Department of Physics.

9. Question paper pattern

10. CSP/Internship/On-the-job training.

11. List of Examiners and Paper setters.

## SRI A.S.N.M. GOVERNMENT COLLEGE (AUTONOMOUS)

#### PALAKOL, W.G.Dt. - 534260

#### DEPARTMENTOFPHYSICS

#### RESOLUTIONS

#### BOARDOFSTUDIES MEETINGON14<sup>th</sup> September 2023

**Agenda 1**: Syllabus design as per the UGC guidelines and APSCHE framework for I, II, III, IV, V and VI Semesters (Both Theory and Practical).

**Proposal:** ItispresentedbeforetheBOSmemberstoratifyandapprovethesyllabi.

- Subjectexpertproposedtokeepthedeletionsandadditionsratiointolerablerange
- University nominee proposed reducing the total number of experiments as only additions are proposed in first and second semesters.
- Chairman of BOS proposed that since the student has given the choice to do any 6 of the proposed experiments, It would be more flexible and convenient to both student and faculty in keeping allproposed experiments

 $\label{eq:resolution:} Resolution: It is resolved to approve the above proposal sand the syllabide signed under the flexibility$ 

of autonomy for I, II, III, IV, Vand VISemesters of B.Sc., considering the syllabi

basedonfeedbackfromstakeholdersandlocalneedsofIndustryfortheacade micyear2023-24 It is resolved to accept proposed list of experiments. It is also resolved toapprove prescribed books for the syllabusdesigned above.

Agenda 2: Single Major /minor System syllabus design for 2023-24 admitted batch.

**Proposal:**Prepared Single major/minor subject syllabi and placed before BOS

members to ratify and approve the Syllabi and also multidisciplinary course for I semester

Agenda3: Followingtheschemeof evaluationforCIA(40MARKS) & SEE(60 MARKS) forall

semesters of B.Sc. program from 2022-23 admitted Batch & onwards and CIA(25MARKS) &SEE(75 MARKS)forall semesters of present III B.Sc. TheScheme of Examination and Blue print of SemesterEnd Examination (SEE) for all Semesters of B.Sc, for the academic year 2023-24.

**Proposal:** It is presented before the BOS members to ratify and approve CIA : SEE = 40:60 for allsemesters from 2022-23 admitted batch onwards. In SEE & CIA

35% marks should be obtained individually and 40% marks should be obtained in SEE & CIA together.

**Resolution:** It is resolved and approved to evaluate the students performance under ContinuousInternal Assessment (CIA) and Semester End Examination (SEE) components at 60:40ratio for **all the semesters** of B.Sc., Program for the academic year 2022 –23 admitted batch onwardsand CIA(25MARKS) &SEE(75 MARKS)forall semesters of present III B.Sc. Theduration of the Examination 3 hrs . Also resolved to follow theScheme ofExamination and Blue print of Semester End Examination (SEE) for all Semesters of B.Sc, from the academic year 2022-23 onwards.

Examination	No.ofMarks	Remarks	
Semester endexamina tion	60	Modelofexaminationpatternfurnishedbelow	
Internalex amination	40 Direct assessment - 35 Indirectassessment-15 50 SCALED DOWN TO 40	Midexamination(I&II) –35marks Attendance -05marks Clean and green -05 Any ONE Pedagogy methods-05 marks(Quiz,classroomseminar, Assignment or case study Test,puzzles,viva andfewmoreinnovative methodsfollowedbyindividuallecturer)	

## SCHEMEFORSEMESTERENDTHEORYEXAMINATION(SEE):

TYPE OFQUESTION	MARKS	SCHEME		
<b>PART-A</b> EssayQuestions	Each questioncarries8 Marks <b>5x8 = 40 M</b>	Answerall questions 1. (A)or(B)-From Unit I 2. (A)or(B)-FromUnitII 3. (A)or(B)-FromUnitIII 4. (A)or(B)-FromUnitIV 5. (A)or(B)-From UnitV		

PART-B Short AnswerQuesti ons Bach questioncarries 4Marks 5x4= 20 M 10 11 12	4 Theoretical ions8 Not more than onequestionfromEachuni t. 4NumericalQuestionsNotmore thanonequestionFromanyunit13
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## SCHEME FOR INTERNAL(ODD SEM) & EXTERNAL(EVEN SEM) PRACTICALEXAMINATION:

S.No	Description	Marks	
1	Formula	05	
2	TabularForm&Readings	10	
3	Calculations&Result(In cludingGraph)	15	
4	Precautions&Units	05	
5	VivaVoce	05	
6	Record**	10	
7	TOTAL	50	
INTERNALSEE(ODDSEM):50M EXTERNALSEE(EVEN SEM):50M			

\*\*Awardofmarksfornumber of practical'srecordedintheRecord

06Practicals	- 10
05Practicals	- 08
04Practicals	- 06
03Practicals	- 04
Lessthan03	- 00

**Agenda 4**: . Additional Inputs in the Curriculum.

**Proposal:**ItispresentedbeforetheBOSmembersto considerandapprovethe aboveagenda4

**Resolution:**ItisresolvedandapprovedtofollowtheAllocationofCreditsforallsemestersofB.Sc. Programasperprevious academic year

- **Agenda 5**: Following the Allocation of Credit for all semesters of B.Sc. Program as per previousacademicyear.
- **Proposal**: Itispresented before the BOS members to consider and approve the above agenda 5
- **Resolution:**ItisresolvedandapprovedtofollowtheAllocationofCreditsforallsemestersofB.Sc. Programasperprevious academic year

**Agenda 6**:Offering one "Community service Project" as a credit course to I & II year students during summer vacation and Internship for III Year students in V/VI Semester

Proposal: Itispresented before the BOS members to consider and approve the above agenda 6

University nominee proposed to introduce research oriented community based project for

the student stoen courage the young generation towards research as well associal responsibility

Chairman of BOS proposed to introduce Community project on data collection in their neighbourhoodareas in different ways

1) Drinking Water - Pollution

Health & Hygiene

2)

- 3) Communitydiseaseanalysis( Diabetes)
- 4) Village development plans

5)Yoga & Awareness

**Agenda7**:Departmentalactivitiesfor2023-24academicyear. **Proposal:**It ispresentedbeforethe BOSmemberstoconsiderandapprovetheaboveagenda7

**Resolution:** It is resolved to approve the above proposals and to offer one of the following"Community Project" as a credit course to I year students who are to be promoted to IIYearduringsummer vacation.

 Subject experts proposed to include more commemorative dates so that the student may inspired from those observations

**Resolution:**ItisresolvedandapprovedtheaboveproposalandtofollowtheDepartmentalactivi tiesfor2023-24academicyear as perthe dategiven.

Agenda8:Certificatecoursesoffered bytheDepartmentofPhysics.Proposal:Itispresentedbeforethe BOSmemberstoconsiderandapprovetheaboveagenda 8

**Resolution:** It is resolved to approve the Certificate course "electrician and electrical wiring from the academic year 2023-24 by the DepartmentofPhysics.

Agenda9: Listofexaminers

Proposal: It is presented before the BOS members to consider and approve the above agenda 9
Resolution: It is resolved to approve the revised list of examiners and paper setters for the academic year 2023-24. List annexed.

The Following Resolutions are made based on the above Agenda and proposals furnished from 1 to 9.

## **Resolutions:**

- It is resolved to follow the same syllabi given by APSCHE for single major& minor system for this academic year as it was first time introduced as per NEP 2020.
- It is also resolved, no inclusion or deletion of syllabi for this academic year as the common subject system is going to vanish with in two years.
- It is resolved to approve the above proposals and the syllabi designed under the flexibility of autonomy for I,II,III,IV,V and VI Semesters of B.Sc., considering the syllabi based on feedback from stake holders and local needs of Industry and members of BOS for the academic year 2023-24.
- It is resolved to accept proposed list of experiments for the list of experiments. It is also resolved to approve the prescribed books for the proposed syllabus.
- It is resolved and approved to evaluate the student's performance under Continuous Internal Assessment (CIA) and Semester End Examination (SEE) components at 60:40 ratio for all the semesters of B.Sc., Program for the academic year 2023 –24. The duration of the Examination is 3 hrs. It is also resolved to follow the Scheme of Examination and Blue print of Semester End Examination (SEE) for all the semesters of B.Sc for the academic year2023-24 in continuation with the previous academic year.

- It is resolved and approved to follow the Allocation of Credits for all semesters except I and II of B.Sc. Program as per previous academic year and for semester I and II as per APSCHE
- It is resolved and approved the above proposals and to offer various "Community Service Projects" as accredit course to I year students who are to be promoted to II Year.

Date 14-9-2023

Chairman

Board of StudiesDepart mentofPHYSICS

#### Members Present:

- 1.
- <u>2.</u>
- <u>3.</u>
- 4.
- 5.
- 6.

# **SYLLABI**

## **Allocation of Credits**

## For the Papersoffered during III, IV, V, VISe mesters

(AsApproved in the BOS meeting held on 14<sup>th</sup> September 2023)

S.No	Semest	Titleof the	Hrs/Wee	Max.	Marks	Credits
	er	Course(	k	Marks	in(CIA)	allotted
		Paper)		(SEE)		
1.	111	Thermodynamics	4	60	40	3
2		Thermodynamics Lab	2	50		2
3		Electricity,				
	IV	Magnetism&Electronics	3	60	40	3
4		Electricity,				
	IV	Magnetism&Electronics Lab	2	50		2
5	v	ModernPhysics	3	50	50	3
6	V	Modern PhysicsLab	2	50		2
7	V& VI	Lowtemperature physics &refrigeration	3	50	50	3
8		Lowtemperature				
	V& VI	physics &refrigeration lab	2	50		2
9	V& VI	SolarEnergy andApplications	3	50	50	3
10	V& VI	SolarEnergy andApplications Lab	2	50		2

NAAC ACCELEDITED	Sri ASNM GDC(A) PALAKOL		Prog	ram &	
CourseCode	HEAT AND THERMODYNAMICS	Semester II B.Sc (III Sem)			
Teaching	Hours Allocated: 60 ( <b>Theory</b> )	L	Т	Р	С
Pre- requisites:	Drift, Diffusion, Laws of thermodynamics, Heat capacities, Gas laws, Heat transfer methods, Statistics (mean, mode, median, Standard deviation, errors)	4	0	-	3

#### **CourseObjectives:**

- Understand the basic aspects of kinetic theory of gases, Maxwell-Boltzmann distribution law, equi-partition 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, the thermodynamic potentials and their physical interpretations.
- Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency
- Develop critical under standing 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.

#### **CourseOutcomes:**

OnCo	ompletion of thecourse, the students willbeable to-	Cognitive Domain
CO	Students would learn about Kinetic Theory of gases, Maxwell's law of	Understanding
1	distribution of molecular velocities and its experimental verification,	&Remembrance
	Mean free path, Degrees of freedom, Transport phenomenon	
	viscosity, Thermal conductivity and diffusion of gases	
CO	Students would learn about Various thermodynamic processes,	Application
2	entropy changes in various processes and heat engines.	
CO	Students would learn about various thermodynamic potentials	Analyzation
3	and joule kelvin cooling concepts using thermodynamic	
	potentials.	
CO	Students would learn about various methods for producing very low	Application
4	temperatures and theory of Joule Kelvin effect.	
CO 5	Students would learn about Blackbody and its spectral energy distribution of black body radiation, Various theories of Black body radiation, usage of various radiation measuring instruments.	Application

### Course with focus on employability / entrepreneurship / Skill Development modules

### UNIT-I

**Kinetic Theoryof gases: (12 hrs)** Kinetic Theory of gases - Introduction, Maxwell's law of distribution of molecular velocities (qualitative treatment only) and its experimental verification **(Toothed wheel)**, Mean free path, **derivations ofC**<sub>avg</sub>, **C**<sub>rms</sub>, **C**<sub>p</sub>, Transport phenomenon in ideal gases: viscosity, thermal conductivity and diffusion of gases.

### UNIT-II

**Thermodynamics:** (12hrs) Introduction- Isothermal and Adiabatic processes, Reversible and irreversible processes, Carnot's engine and its efficiency, Carnot's theorem, Introduction about Heat engines, Second law of thermodynamics: Kelvin's and Clausius statements, Principle of refrigeration, Entropy, Physical significance, Change in entropy in reversible and irreversible

processes; Entropy and disorder-Entropy of Universe; Temperature-Entropy (T-S) diagram and its uses; change of entropy when ice changes into steam.

Additional Input: Thermodynamic scale of temperature and its identity with perfect gas scale

### UNIT-III

**Thermodynamic Potentials andMaxwell'sequations:(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, Clausius-Clayperon's equation, Value of CP- Cv, Value of CP/Cv.

## UNIT-IV

**LowtemperaturePhysics:(12hrs)** Methods for producing very low temperatures - Joule Kelvin effect (Porous plug experiment), ,Distinction between adiabatic and Joule Thomson expansion, Expression for Joule Thomson cooling, Liquefaction of **air** by **Linde's** method,**Production of low** temperatures by adiabatic demagnetization (qualitative),**Practical applications of substances at** lowtemperatures.

Additional Inputs: Joule expansion

## UNIT-V

**Quantum theoryof radiation:(12 hrs)** Blackbody and its spectral energy distribution of black body radiation, Kirchoff's law, Wein's displacement law, Stefan-Boltzmann's law and Rayleigh-Jean's law (No derivations), Planck's law of black body radiation (Derivation), Deduction of Wein's law and Rayleigh-Jean's law from Planck's law, Solar constant and its determination using Angstrom pyroheliometer, Estimation of surface temperature of Sun.

## **TEXT BOOKS:**

- BSc Physics, Vol.2, Telugu Akademy, Hyderabad
- Heat and Thermodynamics -N BrijLal, P Subrahmanyam, S.Chand&Co.,2012
- Unified Physics Vol.2, Optics & Thermodynamics, Jai PrakashNath&Co.Ltd.,Meerut

## **REFERENCE BOOKS:**

- Thermodynamics, R.C.Srivastava, S.K.Saha&AbhayK.Jain, Eastern EconomyEdition.
- University Physics, HD Young, MW Zemansky, FW Sears, Narosa Publishers, New Delhi
- Fundamentals of Physics. Halliday/Resnick/Walker.C. Wiley India Edition2007
- Heat and Thermodynamics- MS Yadav, Anmol Publications Pvt. Ltd,2000

## WebLinks:

1. <u>https://ocw.mit.edu/courses/materials-science-and-engineering/3-00-thermodynamics-of-materials-fall-2002</u>

- 2. <u>https://ocw.mit.edu/courses/chemistry/5-60-thermodynamics-kinetics-spring-2008</u>
- 3. <u>https://onlinecourses.nptel.ac.in/noc20\_me51/preview</u>

4. <u>https://nptel.ac.in/courses/112/108/112108148/</u>

Addition / Deletion	Justification
Toothed wheel:	As a specific experimental verification of Maxwell speeds
	distribution.
Crms, Cavg, Cp:	To understand speed of gas molecules.
Equipartition Theorem:	It is part of introduction to kinetic theory of gases.
Degrees of freedom:	It is part of introduction to kingtic theory of gases
	It is part of introduction to kinetic theory of gases.
Introduction to any four heat engines:	To understand working and efficiencies of several of heat
	engines
Thermodynamic scale of temperature:	Which is having any link with present topics?
Joule-Kelvin effect:	This topic will also study in low temperature physics
Kapitza method:	
Joule Expansion:	It is presented as a part of difference between Joule
	expansion and adiabetic expansionLinde's method:

## TOPICS DELETED/ADDED UNDER AUTONOMOUS SETUP

## CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	3	3	1	2	2	3	2	3	2	3	3	2
CO2	3	2	3	3	2	3	3	1	3	3	3	2	1	2	2	3
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	2	1	3
CO4	3	2	3	2	2	2	3	3	1	1	3	1	2	3	2	2
CO5	3	2	3	2	2	2	3	3	1	1	3	1	2	3	3	1

## Question Bank:

## UNIT-I

- 1. Describe the Toothed wheel experiment for verification of Maxwell's law of distribution of molecular velocities
- 2. Define Mean free path and derive the equation.
- 3. What is thermal conductivity? Derive an expression for coefficient of thermal conductivity.
- 4. Define Viscosity of gases? Derive an expression for coefficient of viscosity of gases.
- 5. What do mean by Diffusion of gases? Derive an expression for coefficient of Diffusion of gases.
- 6. State the postulates of kinetic theory of gases .
- 7. Explain about the Transport phenomena in ideal gases.

## UNIT-II

- 1. Differentiate between Isothermal and Adiabatic processes.
- 2. What is heat engine? Determine the efficiency of a Carnot heat engine.
- 3. Explain briefly about Reversible and irreversible processes.
- 4. Discuss about the second law of Thermodynamics.
- 5. Explain about the change in entropy in reversible and irreversible processes.
- 6. What is Entropy? Explain its physical significance.
- 7. Discuss about principle of refrigeration.
- 8. What is T-S diagram and mention its uses

## UNIT-III

- 1. Explain briefly about Thermo dynamical potentials and its significance
- 2. Derive of Maxwell's thermodynamic relations from thermodynamic potentials
- 3. Derive the difference and ratio between  $C_{p}$  and  $C_{\nu}$
- 4. Determine the expression for Clausius-Clayperon's equation

## UNIT-IV

- 1. Explain about Joule Kelvin effect- Porous plug experiment
- 2. Describe an expression for Joule-Thomson cooling
- 3. Distinguish between Adiabatic and Joule-Thomson expansion
- 4. Discuss about the liquefaction of air by linde's method
- 5. Interpret the phenomenon of Production of low temperatures by adiabatic demagnetization
- 6. Write down the practical applications of substances at low temperatures

## UNIT-V

- 1. What is Black body radiation? Give examples.
- 2. Explain about spectral energy distribution of black body radiation.
- 3. Give definitions for (i) Kirchoff's law (ii) Wein's displacement law (iii) Stefan-Boltzmann's law and (iv) Rayleigh-Jean's law.
- 4. Derive Planck's law of black body radiation.

- 5. Deduction of Wein's law and Rayleigh- Jean's law from Planck's law.
- 6. Define Solar constant and determine it using Angstrom pyroheliometer
- 7. How do estimate the surface temperature of Sun.

## SRI A S N M GOVERNMENT COLLEGE (A), PALAKOL II B.Sc Physics – III SEM

## **MODEL PAPER**

Time: 3 hrs

Max. Marks:60M

5X10

#### **SECTION A**

### Answer ALL Questions (each questions carries 10 marks)

#### =60M

1 A) On the basis of kinetic theory of gases, derive expression for Coefficient of viscosity.

OR

B) Describe the Toothed wheel experiment for verification of Maxwell's law of distribution of molecular velocities.

2 A) Describe the working of Carnot's engine and derive expression for its efficiency.

OR

B) State and prove Carnots theorem.

3 A) Explain Joule-Kelvin effect from Maxwell's thermodynamic relations.

#### OR

B) Derive the four Maxwell thermodynamic relations.

4 A) Describe porous plug experiment. Obtain expression for cooling produced by Joule-Thomson effect.

#### OR

B) Explain the liquification of Air by Linde"s method.

5 A) State Planck's hypothesis. Deduce Planck's radiation formula.

### OR

B) Define solar constant. Explain the working of Angstrom Pyrheliometer.

## SECTION B

Answer any FIVE Questions (each question carries 5 marks) 5X5 = 25

6.Discuss about the postulates of kinetic theory of gases.

7. What are reversible and irreversible processes?

8.Show that Joule-Kelvin effect for perfect gas is zero.

9. What is solar constant? Describe Stefan-Boltzmann law.

10.Calculate the RMS speed of Hydrogen molecules at 5000K. Given K=1.38x10-23J/K..

11.Calculate the change in entropy of helium gas when its temperature changes from 298K to 1000K. Cp for Helium gas is 5/2 R.

12.Calculate the temperature of inversion for H2 and CO2 gases. Given Tc for H2 is -239.9°C and that for CO2 is 31°C.

13.Calculate the surface area of Tungsten bulb of 100W with operating temperature of 2450K and emissivity of 0.3

AGG ACCREDITED B GRADE	Sri ASNM GDC(A) PALAKOL		Prog	ram &			
CourseCode PHY-121	HEAT AND THERMODYNAMICS II B.Sc (III						
Teaching	Hours Allocated: 30 (Practicals)	L	Т	Ρ	С		
Pre- requisites:	Drift, Diffusion, Laws of thermodynamics, Heat capacities, Gas laws, Heat transfer methods, Statistics (mean, mode, median, Standard deviation, errors)	4	0	-	3		
Cour	seOutcomes:						

1. Perform some basic experiments in thermal Physics, viz., determinations of Stefan's constant, coefficient of thermal conductivity, variation of thermo-emf of thermocouple with temperature difference at its two junctions, calibration of a thermocouple and Specific heat of aliquid.

## Minimum of 6 experiments to be done and recorded

- 1. Specific heat of a liquid –Joule's calorimeter
- 2. Thermal conductivity of bad conductor-Lee's method
- 3. Verification of Stefan's law.
- 4. Specific heat of a liquid by applying Newton's law of cooling correction.
- 5. Heating efficiency of electrical kettle with varying voltages.
- 6. Thermal behavior of an electric bulb (filament/torch light bulb)
- 7. Thermo couple and Seebeck Effect.
- 8. Study of variation of resistance with temperature Thermistor.

### Virtual LabLinks:

- 1. https://vlab.amrita.edu/
- 2. <u>http://physics.bu.edu/~duffy/classroom.html</u>
- 3. <u>https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html&so</u> <u>rt=alpha&view=grid</u>
- 4. Study of Phase change of ice, naphthalene.

## **RECOMMENDED CO-CURRICULAR ACTIVITIES:**

### MEASURABLE

- Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual andchallenging)
- Student seminars (on topics of the syllabus and related aspects (individualactivity))
- Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups asteams)
- Field studies (individual observations and recordings as per syllabus content and related areas (Individual or teamactivity)
- 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 (teamactivity)

### GENERAL

- GroupDiscussion
- Visit to Research Stations/laboratories and related industries
- Others

### **RECOMMENDED ASSESSMENT METHODS**

Some of the following suggested assessment methodologies could be adopted;

- The oral and written examinations (Scheduled and surprisetests),
- Problem-solvingexercises,
- Efficient delivery using seminarpresentations,
- Viva voceinterviews.

NAAC ACCREDITED	Sri ASNM GDC(A) PALAKOL	Pr	ogram	1	
CourseCode	ELECTRICITYANDMAGNETISM	er IB.Sc. (ISem)			
Teaching	Hours Allocated:45( <b>Theory</b> )	L	Т	Р	С
Pre-requisites:	Laws of motion, vector and scalar concepts, rotator motion, basic mathematical laws	3	0	-	3

## COURSEOBJECTIVE:

The course on Electricity and Magnetism aims to provide students with a fundamental understanding of theprinciples of electricity, magnetism, and their interactions

### Learning Outcomes

OnC	ompletion of thecourse, the students willbeable to-	Cognitive domain
C01	Students would able to learn about the concepts of electric field and electric potential due to point charge, solid sphere, and cylinder. These concepts will enhance the student towards the problems come across in the real life. Students would also able to learn about the concept of dielectrics and its applications	Understanding & Remembrance
CO2	Students would able to learn about the concepts of Biotsavart's law,Faraday's law and it's applications.Students would also able to learn about Faradays laws and their applications in daily life like solenoid	Application
CO3	Students would able to learn about different combinations of Inductor, capacitance and resistor and also their performance characteristics. Students would also able to learn about mathematical description of Electromagnetic Waves ie Maxwell's equations	Analysis
CO4	Students would able to learn about Semiconductor devices ie PN junction diode, Zener diode and transistors and their characteristics so that the student can able to use appropriately	Understanding
CO5	Students would able to learn about number system ,Boolean algebra, basic logic gates which are more useful in digital world	Application
	Course with focus on employability / entrepreneurship / Skill Development	modules

Skill	Employability		Entropropourship	
Development	Епрюуартну		Entrepreneursnip	

#### UNIT-I (9 hr)

**1. Electrostatics:**Gauss's law-Statement and its proof, **Differential form of Gauss law**,Electric field intensity due to (i) uniformly charged solid sphere and (ii) an infinite conducting sheet of charge, Deduction of Coulomb's law from Gauss law, Electrical potential–Equipotential surfaces, Potential due to a uniformly charged sphere

2. Dielectrics: Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics, Applications of Dielectrics - 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. Additional Input: Dielectric strength,

#### UNIT-II (9 hr)

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

4. ElectromagneticInduction: Faraday's laws of electromagnetic induction, Lenz's law, Self-induction and Mutual induction, Self-inductance of a long solenoid, Mutual inductance of two coils, Energy stored in magnetic field, Principle and working of Transformer, Eddy currents and Electromagnetic damping

#### UNIT-III (9 hr)

**5.** Alternatingcurrents: Alternating current - Relation between current and voltage in LR and CR circuits, Phase and Vector diagrams, LCR series and parallel resonant circuit, Q – factor, Power in ac circuits, Power factor.

**6. Electromagneticwaves-Maxwell'sequations:** Idea of displacement current, Maxwell's equations-Derivation, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves, Poyntingtheorem (Statementand proof)

#### UNIT-IV (9 hr)

**Basic Electronic devices:** PN junction diode, Zener diode and Light Emitting Diode (LED) and their I-V characteristics, Zener diode as a voltage 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 anamplifier.

## UNIT-V (9 hr)

**Digital Electronics:** Number systems, Conversion of binary to decimal system and vice versa, Binary addition & Binary subtraction (1's and 2's complement methods), Laws of Boolean algebra, De-Morgan's laws-Statements and Proofs, Basic logic gates, NAND and NOR as universal gates, Exclusive-OR gate, Half adder and Full adder circuits.

## Additional Input

**Power Sources (Batteries):** Types of power sources - DC & AC sources - Different types of batteries - Rechargeable batteries – Lead acid 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.

### TEXT BOOKS

- BSc Physics, Vol.3, Telugu Akademy, Hyderabad.
- Electricity and Magnetism, D.N. Vasudeva. S. Chand &Co.
- Unified Physics Vol.3, ELECTRICITY, MAGNETISM AND ELECTRONICS, Jai PrakashNath&Co.Ltd.,Meerut

### **REFERENCE BOOKS:**

- 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.Murugeshan, S. Chand &Co.
- Principles of Electronics, V.K. Mehta, S.Chand&Co.,
- Digital Principles and Applications, A.P. Malvino and D.P.Leach, McGrawHilledition.

### WebLinks:

- 1. <u>https://ocw.mit.edu/courses/physics/8-02-physics-ii-electricity-and-magnetism-spring-</u> 2007
- 2. <u>http://physics.bu.edu/~duffy/classroom.html</u>
- 3. <u>https://nptel.ac.in/courses/115/106/115106122/</u>

	Deletion	Addition
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Potential due to a dipole: Students have	Differential form of Gauss law: Differential form of Gauss law is useful to study
studied in lower classes.	Maxwelle electromogratic equations
	Maxwells electromagnetic equations.
Dielectric strength:	Applications of dielectrics: To understand
	the practical usage of dielectrics
	Transformer: To make students to
	understand the application of mutual
	induction.

### Additional Inputs: Power sources

#### CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	0	0	1	2	3	2	3	2	2
CO2	3	2	3	3	0	0	1	3	2	1	2	1	3
CO3	2	3	2	3	0	0	0	2	2	3	3	1	2
CO4	3	2	3	2	0	0	1	3	1	2	2	2	1
CO5	3	2	3	2	0	0	0	3	1	2	1	3	2

## Question Bank:

### UNIT-I

- 1. State the Gauss law in electrostatics and prove it.
- 2. Derive the electric field intensity due to uniformly charged solid sphere.
- 3. Obtain expression electric field intensity due to an infinite conducting sheet of charge.
- 4. Deduce the Coulomb's law from Gauss law
- 5. Derive the potential due to a uniformly chargedsphere
- 6. Discuss about the equipotential surfaces.
- 7. Explain about the Polar and Non-polar dielectrics
- 8. Derive an expression for capacitance of a parallel plate condenser with dielectric slab between the plates.
- 9. Define Electric displacement vector(D), electric polarization (P) and Electric field intensity vector (E). Obtain the relation between D, E and P.
- 10. Discuss about the Dielectric constant and electric susceptibility.

#### UNIT-II

1. What is Biot-Savart's law? Derive its expression.

- 2. Derive an expression for magnetic field due to circular loop.
- 3. Obtain an expression for magnetic field due solenoid.
- 4. Discuss about the Divergence and curl of magnetic field.
- 5. What is Ampere's Circuital Law and discuss its application to Solenoid.
- 6. What is Hall Effect and determine its Hall coefficient?
- 7. Discuss about the applications of Hall Effect.
- 8. State and explain Faraday's Laws in electromagnetic induction? Derivean expression for the self-inductance of a long solenoid.
- 9. Explain briefly about mutual induction two coils.
- 10. Derive an expression for energy storied in magnetic field.
- 11. Explain about the principle and working of transformer.
- 12. Discuss about eddy currents and electromagnetic damping.

### UNIT-III

- 1. What is alternative current (A.C)? Obtain expression of the average value and virtual value of A.C.
- 2. Describe the behavior of LCR series circuit when an alternating current passing through it? Explain the condition of resonance.
- 3. Derive the equation of electromagnetic wave and hence determine the velocity of propagation of electromagnetic wave in free space.
- 4. Derive an expression for impedance of a series LCR circuit for A.C signals.
- 5. Discuss the condition under which resonance occurs in series circuit and obtain an expression for resonant frequency.
- 6. Discuss the growth and decay of current in L-R circuit.
- 7. Explain Q-factor and power factor.
- 8. What is displacement current? How Maxwell modified Ampere's circuital law by displacement current.
- 9. Derive four Maxwell's equations.
- 10. Obtain an expression for Maxwell's electromagnetic waves equations.
- 11. State and prove the Poynting theorem.
- 12. Discuss the transverse nature of electromagnetic waves.

### UNIT-IV

- 1. Define  $\alpha$ ,  $\beta$  and  $\gamma$  of a Transistor? Derive the relation between them?
- 2. What is a Transistor? Explain how it works and explain the CE characteristics of a Transistor?
- 3. Draw the I-V characteristics of a P-N junction diode and explain it?
- 4. Draw the I-V characteristics of a Zener diode and explain it?
- 5. In a Transistor, base current and emitter current are 0.08mA and 9.6mA respectively. Calculate collector current,  $\alpha$  and  $\beta$ ?

- 6. Explain about the Light Emitting Diode.
- 7. Explain that how Zener diode is acts voltage regulator.
- 8. Discuss about CE, CB and CC transistors.
- 9. Discuss about hybrid parameters.
- 10. Discuss that how transistor can be acts as anamplifier.

### UNIT-V

- 1. State and Prove De Morgan's Theorems? Explain how NAND gate can be used as a universal gate?
- 2. Discuss the working of half adder and Full- adder and give their truth-tables
- 3. Convert  $(0.1100101)_2$  to decimal number?
- 4. Explain NAND and NOR gates using their truth tables.
- 5. Discuss about binary addition and subtraction.
- 6. Discuss about basic logic gates.
- 7. What are universal gates and discuss those gates with examples.
- 8. Discuss about Exclusive-OR gate.

## SRIASNM GOVERNMENT COLLEGE (A), PALAKOL <u>DEPARTMENT OF PHYSICS</u> <u>MODEL PAPER FOR IV - SEMESTER END EXAMINATION:</u> <u>Electricity, Magnetism and Electronics</u> (As Approved in the BOS meeting held on 14 Sep 2023)

Time: 3 Hr

Max. Marks: 75

### <u>SECTION – A</u>

## **Answer ALL Questions** 5X10 = 50

1. State Gauss Law In Electrostatics and Derive It's Differential Form

or

Explain the boundary conditions at the dielectric surface.

2. State Hall Effect? Describe the Hal effect setup and determine the Hall coefficient of the given material

Or

State and explain Faraday's Laws in electromagnetic induction? Derivean expression for the self-inductance of a long solenoid

3. Derive the equation of electromagnetic wave and hence determine the velocity of propagation of electromagnetic wave in free space.

or

4. Describe the behaviour of LCR series circuit when an alternating current passing through it? Explain the condition of resonance

or

Define  $\alpha$ ,  $\beta$  and  $\gamma$  of a Transistor? Derive the relation between them

5. Write working and I-V characteristics of Zener Diode?

or

Write about the working of Half adder with neat circuit diagram

### <u>SECTION – B</u>

**Answer Any FIVE Questions** 5*X*5 = 25

6. Write a briefly about Equipotential Surfaces?

7. A series circuit of R = 25  $\Omega$  and L = 0.2 H is to be used at a frequency 500Hz. Find its impedance?

8. A long Solenoid has 20 turns per cm. Calculate the magnetic induction atthe interior point on the axis for a current of 20mA?

9. Show that  $\underline{AB + BC + CA} = \underline{AB} + \underline{BC} + \underline{AC}$ , using Boolean algebra and

Demorgan's Theorems?

10. Write the relation between D, E and P?

11. Define Biot-Savart's Law?

12. State Poynting theorem?

13. State the integral form of Maxwell equations?

NAAC ACCREDITED	Sri ASNM GDC(A) PALAKOL	Program
Course	ELECTRICITYANDMAGNETISM	&Semest er IIB.Sc. (IIISem)

Teaching	Hours Allocated: 30(practicals)	L	Т	Р	С
Pre-requisites:	Basic knowledge of screw gauge, vernier calipers, travelling microscope	2	0	0	1

#### **CourseOutcomes:**

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

V-I characteristics.

6. 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 universalbuilding blocks.

## Minimum of 6 experiments to be done and recorded

- 1. LCR circuit series/parallel resonance, Q factor.
- 2. Determination of ac-frequency –Sonometer.
- 3. Verification of Kirchoff's laws and Maximum Power Transfer theorem.
- 4. Stewart Gee's Experiment.
- 5. Zener Diode –V-I Characteristics
- 6. Transistor CE Characteristics
- **7**. Logic Gates- OR,AND, NOT and NAND gates- Verification of Truth Tables.
- 8. Verification of De Morgan's Theorems.
- 9. Half adder and Full adders-Verification of truth tables.
- **10.** Dielectric constant of a material.

### Virtual LabLinks:

- 1. https://vlab.amrita.edu/
- 2. <u>http://web.mit.edu/8.02t/www/802TEAL3D/visualizations/guidedtour/GuidedTour.htm</u>
- 3. <u>http://web.mit.edu/8.02t/www/802TEAL3D/visualizations/guidedtour/GuidedTour.htm</u>
- 4. <u>http://physics.bu.edu/~duffy/classroom.html</u>
- 5. Barkhausen Effect.
- 6. Temperature coefficient of resistance.
- 7. Hysterisis.

## **RECOMMENDED CO-CURRICULAR ACTIVITIES:**

#### MEASURABLE

- Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual andchallenging)
- Student seminars (on topics of the syllabus and related aspects (individualactivity))
- Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups asteams)
- Field studies (individual observations and recordings as per syllabus content and related areas (Individual or teamactivity)
- 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 (teamactivity)

#### GENERAL

- GroupDiscussion
- Visit to Research Stations/laboratories and related industries
- Others

### **RECOMMENDED ASSESSMENT METHODS**

Some of the following suggested assessment methodologies could be adopted;

- The oral and written examinations (Scheduled and surprisetests),
- Practical assignments and laboratory reports,
- Observation of practicalskills,
- Efficient delivery using seminar presentations,
- Viva voiceinterviews.

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NAME BERNALT	Sri ASNM GDC(A) PALAKOL				
		Program & Seme			
Course Code	MODERN PHYSICS	II	B.Sc.	(IV Ser	n)
Teaching	Hours Allocated: 3 hrs/week (Theory)	L	Т	Р	С

Pre-requisites:	Atomic models, Types of spectra, Matrices, Types	3	0	-	3
	of forces in nature, Electrical conductivity.				

## COURSEOBJECTIVE:

The course on Modern Physics aims to provide students with an understanding of the principles of modernphysics and their applications in various fields.

On Comp	letion of the course, the students will be able to-	
CO1	Students would able to learn about the concepts of atomic	KNOWLEDGE
	models and their drawbacks. Students would also learn about	
	Stern & Gerlach experiment Vector atom model, this model	
	gives the existence of spin of an electron. Study of fine spectra	
	and Zeeman effect on various elements.	
CO2	Students would able to learn about the importance of Quantum	KNOWLEDGE
	mechanics, study the basic concepts involved in the origin of	
	quantum mechanics like uncertainty principle, De-Broglie	
	matter waves, and experiments that confirm wave nature of	
	matter and particle nature of radiation.	
CO3	Students would able to learn about the importance of	UNDERSTANDING
	Heisenberg's uncertainty principle for position and momentum.	
	Students would able to learn Schrodinger time independent and	
	time dependent wave equations. Wave function properties	
	Significance. Basic postulates of quantum mechanics. from these	
	we can predict the position of a particle at future specific time	
CO4	Students would learn about basic properties of nucleus, dipole &	APLICATION
	quadrupole moments, binding energy, nuclear forces and	
	nuclear models. Elementary particles and counters	

CO5	Students would learn about basics of nanomaterials,	APPLICATION
	classification, properties. Students would also learn about	
	Introduction to Superconductivity, types and applications.	

Skill Development	Employability		Entrepreneurship	
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UNIT-I:

 Atomic and Molecular Physics:(12hrs) Quantum numbers associated with Vector atom model - Stern-Gerlach experiment, Angular momentum of the atom, Coupling schemes, Spectral terms and spectral notations, Selection rules, Intensity rules, Zeeman effect,Raman effect, Characteristics of Ramaneffect, Experimental arrangement to study Raman effect, Quantum theory of Raman effect, Applications of Raman effect. Additional Input: Fine structure of Sodium D-lines, Experimental arrangement to study Zeeman effect,

UNIT-II:

2. Matter waves &UncertaintyPrinciple: (12hrs) Matter waves, de Broglie's hypothesis, Wave length of matter waves, Properties of matter waves, Davisson and Germer's experiment, Heisenberg's uncertainty principle for position and momentum & energy and time, Illustration of uncertainty principle using diffraction of beam of electrons (Diffraction by a single slit) and photons (Gamma ray microscope), Bohr's principle ofcomplementarily.

## UNIT-III:

**3. Quantum (Wave) Mechanics: (12hrs)** Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equations-Derivations, Physical interpretation of wave function, Eigen functions, Eigen values, Application of Schrodinger wave equation to (i) one dimensional potential box of infinite height (Infinite Potential Well)

## UNIT-IV:

4. Nuclear Physics:(12hrs) Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; Nuclear forces: Characteristics of nuclear forces- Yukawa's meson theory; Nuclear Models: Liquid drop model, The Shell model, Magic numbers; Nuclear Radiation detectors: G.M. Counter, Cloud chamber, Solid State detector; Additional input: Elementary Particles: Elementary Particles and their classification

UNIT-V:

- 5. Nanomaterials:(9hrs)Nano materials Introduction, Electron confinement, Size effect, Surface to volume ratio, Classification of nano materials– (0D, 1D, 2D);Quantum dots, Nano wires, Fullerene, Carbon Nano Tubes, Graphene (structure and properties), Distinct Properties of nano materials, Properties of nano materials (Mention-*mechanical, optical, electrical, and magnetic properties*);Mention of applications of nano materials: (Fuel cells, Phosphors for HD TV, Next Generation Computer chips, elimination of pollutants, sensors)
- **6. Superconductivity: (3hrs)**Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic field, Meissner effect, Isotope effect, Type I and Type II superconductors, BCS theory (elementary ideas only), Applications of superconductors

## **TEXT BOOKS**

1. BSc Physics, Vol.4, Telugu Akademy, Hyderabad

2. Atomic Physics by J.B. Rajam; S.Chand&Co.,

3. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.

4. Unified Physics Vol.3, ELECTRICITY, MAGNETISM & ELECTRONICS, Jai PrakashNath& Co. Ltd., Meerut

## **REFERENCE BOOKS**

1. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-HillEdition

2. Nuclear Physics, D.C.Tayal, Himalaya PublishingHouse.

3. S.K. Kulkarni, Nanotechnology: Principles & Practices (CapitalPubl.Co.)

4. K.K.Chattopadhyay&A.N.Banerjee, Introd.to Nanoscience and Technology (PHI Learning Priv. Ltd).

5. Nano materials, A K Bandopadhyay. New Age International Pvt Ltd(2007)

6. Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj, BBRath and J Murday-Universities Press-IIM

## WebLinks:

i. <u>https://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008</u>

ii. https://nptel.ac.in/courses/115/105/115105083/

iii. <u>https://ocw.mit.edu/courses/physics/8-02t-electricity-and-magnetism-spring-2005</u>

iv. <u>https://nptel.ac.in/courses/115/103/115103108/</u>

v. https://nptel.ac.in/courses/118/102/118102003/

vi. https://nptel.ac.in/courses/115/104/115104096/

#### TOPICS DELETED/ADDED UNDER AUTONOMOUS SETUP

Deletion	Addition
Experimental arrangement of Zeeman effect:	As its definition is enough at this level of study, hence it's experimental part is not mentioned
Fine structure of Na D-lines:	
Phase and Group Velocities:	
Harmonic Oscillator:	

Elementary Particles topics is kept under additional inputs

## **Question Bank:**

## UNIT-I

- 1. Explain the Quantum Numbers associated with Vector Atom model.
- 2. Describe the Stern and Gerlach experiment and indicate the importance of the results obtained.
- 3. What is Raman Effect? Explain the formation of Stoke's and Anti Stoke's lines on the basis of quantum theory.
- 4. Explain L S Coupling Scheme.
- 5. Explain j j Coupling Scheme.
- 6. Mention any four applications of Raman Effect.
- 7. The Exciting line in an experiment is 5460A° and stokes line is at 5520A<sup>0</sup>. Find the wave length of anti stokes line.
- 8. A sample was excited by 4358 A<sup>0</sup> line. A Raman line was observed at 4447 A<sup>0</sup>. Calculate the Raman shift.
- 9. What is Zeeman Effect?

### UNIT-II

- 1. Describe the Davisson and Germer experiment to demonstrate the wave character of electrons.
- 2. What are matter waves? Derive an expression for de-Broglie wavelength of matter waves.
- 3. State and Explain Heisenberg's uncertainty principle for position and momentum. Extend it to Energy and Time.

- 4. Write the properties of matter waves.
- 5. Explain de Broglie hypothesis of matter waves.
- <sup>6.</sup> Calculate the de-Broglie wavelength associated with a proton moving with a velocity equal to 1/20<sup>th</sup> of the velocity of light. (Mass of the proton is 1.67x10<sup>-27</sup>kg)
- 7. If the uncertainty in the momentum of an electron is 1.65x10<sup>-24</sup> kg m/sec. calculate the uncertainty in its position.
- 8. What are matter waves?
- **9.** Illustrate the uncertainty principle using diffraction of beam of electrons (Diffraction by a single slit).
- **10.** Discuss about Bohr's principle of complementarily.

## UNIT – III

- 1. Derive Schrodinger time dependent wave equation.
- 2. Derive Schrodinger time independent wave equation.
- 3. Obtain an expression for the energy of particle in one dimensional potential well of infinite height.
- 4. Mention the basic postulates of quantum mechanics.
- 5. Explain the physical interpretation of wave function.
- Find the least energy of an electron moving in the dimension in an infinitely high potential box of width 1A<sup>0</sup>. Given mass of the electron 9.11x10<sup>-31</sup> kg and h=6.63x10<sup>-34</sup> J-s
- 7. What is meant by Eigen functions and Eigen values?

## UNIT –IV

- 1. Explain liquid drop model in detail. Write its drawbacks.
- 2. Explain shell model of nucleus. Mention its merits and demerits.
- 3. Explain Gamow's theory of  $\alpha$ -decay
- 4. Explain any four basic properties of nuclei.
- 5. Discuss about the Yukawa's meson theory
- 6. Explain neutrino hypothesis
- 7. A nucleus of mass number 125 has radius 6 Fermi. Find the radius of a nucleus having massnumber 64.
- 8. Define binding energy and explain with examples.
- 9. What are magic numbers?
- 10.Discuss about G.M. Counter and Cloud chamber for nuclear radiation detection.

## UNIT-V

1. Define nano materials. Discuss about electron confinement, size effect and surface to volume ratio.

- 2. Discuss about various types of nanomaterials.
- 3. Explain about carbon nano tubes and Graphene.
- 4. Discuss about the properties of nanomaterials.
- 5. Explain about the vital applications of nanomaterials
- 6. Explain Type-I and Type-II superconductors?
- 7. Explain the Meissner effect.
- 8. Mention the applications of superconductors
- 9. Discuss about BCS theory.
- 10. Define critical temperature, critical magnetic field and isotope effect.

## SRI A S N M GOVERNMENT COLLEGE (A), PALAKOL

DEPARTMENT OF PHYSICS

**MODEL PAPER FOR IV - SEMESTER END EXAMINATION** 

MODULE – V: Modern Physics

(As Approved in the BOS meeting held on 02 Aug 2022 for batch 2022-2023)

Time: 3hrs

Max. Marks: 75

### <u>SECTION – A</u>

## Answer ALL Questions 5X10=60

1. (a) Describe stern and Gerlach experiment. What is its importance?

(or)

(b) What is Raman Effect? How it is experimentally studied.

2. a) Explain De-Broglie hypothesis for matter waves. Derive an expression for De-Broglie wavelength.

(or)

(b) Explain Davison and Germer experiment for detection of matter waves.

3. (a) Derive Schrödinger's time independent waveequation.

(or)

(b) Obtain an expression for the energy of a particle in one dimensional potential wall.

4. (a) Explain magic numbers using nuclear shellmodel.

(or)

(b) Explain Gamow theory of  $\alpha$  –decay.

5. (a) Define Nano materials. Discuss about electron confinement, size effect and surface to volume ratio.

### (or)

5x5 = 25

(b) What is super conductivity? Explain Meissner effect. Mention the properties of super conductivity.

## <u>SECTION – B</u>

### **Answer Any FIVE Questions**

- 6. Explain L-S coupling and J-Jcoupling.
- 7. Explain Raman Effect and symmetry of Raman lines on the basis of quantum theory.
- 8. Explain liquid dropmodel.
- 9. Discuss about the properties of nanomaterials.
- 10. Explain Basic Postulates of QuantumMechanics.
- 11. Calculate the de-Broglie wave length associated with a proton moving with a velocity of 2200m\sec.(h=6.625x10<sup>-34</sup>J-S,m=1.6 x10<sup>-27</sup>kg)

- 12. A neutron breaks into a proton and an electron. Calculate the mass defect in thereaction. (mp=1.6725x10<sup>-27</sup>Kg ,me=9x10<sup>-31</sup>kg,mn=1.6747x10<sup>-27</sup>Kg)
- 13. Explain about carbon nano tubes and Graphene.

NAAC ACCEADURED	Sri ASNM GDC(A) PALAKOL	Prog	gram &	& Sem	ester
CourseCode	0		B.Sc. (	(IV Sen	n)
	U MODERN PHYSICS				
	C				
РНҮ	0				
Teaching	u Hours Allocated: 60	L	Т	Р	С
	r (Practicals)				
Pre-	Radiation safety, Handling electrical equipment and	-	0	2	1
requisites:	magnets, Safety measures.				

utcomes

Measure charge of an electron and e/m value of an electron by Thomson method

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

3. Study the absorption of  $\alpha$ -rays and  $\beta$ -rays, Range of  $\beta$ -particles and the

characteristics of GM counter

4. 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 photocell.
- 4. Determination of the Planck's constant using LEDs of at least 4 different colours.
- 5. Determination of M & H.
- 6. Energy gap of a semiconductor using junction diode.
- 7. Rydberg's constant.
- 8. GM counter characteristics.

#### Virtual LabLinks:

- 1. https://vlab.amrita.edu/
- 2. <u>http://web.mit.edu/8.02t/www/802TEAL3D/visualizations/guidedtour/GuidedTour.ht</u> <u>m</u>
- 3. <u>http://physics.bu.edu/~duffy/classroom.html</u>

## **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 asteams))
- 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
- Others

## **RECOMMENDED ASSESSMENT METHODS**

Some of the following suggested assessment methodologies could be adopted;

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

NAAC ACCREMITED	Sri ASNM GDC(A) PALAKOL	Program & Semester					
Course Code PHY6B	Durse Code       TITLE OF THE COURSE         PHY6B       LOW TEMPERATURE PHYSICS & REFRIGERATION         (Skill Enhancement Course (Elective), Credits: 05)			IV Year B. Sc.(Hons) – Semester – V			
Teaching	Hours Allocated: 50 (Theory)	L	Т	Р	С		
Thermo Dynamic Laws, fluid mechanics, Pre-requisites Condensation, States of matter, Phase diagram of material,		3	-	-	3		

## **Course Objectives:**

- 1. Different methods of liquefaction
- 2. Learning various types of thermometers
- 3. knowledge on refrigeration and air conditioning
- 4. Learning various applications of low temperature & refrigeration

## **Course Outcomes:**

On Cor	npletion of the course, the students will be able to	cognitive domain
CO1	Identify various methods and techniques used to produce low temperatures in the Laboratory.	Remembering
CO2	Acquire a critical knowledge on refrigeration and air conditioning	Understanding
CO3	Demonstrate skills of Refrigerators through hands on experience and learns about refrigeration components and their accessories	Applying
CO4	Understand the classification, properties of refrigerants and their effects on environment	Understanding
CO5	Comprehend the applications of Low Temperature Physics and refrigeration	Analyzing

**Course with focus on Employability / Entrepreneurship / Skill Development modules** 

Skill		Employability		Entropropourship	
Development		Linployability		Littepreneursnip	

## Syllabus:

## 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 REFIGERATOR (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.

**Text books:** 

1. Heat and Thermodynamics by BrijLal&N.Subramanyam, S.Chand Publishers.

#### **Reference books:**

1. Thermal Physics by S C Garg, R M Bansal& C K Ghosh, McGrawHill Education, India

2. Heat and Thermodynamics by M MZemansky, McGrawHill Education (India)

3. Low-Temperature Physics by Christian E. & Siegfried H., Springer.

4. Thermal Engineering by S. Singh, S.Pati, Ch:18 Introduction to Refrigeration.

5. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi

6. A course in Refrigeration and Air Conditioning by S.C. Arora and S. Domkundwar, Dhanpatrai and sons, Delhi

Web links:

1. The Physics Hyper Text Book. Refrigerators. https://physics.info/refrigerators/

2. Other Web sources suggested by the teacher concerned and the reading material. https://nptel.ac.in

#### **CO-PO Mapping:**

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	P O 1	Р О 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	P S O 1	P S O 2	P S O 3	P S O 4	P S O 5	P S O 6
C O 1	3	3	2	3	3	3	1	2	2	3	2	3	2	3	3	2
C O 2	3	2	3	3	2	3	3	1	3	3	3	2	1	2	1	2
C O 3	2	3	2	3	2	3	2	2	2	3	2	2	3	1	2	1
C O 4	3	2	3	2	2	2	3	3	1	1	3	1	2	1	2	3

## **Question Bank**

UNIT-I

- 1. Define and Discuss about Regenerative cooling
- 2. Describe the Joule-Thomson effect
- 3. What are the Freezing mixtures
- 4. Write Properties of materials at low temperatures
- 5. Explain Adiabatic demagnetization
- 6. Describe about production of liquid hydrogen and nitrogen
- 7. Discuss about different methods of liquefaction of gases and explain about liquefaction of air

## UNIT-II

- 1. Explain Gas thermometer and its correction and calibration
- 2. Differentiate between thermometers and thermocouples
- 3. Discuss about Resistance thermometers, Vapour pressure thermometers and Magnetic thermometers
- 4. Write about Advantages and drawbacks of each type of thermometer
- 5. Discuss about thermocouples

## UNIT-III

- 1. What is Refrigeration? Mention the types of Refrigeration.
- 2. Discuss about the Stages of refrigeration.
- 3. Draw the block diagram and explain Refrigeration cycle.
- 4. Distinguish between Natural and artificial refrigeration.
- 5. Explain Vapour compression and vapour absorption refrigeration systems,
- 6. What is Ideal refrigerant? What are commonly used refrigerants
- 7. Write the role of Refrigerants in air conditioners.
- 8. Interpret the phenomenon of Eco-friendly refrigerants.
- 9. What are the properties of refrigerant.

## UNIT-IV

- 1. Discuss about Refrigerator and its working with Block diagram
- 2. Describe the types of compressors, evaporators and condensers and their functional aspects.
- 3. Explain defrosting in a refrigerator.
- 4. Define Coefficient of Performance (COP), Tons of refrigeration (TR) and Energy Efficiency Ratio (EER).
- 5. Explain Refrigerant leakage and detection.

## UNIT-V

- 1. What are the applications of Low temperatures.
- 2. Discuss about Preservation of biological material.
- 3. Describe the role of liquid nitrogen and liquid hydrogen in medical field.
- 4. What is Food freezing.
- 5. Explain Tissue ablation (cryosurgery) and Cryogenic rocket propulsion system.
- 6. Explain about the various applications of Refrigeration.

## SRI A S N MGOVERNMENT COLLEGE (A), PALAKOL III B.Sc Physics – V SEM

## 6B: LOW TEMPERATURE PHYSICS AND REFRIGERATION MODEL PAPER

Time: 3 hrs

Max. Marks:75 M

#### SECTION A

#### Answer ALL Questions (each questions carries 10 marks) 5X10 = 50M

1 A) Describe the Joule-Thomson effect.

#### OR

B) Discuss about different methods of liquefaction of gases and explain about liquefaction of air.

2 A) Discuss about Resistance thermometers, Vapour pressure thermometers and Magnetic thermometers.

#### OR

- B) Discuss about thermocouples.
- 3 A) Explain Vapour compression and vapour absorption refrigeration systems. OR
  - B) Write the role of Refrigerants in air conditioners
- 4 A) Discuss about different types of compressors.
  - OR
  - B) Explain Refrigerant leakage and detection

5 A) Explain Tissue ablation (cryosurgery) and Cryogenic rocket propulsion system.

#### OR

B) Discuss about Preservation of biological material

#### SECTION B

#### Answer any FIVE Questions (each question carries 5 marks) 5X5 = 25M

- 6 Define and Discuss about Regenerative cooling.
- 7 Explain Gas thermometer and its correction and calibration.
- 8 Write about Natural and artificial refrigeration ..
- 9 Explain defrosting in a refrigerator..
- 10 Write about desalination of water.
- 11 what are freezing mixtures and give examples.
- 12 What is Food freezing.
- 13 Write about advantages and draw backs of each thermometer.



Sri ASNM GDC(A) PALAKOL

Program &

Course	TITLE OF THE PRACTICAL		Semester				
Code	Course 6B: Low Temperature Physics &		IV Year B.				
РНҮ6В Р	Refrigeration		Sc.(Hons) –				
		S	emes	ter – ∖	/		
Practical	Hours Allocated: 30 hrs, Max Marks: 50 (Lab)	L	Т	Р	с		
Pre-	Multimeter Various refrigerants	_	_	з	2		
requisites	Wattimeter, Various reingerants			5	2		
Learni	ing Outcomes.						

On successful completion of this 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

## Practical (Laboratory) Syllabus: (30 hrs)

### Minimum of 6 experiments to be done and recorded

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 chlorofluorocarbonshydrochlorofluoro- 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

### Lab References:

1. Experimental techniques in low temperature physics by Guy White, PhilipMeeson.

2. Experimental low-temperature physics by A. Kent, Macmillan physical science series

3. Physics and Chemistry at Low Temperatures by Leonid Khriachtchev.

4. Practical Cryogenics. http://research.physicsillinois.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.

https://www.routledge.com/Physics-and-Chemistry-at-Low-Temperatures/Khriachtchev/p/book/9789814267519

## **Co-Curricular Activities**

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

### 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.

### 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..

- Max marks for Fieldwork/Project work: 05.
- Suggested Format for Fieldwork/Project work: Title page, student details, index page, details of place visited, observations, findings and acknowledgements.
- Tests (IE).

## 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



Sri ASNM GDC(A) PALAKOL

Program &

	TITLE OF THE COURSE	9	Semester				
Course Code PHY7B	Solar Energy and Applications (Skill Enhancement Course (Elective), Credits: 05)	IV Year B. Sc.(Hons) – Semester – V					
Teaching	Hours Allocated: 50, Max. marks 100 (Theory)	L	Т	Ρ	С		
Pre- requisites	Basic idea about Latitudes and Longitudes, Introduction to semiconductors, PN junction diode and its characteristics	3	-	-	3		
<b>Course Objective</b>	25:						

- 1. Learning various radiation measurements
- 2. Understanding various solar thermal collectors and Solar water heaters
- 3. Learning various types of solarcells and modules

## **Course Outcomes:**

On Comple	tion of the course, the students will be able to	cognitive domain
CO1	Understand Sun structure, forms of energy coming from the Sun and its measurement.	Understanding
CO2	Acquire a critical knowledge on the working of thermal and photovoltaic collectors	Remembering
СО3	Demonstrate skills related to callus culture through hands on experience	Applying
CO4	Understand testing procedures and fault analysis of thermal collectors and PV modules	Understanding
CO5	Comprehend applications of thermal collectors and PV modules.	Analyzing

Course with focus on Employahi	lity / Entrenreneurshin	/ Skill Development modules
course with locus on Employasi	nty / Entrepreneursnip /	

Skill Development	Employability	Entrepreneurship	

## Syllabus:

## 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, Pyrometer-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 SOLARCELLS 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 **Text books:** 

1.Solar Energy Utilization by G. D. Rai, Khanna Publishers **Reference books:** 

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 Mc-Graw 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., and Air Conditioning by S.C. Arora and S. Domkundwar, Dhanpatrai and sons, Delhi

Web links:

1. https://courses.edx.org/c4x/DelftX/ET.3034TU/asset/solar\_energy\_v1.1.pdf

2.https://www.sku.ac.ir/Datafiles/BookLibrary/45/John%20A.%20Duffie,%20William% 0A.%20Beckman(auth.)Solar%20Engineering%20of%20Thermal%20Processes,%20Fou rth%20Edition%20(20 13).pdf

	CO-PO	Mapp	ing:													
	(1: Sli	ght [Lo	w];	2: Mo	derate	e [Meo	dium]	; 3: S	ubsta	ntial [	High],	'-' : No	o Correl	ation)		
	D	D	D	D	D	D	D	D	D	Р	Р	Р	Р	Р	Р	Р
	0	0	0	0	0	0	0	0	0	0	S	S	S	S	S	S
	1	2	3	4	5	6	7	8	9	1	0	0	0	0	0	0
					-					0	1	2	3	4	5	6
C O 1	3	3	2	3	3	3	1	2	2	3	2	3	2	2	3	1
C O 2	3	2	3	3	2	3	3	1	3	3	3	2	1	3	2	2
C O 3	2	3	2	3	2	3	2	2	2	3	2	2	3	1	2	3
C O 4	3	2	3	2	2	2	3	3	1	1	3	1	2	3	1	2

#### Question Bank:

#### UNIT-I

1. Explain about Spectral distribution of solar radiation

- 2. Describe the working principle of Pyroheliometer.
- 3. Explain the working Principle of Pyrometer.
- 4. Define and explain Solar constant.
- 5. What is zenith angle and Air-Mass.
- 6. State and explain standard time.
- 7. Write short note on equation of time. UNIT-II
- 1. What are the Solar Thermal Collectors and explain Flat plate collector.
- 2. Write a short notes on Solar cookers, Solar dryers, Solar desalinators.
- 3. Describe about Concentrating collectors.
- 4. Define collector efficiency factor, collector heat-removal factor and collector flow factor.
- 5. Explain about Evacuated tube collector.

## UNIT-III

- 1. Define and explain Schottky barrier.
- 2. What are the advantages and drawbacks of solar cells .
- 3. Draw and explain I-V characteristics of a Solar cell.
- 4. Define series and shunt resistance? Give explanation about their effect on efficiency.
- 5. Write short notes on Photovoltaic cell.
- 6. Discuss about conversion efficiency and quantum efficiency .

## UNIT-IV

- 1. What are different types of solar cells.
- 2. Discuss about I-V characteristics of Crystalline silicon solar cells .
- 3. Describe the structure and configurations of thin film solar cells CdTe/CdS.
- 4. What are the advantages and limitations of solar cells.
- 5. Describe briefly about the various steps involved in Module fabrication.
- 6. Write about Modules in series and parallel.
- 7. Explain Double and triple junction cells .

## UNIT-V

- 1. Discuss about Energy storage modes.
- 2. Describe the Energy storage in PV systems.
- 3. Write about Mechanical storage Flywheel .
- 4. Write about Electrical storage –Super capacitor.
- 5. Explain briefly about Solid-state battery, Molten solvent battery, lead acid battery and dry batteries.

## SRI A S N M GOVERNMENT COLLEGE (A), PALAKOL

## **III B.Sc Physics – V SEM**

7B: Solar Energy and Applications

**MODEL PAPER** 

Time: 3hrs

#### Max. Marks :75M

#### **SECTION A**

## Answer ALL Questions (each question carries 10 marks)

5X10

=50M

**1** a) Describe the working principle of Pyroheliometer.

#### OR

**b)** Explain about Spectral distribution of solar radiation.

2 a) Write a short notes on Solar cookers, Solar dryers, Solar desalinators.

OR

- b) Explain about Evacuated tube collector.
- 3 a) What are the advantages and drawbacks of solar cells.

OR

b) Define series and shunt resistance? Give explanation about their effect on efficiency.

4 a) Discuss about I-V characteristics of Crystalline silicon solar cells

OR

- b) Discuss about I-V characteristics of Crystalline silicon solar cells.
- 5 a) Describe the Energy storage in PV systems

OR

b) Write about Mechanical storage – Fly wheel.

### **SECTION B**

## Answer any FIVE Questions (each question carries 5 marks)

5X5 =25

**6** Define and explain Solar constant.

- 7 Write a short notes on Solar cookers, Solar dryers, Solar desalinators.
- 8 Write short notes on Photovoltaic cell.
- 9 Explain Double and triple junction cells.
- 10 Describe the Energy storage in PV systems.
- 11 Describe briefly about the various steps involved in Module fabrication.
- 12 Discuss about I-V characteristics of Crystalline silicon solar cells.
- 13 Write about Electrical storage –Super capacitor

NAAC ACCREDITED B DRADE	Sri ASNM GDC(A) PALAKOL		Progr Seme	am & ester	
Course Code PHY7B P	TITLE OF THE PRACTICAL Course 7B: Solar Energy and Applications	S	IV Year B. Sc.(Hons) – Semester – V		
Practical	Hours Allocated: 30 hrs, Max Marks: 50 (Lab)	L	Т	Р	С
Pre- requisites	Plotting graphs, Volatage, current, solar radiation	_	_	3	2
Learni	ng 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.
- 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

## Practical (Laboratory) Syllabus: (30 hrs)

## Minimum of 6 experiments to be done and recorded

- 1. Measurement of direct radiation using pyrheliometer.
- 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

## 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
- 4. Development of simple solar hot water collector:
- 5. <u>https://www.youtube.com/watch?v=WP8H5IOTwYU</u>
- 6. <u>https://www.instructables.com/Solar-Water-Heater-From-Scratch/</u>

## **Co-Curricular Activities**

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

## 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.

## 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

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

## 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.

## SRI A.S.N.M. GOVERNMENT COLLEGE, PALAKOL, WEST GODAVARI DISTRICT, A.P

## **DEPARTMENT OF PHYSICS**

## Certificate Course 2023-24

### Course Title: Electrical wiring

### **Course Objectives**:

- Understand the basic working principles of important electrical and electronic circuit components.
- > To Develop skills in repairing Electrical Appliances.
- > To provide Self employment.

## **Syllabus**

Module 1:

Ohms Law ,Work ,Power & energy,Cells- Primary & Secondary cells, general defects and maintainanence

### Module 2: First aid –safety precautions:

Precautions to be taken of various stages (while handling tools , during wiring etc.,) -electric fire

precautions against shocks -first aid artificial respirations

### Module 3: Wiring Circuits and system

3.1 Wiring Systems: Energy Distribution Systems – Distribution Board system – T.System – Tree System , Loop – in – System - Advantages – Disadvantages.

3.2 House wiring : Selection of wiring – C.T.S. wiring casing and capping – conduit wiring (concealed and surface) – comparison of different types of wirings.

3.3 Wiring Circuits: Simple Lamp circuits – staircase wiring – Corridor wiring – Master circuit – LodgeWiring – Go down wiring – Tube Light Circuit Running Light Circuit

### Module 4: .Earthing:

Necessity of earthing – Methods of Earthing – Pipe Earthig – Plate Earthing.

### Module 5: . A.C.Starters:

Necessity of starter – Constructions and working of D.O.L Starter – Star – Delta Starter

**Reference Book:** 

"Basic electrical Engineering" by V.K.Mehata

Quality Assurance Mechanism: The quality of the course will be ensured through continuous evaluation of feedback from students and course coordinator by IQAC of the college.

This proposal is placed before BOS committee for syllabus approval.

**Committee Members** 

**BOS** Chairman

## **DEPARTMENT OF PHYSICS**

## DEPARTMENTALACTIVITIES PROPOSEDDURING

## **THEACADEMICYEAR2023-24**

S.No	Name of the Activity	Month/Date
1	Parent- Teacher meetingforIII yr & II yr	2nd week of
	students	September 2023
2	GuestLectureto First Second& final	4 <sup>th</sup> week of
	yearStudents	September 2023
3	Parent – Teacher meeting for I yr Students	1st week of
		October 2023
4	Quiz programs	1 <sup>st</sup> week of october 2023
5	Group Discussions/ Debates	3 <sup>rd</sup> week of October
5	Celebrationof SirCVRamanBirthday	07-11-23
6	Teach back session for II yr & III yrstudents	2 <sup>nd</sup> week of
		November
7	Teach back session for I yr students	3 <sup>rd</sup> week of
		November
8	Certificate Course	3 <sup>rd</sup> week of January
9	StudentSeminars	1 <sup>st</sup> Weekof Dec & Feb 2024
10	NationalScienceday	28/02/2023
11	Birthday of Albert Einstein	14-03-24
12	Field Trip	4 <sup>th</sup> week March 2024
13	Study projects	1 <sup>st</sup> week of April
		2024

## SRI A S N M GOVERNMENT COLLEGE (A), PALAKOL, W.G.DT

#### **DEPARTMENT OF PHYSICS**

#### LIST OF EXAMINERS AND PAPER SETTERS 2023-24

(As Approved in the BOS meeting held on 14.9.2023)

S.NO	NAME OF THE LECTURER	ADDRESS		
01	Sri S Vankataswara Raa	Govt Arts College, Rajahmundry		
01	SIT S. VEIIKateswara Rau	E.G. Dt, Phone:9959988222		
02	Smt D.Vakula Driva	SRR Govt. college(A),		
02	SIIIL.P.Vakula Pilya	Vijayawada, Phone:		
		S C I M G.D.C,		
03	Sri K. Nelson	Tanuku, W.G.Dt		
		Phone: 9441655767		
		Government College,		
04	Sri M. Madhu Raju	Ganapavaram, W.G. Dt,		
		Phone: 9440333037		
OF	Sri K Javadov	P.R.Govt.College, Kakinada		
05	STER.Jayauev	E.G. Dt, Phone:9705558292		
06	CritCV Dadmanahham	G.D.C,Razole,		
00		E.G.Dt, Phone: 9948195459		
07	Cri C. Sundar Singh	Y N M college,		
07		Narsapur. W.G.Dt.		
00	Dr. M. Swietha	S.V.R.K. Government College (M),		
08	Dr. M. Sujatha	Nidadavole, Phone: 9912344027		
		S.V.K.P & Dr K.S. Raju Arts & Science College,		
09	Sri S. Srinivasa kao	Penugonda, Phone: 9951990869		
10		SRR & CVR Government College,		
10	Sri V Phani Kumar	Vijayawada, Krishna Dt., Phone: 9494533594		

#### Signatures of the Committee Members:-

1.	5.		9.	
2.		6.		10.
3.	7.		11.	

8.

4.

# BOSCERTIFICATION

## Sri A S N M Govt. COLLEGE(A), Palakol

## **DepartmentofPhysics**

## BOSCERTIFICATE

Thisistocertifythattheproposed agenda of board of studies meeting for the Academic Year 2023-24

havebeen discussed and approved by the board members unanimously. Their useful suggestions have been incorporated for effective implementation of Curricular/Co-curricular activities for the academic year 2023-24.

1.Syllabus design as per the UGC guidelines and APSCHE framework for I, II, III, IV, V and VI Semester(Both Theory and Practical).

2. Single Major /minor System syllabus design for 2023-24 admitted batch.

3. CBCS syllabus design for 2021-22 and 2022-23 admitted batch. With the scheme of evaluation

of 40 and SEE 60 marks for 2022-23 admitted batch and 25 ,75 marks for 2021-22 admitted batch

4. Additional Inputs in the Curriculum.

5. Internal and External assessment pattern.

6. Following the Allocation of Credit for all semesters of B.Sc.Programas per previousacademicyear Offering one "Community Project" as a credit course to I & II students during summervacation and Internship for III Year students in V/VI Semester

7. Departmentalactivitiesfor2023-24academicyear.

8. Certificatecourses offered by the Department of Physics.

9. Question paper pattern

10. CSP/Internship/On-the-job training.

11. List of Examiners and Paper setters.

MembersPresent:

1.

2

3.

126

Chairman,BoS