P.R. GOVERNMENT COLLEGE, KAKINADA

AN AUTONOMOUSE COLLEGE WITH NAAC "A" GRADE

DEPARTMENT
OF
PHYSICS AND ELECTRONICS

Board of Studies

Physics

2019 - 2020

P.R. Government College (A), Kakinada

Department of Physics and Electronics

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P.R. Government College (A), Kakinada

Department of Physics and Electronics

Agenda

Discuss and Approve

1. Syllabi for 5^{th} and 6^{th} semesters.
2. Question Bank and Blue Print.
3. Panel of Question Paper Setters and Examiners.
4. Internal to External exams to be assessed in the ratio 40:60 for all First, Second and third years
5. Split up for Continuous Comprehensive Evaluation (CCE)
6. Utilization of funds under various heads
7. Department Action plan for 2019-20
8. Any other proposal with the permission of the chair

P.R. Government College (A), Kakinada

Department of Physics and Electronics

RESOLUTIONS BOARD OF STUDIES MEETING OF PHYSICS

4th April 2019

1. It is resolved to continue to offer two Electives in VI semester for the present academic year 2019 – 20 as done in the previous year ie., 2018-19. The student has to choose one of the two electives.
   VII B Material Science
   VII C Renewable Energy

2. It is resolved to offer two Cluster Electives in semester VI comprising of three papers each. The student has to choose one of the two electives.

   Cluster Elective B
   VIII B1: Fundamentals of Nano Science.
   VIII B2: Synthesis and Characterization of Nano Materials.
   VIII B3: Application of Nano materials and Devices.

   Cluster Elective C
   VIII C1: Solar Thermal and Photovoltaic Aspects
   VIII C2: Wind, Hydro and Ocean Energies
   VIII C3: Energy Storage Devices

3. It is resolved to approve the Question Bank and Blue print for I, II & III years

4. It is resolved to approve the conduct of semester end practical exams for all I, II & III years uniformly from the academic year 2019 - 20

5. It is resolved to approve blue print for Practical examination for all three years.

6. It is resolved to approve to conduct Two mid semester examinations for Internal assessment for I year Students from academic year 2019 – 20. Out of the two one would be an online examination for 20 Marks and another would be theoretical for 20 Marks. An average of both the examinations would be taken for internal assessment.

7. It is resolved to approve question bank of MCQ's intended for I mid examination for I year students.

8. It is resolved to approve to continue to conduct Two theoretical mid semester examination for II & III year students.

9. It is resolved to approve blue print for internal examination for all three years.

10. It is resolved to approve the split up of Continuous Comprehensive Evaluation

    For I, II & III year CCE – 20 Marks
    10 M – Mini Project, 5M Seminar/ Assignment, 5 M – Quiz /Group discussion

11. To alter the number of seats for I year MPC Telugu medium and English medium.
    ie., To increase the number of seats in MPC English medium from 30 to 60 and to decrease the number of seats in MPC Telugu medium from 60 to 30. This is done by considering the demand ratio of both the groups for the past three years.

12. It is resolved to approve Department Action Plan for the academic year 2019-20.

13. Resolved to approve funds allocated under various heads

Sl. No	Purpose	Projected Amount
1	Board of Studies	5,000/-
2	Invited Lectures	12,000/-
3.	lab equipment	2,00,000/-
4	Reference Books	50,000/-
5.	Teaching learning Material	20,000/-
6.	Minor Repairs and Stationery	40,000/-
7.	Outreach Programme	20,000/-
8.	Study Area Programme	50,000/-
9	Teacher Training Programme	1,00,000/-
Total		**4,97,000/-**

P.R. Government College (A), Kakinada

Department of Physics and Electronics

AIM AND OBJECTIVES OF THE PROGRAMME

Aim

In this programme, we aim to provide a solid foundation in all aspects of physics and to show a broad spectrum of modern trends in physics and to develop experimental, computational and mathematical skills of students. The syllabi are framed in such a way that it bridges the gap between the plus two and post graduate levels of physics by providing a more complete and logical framework in almost all areas of basic physics.

The programme also aims

- To provide education in physics of the highest quality at the undergraduate level and generate graduates of the caliber sought by industries and public service as well as academic teachers and researchers of the future.
- To attract outstanding students from all backgrounds.
- To provide an intellectually stimulating environment in which the students have the opportunity to develop their skills and enthusiasms to the best of their potential.
- To maintain the highest academic standards in undergraduate teaching.
- To impart the skills required to gather information from resources and use them.
- To equip the students in methodology related to physics.

Objectives/Out comes

By the end of I year (2nd semester), the students should have,

- Attained a common level in basic mechanics and properties of matter and laid a secure foundation in mathematics for their future courses.
- Developed their experimental and data analysis skills through a wide range of experiments in the practical laboratories.

By the end of II year (4th semester), the students should have

- Been introduced to powerful tools for tackling a wide range of topics in Thermodynamics, Statistical Mechanics and Electrodynamics.
- Become familiar with additional relevant mathematical techniques.
- Further developed their experimental skills through a series of experiments which also illustrate major themes of the lecture courses.

By the end of III year (6th semester), the students should have

- Covered a range of topics in almost all areas of physics including quantum mechanics, solid state physics, computational physics, electronics, Renewable Energy etc.
- Had experience of independent work such as projects, seminars etc.
- Developed their understanding of core physics.

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Department of Physics and Electronics

Abstract of Course Wise Allocation of Credits

S. No.	Semester	PAPER	Course Code	Course	Hours/Week	Hours/Sem	Max. Marks	No. of Credits	Course Credits
1	I	PAPER – 1	PH1202	Mechanics	04	60	60 + 40	3	3
2	I	Practical – 1	PH1202 P	Mechanics	03	30	50	2	2
3	II	PAPER – 2	PH2202	Waves and Oscillations	04	60	60 + 40	3	3
4	II	Practical – 2	PH2202 P	Waves and Oscillations	03	30	50	2	2
5	III	PAPER – 3	PH3202	Optics	04	60	60 + 40	3	3
6	III	Practical – 3	PH3202 p	Optics	03	30	50	2	2
7	IV	PAPER – 4	PH4202	Thermodynamics	04	60	60 + 40	3	3
8	IV	Practical – 4	PH4202 P	Thermodynamics	03	30	50	2	2
9	V	PAPER - 5	PH5203	Electrostatic & Magnetostatics Basic and Digital Electronics	03	45	60 + 40	3	3
10	V	Practical - 5	PH5203 P	Electrostatic & Magnetostatics Basic and Digital Electronics	03	30	50	2	2
11	V	PAPER - 6	PH5204	Modern Physics	03	45	60 + 40	3	3
12	V	Practical - 6	PH5204 P	Modern Physics	03	30	50	2	2
13	VI	PAPER VII - B	Elective	Materials Science	03	45	60 + 40	3	3
14	VI	**PAPER VII - C**		**Renewable energy**	03	45	60 + 40	3	3
15	VI	Practical VII (B/C)	Elective	Elective practical	03	30	50	2	2
16	VI	PAPER VIII(B)-1	Cluster Elective	Fundamentals of Nanoscience	03	45	60 + 40	3	3

17	VI	Practical VIII (B) -1	e - B	Cluster Elective practical – (B) - 1	03	30	50	2	2
18	VI	PAPER VIII(B)-2		Synthesis and Characterization of nanomaterials	03	45	60 + 40	3	3
19	VI	Practical VIII (B) -2		Cluster Elective practical – (B) - 2	03	30	50	2	2
20	VI	PAPER VIII(B)-3		Applications of Nano materials and devices	03	45	60 + 40	3	3
21	VI	Practical VIII (B) -3		Cluster Elective practical – (B) – 3 / Project	03	30	50	2	2
22	VI	PAPER VIII(C)-1	Cluster Elective - C	Solar Thermal and Photovoltaic Aspects	03	45	60 + 40	3	3
23	VI	Practical VIII(C)-1		Cluster Elective practical – C-1	03	30	50	2	2
24	VI	PAPER VIII(C)-2		Wind, Hydro and Ocean Energies	03	45	60 + 40	3	3
25	VI	Practical VIII (C) -2		Cluster Elective practical – C -2	03	30	50	2	2
26	VI	Paper VIII (C) -3		Energy Storage Devices	03	45	60 + 40	3	3
27	VI	Practical VIII (C) -3		Cluster Elective practical – C -3 / Project	03	30	50	2	2
Total Credits Awarded - 50									

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Blue print for Semester End Theory Examination

For I Year (Sem I & sem II) , II year (Sem III & sem IV) & III year (Sem V & semVI) Papers

S. No.	Type of question	No. of Questions Given			No. of Questions to be answered		
		No. of Questions	Marks allotted To each question	Total marks	No. of Questions	Marks allotted To each question	Total marks
1	Section – A Essay question	5	10	50	3	10	30
2	Section – B Short answer Question	9	5	45	6	5	30
TOTAL				**95**			**60**

Percentage of Choice given $= \frac{95-60}{95} \; x \; 100$

$= \frac{35}{95} \; x \; 100 \qquad = 36.8\,\%$

P.R. Government College (A), Kakinada

Blue Print for Internal Theory Examination

For I Year (Sem I & Sem II) , II year (Sem III & sem IV) &
III year (Sem V & sem VI) Papers

S. No.	Type of question	No. of Questions Given			No. of Questions to be answered		
		No. of Questions	Marks allotted To each question	Total marks	No. of Questions	Marks allotted To each question	Total marks
1	**Section – A** Essay question	2	10	20	2	10	20
2	**Section – B** Short answer questions	4	5	20	4	5	20
TOTAL				**40**			**40**

Percentage of Choice given $= \frac{0}{40} \times 100 = 0\%$

The total of two internals is reduced to 20 marks and the other 20 marks allocated for CCE are further divided as follows

Seminar / Assignment	= 5 marks
Group discussion / Quiz	= 5 marks
Mini Project	= 10 marks
Total	**= 20 marks**

Blue print for Semester End Practical examination
For I Year,II year & III Year

Practical Paper

Scheme of Valuation for Practicals

Time:3 hrs Max.Marks:50

1. Formulae & Explanation - 6 Marks
2. Tabular form + graph + circuit diagram - 6 Marks
3. Observations - 12 Marks
4. Calculation, graph, precaution and results - 06 Marks
5. Viva Voce - 10 Marks
6. Records - 10 Marks

Note: Minimum of 6 experiments to be done and recorded.

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DEPARTMENT OF PHYSICS & ELECTRONICS

ADDITIONS AND DELETIONS IN THE III YEAR

Paper – V Topics Added			
S. No.	Name of the Unit	Topics added	Justification
1	Unit 4	1. Maxwell equations – integral & differential form 2. EM wave equation, wave velocity, 3. Poynting vector,	1. To give an insight in to Maxwell's equation
2	Unit 5	1. Basic semiconductor physics and P type and N type semiconductors, 2. Zener diode as voltage regulator	1. To provide strong foundation in semiconductors. 2. As an application of Zener diode.
Paper – V Topics Deleted			
	Name of the Unit	Topics Deleted	Justification
3	Unit 4	Transformer energy losses – efficiency.	Not in continuity with the existing syllabus
4	Unit 5	Tunnel diode, Transistor H-parameters	Not in continuity with the existing syllabus
Paper – VI Topics Added			
	Name of the Unit	Topics added	Justification
5	Unit 1	Selection rules, Intensity rules, Types of spectra.	To cover the total subject of coupling schemes.
Paper – VI Topics Deleted			
	Name of the Unit	Topics Deleted	Justification
6	Unit 1	Somerfield's elliptical orbits relativistic correction	Not much relavant to the existing syllabus

W.e.f. 2019-20 ADMITTED BATCH

MECHANICS

Course Code: PH1202 **No. of credits: 03** **4**
Hours/Week **Total hours: 60 hrs**

Module – 1 Vector Analysis (8):

Scalar and vector fields, gradient of a scalar field and its physical significance (L). Divergence of vector field and its physical significance (L). Curl of a vector field and its physical significance (L). Vector related problems. Vector integration- line, surface and volume integrals. Stokes, Gauss and Greens theorems (Statements only) (L).

Module – 2 Mechanics of Particles(10)

Laws of motion, motion of variable mass system (L), motion of a rocket, multi-stage rocket(S), conservation of energy and momentum (L). Collisions in two and three dimensions (L), concept of impact parameter, Rutherford scattering angle - derivation (L)

Module – 3 Mechanics of rigid bodies(10)

Definition of Rigid body (L), rotational kinematic relations (L), equation of motion for a rotating body (T), angular momentum and inertial tensor (L). Euler's equation (T), Gyroscope(S), precession of the equinoxes (L)

Module – 4 Mechanics of continuous media(10)

Elastic constants of isotropic solids and their relations (L), Poisson's ratio and expression for Poisson's ratio in terms of y, n, k (T). Classification of beams (P), cantilever with an end load (L) – Torsional oscillations – determination of rigidity modulus by torsional pendulum (T) (Disc method)

Module – 5 Central forces(12)

Central forces – definition and examples(L), conservative nature of central forces(L), conservative force as a negative gradient of potential energy(T), equation of motion under a central force(T), gravitational potential and gravitational field, motion under inverse square law(S), derivation of Kepler's laws(T).Geo stationary satellite , motion of the satellite.

Module – 6 Special theory of relativity (10)

Galilean relativity (L), absolute frames, Michelson-Morley experiment(S), Postulates of special theory of relativity(S). Lorentz transformations, time dilation, length contraction, mass-energy relation (T).

Textbooks

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008*.
2. **Fundamentals of Physics**. Halliday/Resnick/Walker *Wiley India Edition 2007*.
3. **Waves and Oscillations**. S. Badami, V. Balasubramanian and K. Rama Reddy *Orient Longman*.
4. **First Year Physics** - *Telugu Academy*.
5. **Mechanics of Particles, Waves and Oscillations**. Anwar Kamal, *New Age International*.
6. **College Physics-I**. T. Bhimasankaram and G. Prasad. *Himalaya Publishing House*.
7. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. *McGraw Hill*.
8. **Waves and Oscillations**. N. Subramaniyam and Brijlal *Vikas Publishing House Private Limited*.

Reference Books

1. Physics — Halliday & Resnick
2. Properties of Matter — D.S.Mathur
3. Lectures on Physics — Richard Feynmann
4. University Physics — Zemansky
5. Mechanics — Berkley Series
6. Mechanics, waves and oscillations — S.L. Gupta and Sanjeev gupta
7. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company* Edition, 2008.
8. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005*.
9. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition*.
10. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. *The McGraw Hill Companies*.
11. **Mechanics**. Hans & Puri. *TMH Publications*.
12. **Engineering Physics**. R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications*.
13. **Mechanics by D**.S Mathur.

I B.Sc., Semester – I (Model paper)
PHYSICS - Paper 1
(MECHANICS)

Course Code: PH1202 **No. of credits: 03**

W.e.f. 2019-20 ADMITTED BATCH

Note: - Set the question paper as per the blue print given at the end of this model paper.

Time: $2\frac{1}{2}$ Hours Max Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	-	1	1	10
II	1	1	-	15
III	1	1	-	15
IV	1	1	1	20
V	1	1	-	15
VI	1	1	1	20
Total Marks				95

Note: At least ONE problem should be answered.

QUESTION BANK

SUBJECT: PHYSICS **PAPER: I** **SEMESTER: I**

MECHANICS

UNIT - I (VECTOR ANALYSIS)

Short Questions - 5M

1. What is divergence of a vector field? Explain its physical significance.
2. What is curl of a vector field? Explain its physical significance?
3. Explain gradient of a scalar field and its physical significance.
4. What are line, surface and volume integrals?
5. State Gauss, Greens and Stokes theorems?

Problems - 5M

6. If A=2xi+2yj+3zk, find curl A?
7. If A= iy^2+ j(x+y) + k (yz+zx) then find diva at (1,-1, 1)?
8. Find the value of curl (**a** x **r**), where a is **a** constant vector?
9. Obtain the values of (i) curl grad φ (ii) div curl A?
10. If A= iy+ j(x^2+y^2) + k (yz +zx) then find curl A at point (2, 2,-2).

UNIT – II (MECHANICS OF PARTICLES)

Essay Questions - 10M

11. Derive an expression for Rutherford's scattering angle.
12. State Newton's laws. Derive the equation of motion of variable mass system?
13. Explain the motion of a rocket under constant gravitational field.

Short Questions – 5 M

14. Explain the multistage Rocket?
15. Derive the equation for the final velocities of particles in two dimensional elastic collision
16. Write a note on impact parameter?
17. State and prove the conservation of angular momentum.

UNIT – III (MECHANICS OF RIGID BODIES)

Essay Questions - 10M

18. What is rigid body? Derive Euler's equations for a rigid body?
19. Define rigid body. Obtain rotational kinematic relations of rigid body..

Short Questions - 5M

20. Obtain the equation of motion for a rotating body.
21. Explain the principle and working of a Gyroscope.
22. Write a short notes on inertia tensor.
23. Write a note on precession of Equinoxes.

UNIT - VI (MECHANICS OF CONTINUOUES MEDIA)

Essay questions - 10M

24. Define three moduli of elasticity and obtain the relation between them.
25. What is cantilever. Obtain the expression for the depression at the loaded end of cantilever.

Short Questions – 5 M

26. Classify different types of beams.
27. How can you determine the Rigidity Modulus of a wire by using Torsion pendulum method?

Problems - 5M

28. Calculate Poisson's ratio for silver, given its young's modulus 7.25×10^{10} N/m^2 and bulk modulus 11×10^{10} N/m^2
29. The young's modulus for steel is $Y = 2 \times 10^{11}$N/m^{2}and its rigidity modulus $10xx10^{10}$ N/m^2.find the poison's ratio and its bulk modulus.

UNIT – V (CENTRAL FORCES)

Essay questions - 10M

30. What are central forces? "Show that the central force is conservative"
31. State and prove Kepler's first law of planetary motion?
32. State and prove Kepler's second and third laws of planetary motion?

Short Questions – 5M

30. Show that conservative force is equivalent to negative gradient of potential energy.
31. Derive equation of motion under central force?
32. What are satellites? Discuss the motion of satellite and derive expression for velocity.
33. Write a note on geo stationary satellite.

UNIT – VI (SPECIAL THEORY OF RELATIVITY)

Essay Questions - 10M

34. Describe Michelson-Morley experiment and explain the physical significance of negative results
35. State the Postulates of Special theory of Relativity. Derive Einstein's Mass Energy equivalence relation.
36. What is relativity? Derive Lorentz transformation equations?

Short Questions – 5M

37. Write about Galilean relativity
38. Explain Length Contraction.
39. Explain time dilation.

Problems - 5M

40. Calculate the velocity of the rod, when its length will appear 90% of its proper length.
41. A particle of mass M_0 is moving with a velocity 0.9C. Calculate its relativistic mass.
42. Find the mass of Electron moving with a velocity 10^{10} cm/sec. The rest mass of the electron is 9.1×10^{-31}Kg.
43. The total energy of a particle is exactly twice its rest energy. Find its speed.

P.R. Government College (A), Kakinada

I B.Sc., Physics-Practical Semester – I

W.E.F . 2019 - 20 ADMITTED BATCH

Course Code : PH1202P **No. of credits : 02**

3 Hours/Week **Total hours : 30**

Any six experiments.

1. Study of a compound pendulum determination of ‘g’ and ‘k
2. Study of damping of an oscillating disc in Air and Water logarithmic decrement
3. Study of Oscillations under Bifilar suspension
4. Study of oscillations of a mass under different combination of springs
5. ‘Y’ by uniform Bending (or) Non-uniform Bending
6. ‘n’ by torsion Pendulum
7. Verification of Laws of a stretched string (Three Laws)
8. Study of Viscosity of a fluid by different methods

P.R. Government College (A), Kakinada.

I B.Sc., Physics-Semester – II Paper – II

WAVES AND OSCILLATION

Course Code : PH2202 **No. of credits : 03**

w.e.f. 2019-20 ADMITTED BATCH

Hours/Week 4 **Total hours : 60**

Module – 1: Fundamentals of Vibrations(12)

Simple harmonic oscillator and solution of the differential equation(T)– Physical characteristics of SHM(P) - combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies(T), Lissajous figures – applications(L).

Module – 2: Damped and Forced Oscillations(12)

Damped harmonic oscillator(L), solution of the differential equation of damped oscillator(T). Logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution(P).

Module – 3: Complex vibrations and coupled oscillations (6)

Fourier theorem and evaluation of the Fourier coefficients(T), analysis of periodic wave functions-square wave(T), saw-tooth wave(P).

Module – 4: Vibrations of bars (12)

Longitudinal vibrations in bars- wave equation and its general solution(T). Special cases (i) bar fixed at both ends ii) bar fixed at the midpoint iii) bar free at both ends iv) bar fixed at one end(T). Tuning fork(P). Comparison between Longitudinal and Teraservers Vibrations in a bar.

Module – 5: Vibrating Strings (12)

Transverse wave propagation along a stretched string, general solution of wave equation and its significance (T), modes of vibration of stretched string clamped at both ends(L), overtones.

Module – 6: Ultrasonics (6)

Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostriction methods(L), detection of ultrasonics. Applications of ultrasonic waves – ultra sound scan(S).

Textbooks

1. **Berkeley Physics** Course. Vol.1,
2. **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008.*
3. **Fundamentals of Physics**. Halliday/Resnick/Walker *Wiley India Edition 2007*.
4. **Waves and Oscillations**. S. Badami, V. Balasubramanian and K. Rama Reddy *Orient Longman*.
5. **First Year Physics** - *Telugu Academy*.
6. **Mechanics of Particles, Waves and Oscillations**. Anwar Kamal, *New Age International*.
7. **College Physics-I**. T. Bhimasankaram and G. Prasad. *Himalaya Publishing House*.
8. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. *McGraw Hill*.
9. **Waves and Oscillations**. N. Subramaniyam and Brijlal *Vikas Publishing House Private Limited*.
10. Mechanics, waves and oscillations S.L. Gupta and Sanjeev Gupta

Reference Books

1. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company* Edition, 2008.
2. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005*.
3. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*
4. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. *The McGraw Hill Companies*.
5. **Mechanics**. Hans & Puri. *TMH Publications*.
6. **Engineering Physics**. R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications*.
7. Waves and oscillations Brijlal and Subrahmanyam.
8. Mechanics and waves Berkley series

I B.Sc., Semester – II (Model paper)
PHYSICS PAPER – II
w.e.f. 2019-20 ADMITTED BATCH

(Waves and oscillations)

Course Code : PH2202 **No. of credits : 03**

Note:- Set the question paper as per the blue print given at the end of this model paper.

Time : $2\frac{1}{2}$ Hours Max Marks : 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	1	20
II	1	1	1	20
III	1	1	-	15
IV	1	1	-	15
V	--	1	1	10
VI	1	1	-	15
Total Marks				95

Note: At least ONE problem should be answered.

QUESTION BANK

SUBJECT: PHYSICS PAPER: II SEMESTER: II

WAVES & OSCILLATIONS

UNIT – I (Fundamentals of vibrations)

Essay Questions - 10M

1. Obtain the differential equation for the motion of a simple harmonic oscillator.Find its solution?
2. Discuss the linear combination of two mutually perpendicular simple harmonic vibrations having different frequencies?
3. Discuss the linear combination of two mutually perpendicular simple harmonic vibrations having same frequencies?

Short Questions – 5 M

4. What are Lissajous Figures? What are its uses?
5. What is simple harmonic motion? What are its characteristics?

Problems - 5M

6. A particle executes S.H.M. with a period of 0.02 sec and amplitude 10 cm. Find its acceleration when it is 4 cm away from its mean position.
7. The displacement of the particle executing S.H.M. is given by $x= 10 \cos(4\pi t+\pi/3)$ metre. Find the frequency and displacement after time 1 second.

UNIT – II (Damped and Forced oscillations)

Essay Questions - 10M

8. Explain Damped oscillations. Obtain equation for damped oscillator and find its solution?
9. What are Forced oscillations? Obtain differential equation for forced oscillations and find its solution.

Short Questions – 5 M

10. Explain Logarithmic decrement of an oscillator?
11. Define Relaxation time? Derive the formula for it?
12. Explain Quality factor?

Problems - 5M

13. The amplitude of a second pendulum falls to half initial value in 150 sec. calculate the Q factor.
14. The amplitude of an oscillator of frequency 200Hz falls to 1/10 of its initial value after 2000 cycles. Calculate its relaxation time.

UNIT – III (Complex vibrations and coupled oscillations)

Essay Questions - 10M

15. State and prove Fourier theorem?
16. Analyse a square wave using fourier theorem?
17. Analyse a saw-tooth wave using Fourier theorem?

Short Questions – 5 M

18. State Fourier theorem?
21. What are limitations of Fourier theorem?
22. Evalute the values of $\mathbf{A_O, A_r, B_r}$?

UNIT- IV(Vibrations of bars)

Essay Questions - 10M

23. What are longitudinal waves?.Obtain wave equation and its solution for longitudinal vibrations in a bar.
24. Derive the general solution for a longitudinal wave in a bar. Discuss the mode of vibrations for (a) Bar free at both ends (b) Bar fixed at one and.
25. Derive the general solution for a longitudinal wave in a bar. Discuss the mode of vibrations for (a) Bar fixed at both ends (b) Bar fixed at middle.

Short Questions – 5 M

26. Compare the longitudinal and transverse vibrations in a bar.
27. Describe the construction and working of tuning fork.

UNIT- V(Vibrating strings)

Essay Questions - 10M

Short Questions – 5 M

28. Obtain the equation for velocity of transverse wave in a stretched string and discuss the solution of a wave equation.
29. Explain modes of vibration of stretched string clamped at both ends.
30. Write a note on overtones.

Problems - 5M

31. The diameter of iron wire is 1.2 mm .If the speed of transverse waves in the wire is 50m/sec then what is the tension in the wire. The density of iron is $7.7x10^2$ kg/m^3.
32. A wire of mass 0.001kg and length 2.5 mm is under tension of 1N.Find the fundamental frequency of the wire.
33. A travelling wave propagates according to the expression Y=0.003sin (3x-2t).Determine the amplitude, wave length ,frequency and period of the wave.
34. A steel wire 50cm long has mass of 5gms. It is stretched with a tension of 400N. Find the frequency of the wire in fundamental mode of vibration?

UNIT- VI(Ultrasonics)

Essay Questions - 10M

35. What are Ultrasonic waves? Describe the magnetostriction method of producing ultrasonics?
36. Explain how ultrasonic waves can be produced and detected using Piezo-electric method?

Short Questions – 5 M

37. What are the applications of ultrasonic sounds.
38. Explain various methods used in detection of ultrasonics?

P.R. GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., Physics-Practical II Semester – II
w.e.f. 2019-20 ADMITTED BATCH

Course Code : PH1202P(B) **No. of credits : 02**
3 Hours/Week **Total hours : 30**

Any six experiments.

1. Study of flow of liquids through capillary
2. Determination of Surface Tension of a liquid by different methods
3. Volume Resonator –determination of frequency of a tuning fork
4. Velocity of Transverse wave along a stretched string
5. Determination of frequency of a Bar-Melde's experiment
6. Measurement of errors –simple Pendulum
7. Moment of Inertia of a fly wheel
8. Observation of Lissajous figures from CRO

P.R. Government College (A), Kakinada

II B.Sc., PHYSICS- SEMESTER-III Paper – III
w.e.f. 2018 - 19 ADMITTED BATCH

OPTICS

Course Code : PH3202 **No. of credits : 03**

4 Hours/Week **Total Hours : 60**

1) **Module – 1 The Matrix methods in paraxial optics: (8)**

Introduction, the matrix method(L), **optical direction cosine -** effect of translation, effect of refraction(T), System matrix - System matrix and lens formula for thick & thin lenses (L) – System marix for the combination of two thin lenses in contact & seperated by a distance (T).

2) **Module – 2 Interference: (10)**

Principle of superposition(L) – coherence – Theory of interference fringes(L) - conditions for Interference of light(L)

Interference by division of wave front: Fresnel's biprism – determination of wave length of light(T). Determination of thickness of a transparent material using Biprism (L)– Lloyd's mirror experiment(S).

3) **Module – 3 Interference: (12)**

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law)(T) – Colours of thin films – Non reflecting films(L) – Determination of diameter of wire-Newton's rings in reflected light with contact between lens and glass plate(T) – Determination of wave length of monochromatic light (S)– Michelson Interferometer (Theory only) – Determination of wavelength of monochromatic light(S).

4) **Module – 4 Diffraction: (12)**

Introduction – Distinction between Fresnel and Fraunhoffer diffraction(L) -Fraunhoffer diffraction- Diffraction due to single slit (L) – Fraunhoffer diffraction due to double slit(S) Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating(L).

Fresnel diffraction:-

Fresnel's half period zones(L) – area of the half period zones –zone plate – Comparison of zone plate with convex lens – difference between interference and diffraction(S).

5) **Module – 5 Polarization (12)**

Polarized light : Methods of Polarization(L), Polarization by reflection(T), refraction, Double refraction, selective absorption,– Brewster's law(L) – Malus law – Nicol prism polarizer and analyzer(L) – Quarter wave plate(L), Half wave plate (L)– Optical activity(L), analysis of light by Laurent's half shade polarimeter(S).

6) **Module – 6 Laser (06)**

Lasers: Introduction – Spontaneous emission – Stimulated emission – Population inversion(L) . Laser principle – Einstein coefficients(T) – Types of Lasers – He-Ne laser (L)– Ruby laser (L)– Applications of lasers(S).

Textbooks

1. **Optics** by Ajoy Ghatak. *The McGraw-Hill companies*.
2. **Optics** by Subramaniyam and Brijlal. *S. Chand & Co*.
3. **Fundamentals of Physics**. Halliday/Resnick/Walker.*C. Wiley India Edition 2007.*
4. **Optics and Spectroscopy**. R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co*.
5. **Second Year Physics** – *Telugu Academy.*
6. **Modern Physics** by R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co*.

Reference Books

1. **Modern Physics** by G. Aruldhas and P. Rajagopal, *Eastern Economy Education.*
2. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications.*
3. **Feyman's Lectures on Physics** Vol. 1,2,3 & 4. *Narosa Publications*.
4. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill I*

II B.Sc. - III SEMESTER END EXAMINATION
PHYSICS – PAPER III (Model Paper) Semester III
w.e.f. 2018 - 19 ADMITTED BATCH

OPTICS

Course Code : PH3202 **No. of credits : 03**

Note:- Set the question paper as per the blue print given at the end of this model paper.

Time: 21/2 Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	--	1	1	10
II	1	1	--	15
III	1	1	1	20
IV	1	1	1	20
V	1	1	1	20
VI	1	--	--	10
Total Marks				95

Note: At least ONE problem should be answered.

QUESTION BANK

SUBJECT: PHYSICS **PAPER: III** **SEMESTER: III**

OPTICS

UNIT: 1 – Matrix methods in paraxial optics

Short questions – 5 M

1. Obtain system matrix for thin lens.
2. Obtain translation matrix in paraxial optics
3. Obtain refraction matrix in paraxial optics
4. Find the focal length when two thin lenses in contact.
5. Find the focal length when two thin lenses separated by a distance.

Problems – 5 M

6. A lens of thickness 2 cm and refractive index 1.5 placed in air has radii of curvature 8 cm and -8 cm. Find the system matrix and focal length of this thick lens.
7. Two thin converging lenses of powers 5 and 4 diopters are placed coaxially 10 cm apart. Find the focal length of the combination.
8. Obtain the system matrix for a thin lens placed in air and made of glass of refractive index 1.5 and radii of curvature100 cm each. What is the focal length of the lens?
9. The radius of curvature of the surfaces of a double convex lens are R1 = R2 = 50 cm. The refractive index of the material of the lens is 1.5. Find the optical power of the lens.

UNIT: 2 - Interference (Division of Amplitude)

Essay questions-10 M

10. Derive the expression for fringe width in biprism experiment.
11. Describe an experimental arrangement for the observation and measurement of Lioyd's mirror fringes.

Short questions – 5 M

12. Write conditions for interference of light?
13. Give the theory of interference fringes of light.
14. Describe how the thickness of a transparent material can be determined using Biprism.

UNIT: 3 - Interference (Division of Wave front)

Essay questions-10 M

15. Describe the Newton's ring method for measuring the wave length of monochromatic light. Give the necessary theory.
16. Describe the construction and working of Michelson interferometer?

Short questions – 5 M

17. Explain Cosine law.
18. Explain the formation of colours in thin films.
19. What is non-reflecting film? Explain its need.

Problems - 5 M

20. A non-reflecting film of refractive index 1.2 is minimising the reflection for a light of wavelength 5000 A^0. Find the wavelength of the film
21. In Newton's rings experiment, the diameter of 10^{th} dark ring is 0.433 cm. Find the wave length of incident light, if the radius of curvature of the lens is 70 cm
22. In a Newton's ring experiment, the diameter of the 5^{th} ring was 0.3 cm and the diameter of 25^{th} ring was 0.8 cm. If the radius of curvature of Plano-convex lens is 100 cm. Find the wave length of light used.

UNIT: 4 - Diffraction

Essay questions - 10 M

23. Discuss Fraunhofer diffraction due to a single slit. Explain the distribution of intensity of light in the diffraction pattern.
24. What are Fresnel's half period zones? Show that the resultant intensity is one-fourth that due to the first half period zone acting alone.
25. Explain the construction and working of zone plate? Derive the formula for its focal length.

Short questions - 5 M

26. Distinguish between Fresnel's and Fraunhofer diffractions.
27. Distinguish between Interference and Diffraction.
28. Find the expression for resolving power of a grating when the light is incident normally on the grating.

Problems - 5 M

29. A parallel beam of sodium light is allowed to be incident normally on a plane grating having 4250 lines per cm and a second order spectral line is observed to be deviated through 30^0. Calculate the wavelength of spectral line.
30. A zone plate has a focal length of 60 cm for wavelength of 5893 A^0. Find the radii of first and hundredth circles of the zone plate.
31. Find the radius of the first zone in a zone plate of focal length 20 cm for a light of wavelength 500 nm.

UNIT: 5 - Polarisation

Essay questions - 10 M

28. Describe the construction and working of Nicols prism. And mention it uses.
29. Describe the construction and working of Laurent's half shade Polarimeter.

Short questions - 5 M

30. State and prove Brewster's law.
31. State and explain Malus law.
32. Write a note on Quarter wave plate.
33. Write a note on Half wave plate.
34. Write a note on Babinet's compensator

Problems - 5 M

35. Calculate the specific rotation if the plane of polarisation is turned through 26.4^0 traversing 20 cm length of 20% sugar solution?
36. A glass slab is to be used as a polariser. Find the angle of polarisation for it. Also find the angle of refraction. Given μ for glass = 1.54
37. Calculate the thickness of (a) a quarter wave plate (b) half wave plate given μ_e=1.533, μ_0=1.544 and λ=5000A^o

UNIT: 6 – LASERS

Essay questions - 10 M

38. What do you mean by LASER? Describe the construction and working of Ruby LASER
39. Describe the construction and working of He-Ne laser? Give any 3 applications of LASER

P.R. Government College (A), Kakinada

II B.Sc., Physics-Practical III Semesters –III
w.e.f. 2018-19 ADMITTED BATCH

Course Code : PH3202P **No. of credits : 02**

3 Hours/Week **Total hours: 30**

Any Six experiments.

1. Thickness of a wire-wedge method.
2. Determination of Radius of curvature of a given convex lens- Newton's rings..
3. Study of optical rotation - polarimeter.
4. Dispersive power of a prism
5. Determination of wavelength of light using diffraction grating minimum deviation method.
6. Resolving power of a telescope.
7. Refractive index of a liquid and glass (Boys Method).

P.R. GOVERNMENT COLLEGE (A), KAKINADA

II B.Sc., PHYSICS- SEMESTER-IV Paper – IV
w.e.f. 2018-19 ADMITTED BATCH

THERMODYNAMICS

Course Code : PH4202 **No. of credits : 03**

4 Hours/Week **Total hours : 60**

Unit – I **33 hrs**

1. **Module – 1 Kinetic theory of gases: (11)**

Introduction(L) – Deduction of Maxwell's law of distribution of molecular speeds(T), C, C_p & C_{rms} and the relation among them(T) - Mean free path - Transport Phenomena(L) – Viscosity of gases – thermal conductivity – diffusion of gases(T).

2. **Module – 2 Thermodynamics: (12)**

Introduction – Reversible and irreversible processes(L) – Carnot's engine and its efficiency (T)– Carnot's theorem (L)– Second law of thermodynamics, Kelvin's and Clausius statements(T) –Entropy, physical significance (L)– Change in entropy in reversible and irreversible processes (L)– Entropy and disorder – Entropy of universe(L) – Temperature- Entropy (T-S) diagram(L).

3. **Module – 3 Thermodynamic potentials and Maxwell's equations: (10)**

Thermodynamic potentials – Derivation of Maxwell's thermodynamic relations (T)– Clausius-Clayperon's equation (T)– Derivation for ratio of specific heats(T) – Derivation for difference of two specific heats for perfect gas(T). Stephen – Boltzmann law - derivation

Unit – II **27 hrs**

4. **Module – 4 Low temperature Physics: (12)**

Introduction – Joule Kelvin effect – liquefaction of gas using porous plug experiment(L). Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling(T) – Liquefaction of helium, Kapitza's method (L)– Adiabatic demagnetization – Production of low temperatures(L) – Principle of refrigeration, vapour compression type(S). Working of refrigerator.

5. **Module – 5 Quantum theory of radiation 1: (8)**

   Black body-Ferry's black body(L) – Quantum theory of radiation - Planck's law – deduction of Wein's law, Rayleigh-Jeans law, from Planck's law (T)-

6. **Module – 6 Quantum theory of radiation 2: (7)**

   Measurement of radiation – Types of pyrometers(S) – Disappearing filament optical pyrometer experiment (S) – Angstrom pyroheliometer(L) - determination of solar constant, temperature of sun(T).

Textbooks

1. **Fundamentals of Physics**. Halliday/Resnick/Walker.*C. Wiley India Edition 2007.*
2. **Optics and Spectroscopy**. R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co*.
3. **Second Year Physics** – *Telugu Academy.*
4. **Modern Physics** by R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co*.

Reference Books

1. **Modern Physics** by G. Aruldhas and P. Rajagopal, *Eastern Economy Education.*
2. Berkeley Physics Course. Volume-5. **Statistical Physics** by F. Reif. *The McGraw-Hill Companies.*
3. **An Introduction to Thermal Physics** by Daniel V. Schroeder.*Pearson Education Low Price Edition*.
4. **Thermodynamics** by R.C. Srivastava, Subit K. Saha & Abhay K. *Jain Eastern Economy Edition*.
5. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications.*
6. **Feyman's Lectures on Physics** Vol. 1,2,3 & 4. *Narosa Publications*.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

II B.Sc., SEMESTER – IV PAPER IV (Model Paper)
w.e.f. 2018-19 ADMITTED BATCH

THERMODYNAMICS

Course Code : PH4202 No. of credits : 03

Note:- Set the question paper as per the blue print given at the end of this model paper.

Time : $2\frac{1}{2}$ Hours Max Marks : 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	-	15
II	1	1	1	20
III	1	1	-	15
IV	1	1	1	20
V	1	1	-	15
VI	-	1	1	10
Total Marks				95

QUESTION BANK

SUBJECT: PHYSICS **PAPER: IV** **SEMESTER: IV**

THERMODYNAMICS

Module – I (KINETIC THEORY OF GASES)

Essay questions - 10 M

1. Derive an expression for the Maxwell's law of distribution of molecular speeds in a gas.
2. Define Coefficient of Viscosity. On the basis of kinetic theory of gases, derive an expression for the coefficient of Viscosity.
3. Define Coefficient of Thermal Conductivity. On the basis of kinetic theory of gases, derive an expression for the coefficient of Thermal Conductivity.
4. Derive expressions for C, C_p, and C_{rms} & derive the relation between them
5. Define Coefficient of Diffusion. On the basis of kinetic theory of gases, derive an expression for the coefficient of Diffusion.

Short questions - 5 M

6. Derive the relation between C, C_p, and C_{rms}
7. Explain the Transport Phenomena with reference to a gas
8. Write a short note on Mean free path

Module – II (THERMODYNAMICS)

Essay questions - 10 M

9. Describe the working of Carnot's Engine and derive an expression for its Efficiency.
10. Define Entropy. Give the Physical significance of the entropy. Calculate the change in Entropy in irreversible cycle.
11. What is a T-S diagram? Give its uses. Obtain an expression for the efficiency of a Carnot's engine using T-S diagram.

Short questions - 5 M

12. What are reversible and irreversible processes? Give examples
13. State and Prove Carnot's theorem.
14. Obtain an expression for the change in entropy in Reversible cycle.
15. Write a short note on Entropy and disorder.

Problems - 5 M

16. Calculate the efficiency of a reversible engine working between 327^0C and 127^0C
17. Carnot engine has the same efficiency between 1500K and 500K and T K and 1000K. Find the value of T
18. Calculate the change of entropy when 300g of lead melts at 327^0C. Lead has a latent heat of fusion of 5.85 Cal g^{-1}

Module – III (THERMODYNAMIC POTENTIALS & MAXWELLS EQUATIONS)

Essay questions - 10 M

19. What are Thermodynamic Potentials? Derive the Maxwell's Thermodynamic Equations.
20. Derive Stephen – Boltzmann law using Maxwell's Equations
21. Obtain Maxwell's thermodynamic relations?

Short questions - 5 M

22. Derive the Equation for the difference of two specific heats of a perfect gas
23. Derive the Equation for the ratio of two specific heats
24. Derive Clausius – Clapeyron's equation from Maxwell's Equations.
25. Write about Thermodynamic Potentials.

Module – IV (LOW TEMPERATURE PHYSICS)

Essay questions - 10 M

26. What is Joule – Thomson Effect? Obtain an expression for the Cooling produced in this effect.
27. What is Adiabatic demagnetization? Explain the Principle of Adiabatic demagnetization.
28. What is Joule – Kelvin effect? Describe the porous plug experiment and indicate the results
29. What is refrigeration? Explain the principle of working of a vapour compression machine

Short questions - 5 M

30. Explain the principle of regenerative Cooling
31. Explain the method of cooling Helium vapour by Kapitza method

Problems - 5 M

32. Calculate the temperature of inversion of helium gas. Given that a = 3.44x13-3 nt-m^4/mol^2 and b = $0.0237x10^{-3}$ m^3/mol and R = 8.31 joule/(mol – K)
33. Calculate the temperature of inversion in case of H_2 and CO_2 from the given date. T_c for H_2 is -239.9^oC and fro Co_2 is 31^oC.

Module – V (Quantum theory of radiation 1)

Essay questions - 10 M

34. State Planck's hypothesis. Derive Planck's formula for the distribution of energy in black body radiation.
35. Derive Wein's law and Rayleigh-Jeans law from Planck's radiation law.

Short questions - 5 M

36. Describe Fery's black body
37. What is black body? What are the properties of black body radiation?

Module – VI (Quantum theory of radiation 2)

Short questions - 5 M

38. Write a note on Disappearing filament Optical pyrometer.
39. How do you determine Solar constant experimentally by using Angstrom Pyrheliometer?
40. Write a short note on Solar constant.
41. How temperature of sun is determined?

Problems - 5 M

42. Determine the temperature of sun with the help of wien's law, given b = 2.92×10^{-3} mK. Maximum wavelength = 4900 A^0.
43. A black body radiator at 0^0 c radiates energy of 3.2×10^2 Jm^{-2} sec^{-1}. Calculate the value of Stefan's constant.
44. Calculate the temperature of the sun from the following data. S = 1.34 KW/ m^2, radius of the Sun = 7.92×10^5 Km. Distance of the sun from the earth = 1.5×10^5 Km and Stefan's constant = 5.7×10^{-8} W m^{-2} K^{-4}.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

II B.Sc., Physics-Practicals IV Semesters – IV
w.e.f. 2018 - 19 ADMITTED BATCH

Course Code : PH4202P **No. of credits : 02**

3 Hours/Week **Total hours: 30**

Any Six experiments.

1. Thermal conductivity of bad conductor-Lee's method
2. Study of variation of resistance with temperature – thermistor
3. Heating efficiency of electrical kettle with varying voltages.
4. Thermo emf- thermo couple – potentiometer
5. Measurement of Stefan's constant.
6. Specific heat of a liquid by applying Newton's law of cooling correction.

P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper V – Semester – V
w.e.f. 2017-18 ADMITTED BATCH

Course Code : PH5203 **No. of credits : 03**
Electrostatic & Magnetostatics, Basic and Digital Electronics

No. of Hours per weak: 3 **Total Lectures:45**

UNIT-I (8 hrs)

1. Electric field intensity and potential:

Gauss's law statement and its proof- Electric field intensity due to (1) Uniformly charged sphere and (2) an infinite conducting sheet of charge. Electrical potential – equipotential surfaces- potential due to i) a point charge, ii) ***Dipole*** and iii) circular disc

UNIT-II (6 hrs)

2. Dielectrics:

Electric dipole moment and molecular polarizability - Electric displacement D, electric polarization P – relation between D, E and P- Dielectric constant and susceptibility. Boundary conditions at the dielectric surface.

UNIT-III (7 hrs)

3. Electric and magnetic fields

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

UNIT-IV (8 hrs)

4. Electromagnetic induction & Introduction to Maxwell's Equations

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

Maxwell's Equations –

Maxwell equations in integral and differential forms (No derivation), wave equation and wave velocity, Poynting theorem (Definition only).

UNIT-V (7 hrs)

5. Basic electronics:

Band theory of solids, ***Basic semiconductor physics and P type and N type semiconductors*** - PN juction diode, Zener diode I-V characteristics, ***Zener diode as voltage regulator***, PNP and NPN transistors, CB, CE and CC configurations – Relation betweenα, β and γ - transistor (CE) characteristics, Transistor as an amplifier.

UNIT-VI: (9 hrs)

6. Digital electronics

Number systems - Conversion of binary to decimal system and vice versa.Binary addition and subtraction (1's and 2's complement methods).Laws of Boolean algebra - De Morgan's

laws-statement and proof, Basic logic gates, NAND and NOR as universal gates, exclusive-OR gate, Half adder and Full adder, Parallel adder circuits.

Note: Topics in Bold & Italic are newly added from this academic year

REFERENCE BOOKS

1. BSc Physics, Vol.3, Telugu Akademy, Hyderabad.
2. Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.
3. Electricity, Magnetism with Electronics, K.K.Tewari, R.Chand& Co.,
4. Principles of Electronics, V.K. Mehta, S.Chand& Co.,
5. Digital Principles and Applications, A.P. Malvino and D.P.Leach, McGrawHill Edition.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics Paper – V – Semester – V – Model Paper
w.e.f. 2017-18 ADMITTED BATCH

Course Code : PH5203 **No. of credits : 03**

Electrostatic & Magneto statics, Basic and Digital Electronics

Note:- Set the question paper as per the blue print given at the end of this model paper.

Time: 2 1/2Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	--	15
II	--	2	--	10
III	1	--	1	15
IV	1	1	1	20
V	1	1	--	15
VI	1	1	1	20
Total Marks				95

Note: At least two problems should be answered.

QUESTION BANK

SUBJECT: PHYSICS PAPER: V SEMESTER: V

UNIT-I (Electric field intensity & Potential)

Essay questions-10M

1. State and Prove Gauss theorem in electrostatics
2. State Gauss theorem and derive an expression for the electric field due to uniformly charged sphere?
3. Define Electric potential. Calculate the electric potential due to a circular disc.
4. Define Electric dipole. Derive an expression for Electric potential due to a dipole.

Short questions- 5M

5. Derive an expression for electric potential due to a point charge
6. What are equipotential surfaces?
7. Derive an expression for Electric field intensity due to an infinitely conducting sheet

UNIT-II (Dielectrics)

Short questions- 5M

8. Define Electric Dipole Moment and molecular polarizability.
9. Define D, E and P and deduce relation between them.
10. Write a note on boundary conditions at dielectric surfaces?
11. Find the relation between Susceptibility and Dielectric Constant.

UNIT-III (Electric & Magnetic fields)

Essay questions-10M

12. Derive an expression for the magnetic induction at a point due to an infinitely long straight current carrying current.
13. State and explain Biot-Savart's law. Derive an expression for the magnetic induction on the axis due to circular loop.
14. Derive an expression for the Magnetic induction due to Solenoid.
15. Define Hall Effect? Derive an expression for hall coefficient? Mention its applications.

Problems – 5M

16. A long straight wire carries a current 3.5A. Find the magnetic induction at a point 0.2m from the wire.
17. A current of 1A is flowing in a circular coil of radius 10 cm and 20 turns. Calculate the magnetic field at a distance 10cm on the axis of the coil and centre.
18. A Solenoid of length 100 cm has 1000 turns wounded on it. Calculate the magnetic field at the middle point of its axis, when a current of 2 amps is passed through it.
19. The single carrier holes in a shaped silicon sample are 2.05×10^{22} $m^{-3.}$ Calculate its Hall Coefficient.

UNIT-IV (Electromagnetic Induction &Maxwell equations)

Essay questions-10M

20. Define Coefficient of Self induction and obtain an expression for self inductance of a solenoid.
21. Derive the equation of Electromagnetic wave. Show that the velocity of EM wave is equal to velocity of light in free space.
22. Derive Maxwell's equations in differential form.

Short questions – 5M

23. Obtain an expression for the energy stored in a solenoid.
24. State and explain Faraday's and Lenz's law?
25. Explain self inductance and mutual inductance.
26. Derive an expression for the coefficient of coupling.
27. Write a short note on Poynting Vector.

UNIT-V (Basic **Electronics)**

Essay questions-10M

28. Describe the construction & working of a PN junction diode. Explain the V-I characteristics of PN junction diode.
29. Describe the construction & working of a Zener diode. Explain the V-I characteristics of Zener diode.
30. Explain the Input & Output characteristics of PNP transistor in CE configuration.

Short questions - 5M

31. Define α, β& Υ of a transistor. Obtain a relation between them.
32. Explain a Zener diode as a voltage regulator.
33. How does transistor work as an amplifier?

UNIT- VI (Digital Electronics)

Essay questions-10M

34. State and prove De-Morgan's theorem?
35. Draw the circuit diagrams of Half adder & full-adder and explain its operation with truth table.

Short questions - 5M

36. Draw the truth table of AND, OR & NOT logic gates?
37. Show that NAND Gate is a universal gate?
38. Show that NOR Gate is a universal gate?

Problems-5M

39. Convert the following (A) 55_{10} = ……$_2$ (b) 10010.1011_2 = ……$_{10}$
40. Using 2's complemental , subtract $(100111)_2$ from $(110011)_2$
41. Add the following using binary addition method $(10111)_2$ and $(10101)_2$

P.R. GOVERNMENT COLLEGE (A),KAKIINADA

III B.Sc., Physics-Practicals –paper V Semesters – V
w.e.f. 2017-18 ADMITTED BATCH

3 HOUR/WEEK **TOTAL HOURS : 30**

No. of credits: 2

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. Field along the axis of a circular coil carrying current.
5. PN Junction Diode Characteristics.
6. Zener Diode Characteristics.
7. Transistor CE Characteristics- Determination of hybrid parameters.
8. Logic Gates- OR,AND,NOT and NAND gates. Verification of Truth Tables.
9. Verification of De Morgan's Theorems.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics Paper – VI – Semester – VI
2017-18 Admitted batch

Course Code: PH6203 **No. of credits: 03**

Modern Physics

No. of Hours per week: 03 **Total Lectures: 45**

UNIT-I (8 hrs)

1. Atomic physics

Introduction –Drawbacks of Bohr's atomic model - Vector atom model and Stern-Gerlach experiment - quantum numbers associated with it. L-S and j- j coupling schemes. ***Selection rules, intensity rules,*** Zeeman effect and its experimental arrangement, ***types of spectra***.

UNIT-II (6 hrs)

2. Molecular physics

Raman effect, hypothesis, Stokes and Anti Stokes lines. Quantum theory of Raman effect. Experimental arrangement – Applications of Raman effect.

UNIT-III (9 hrs)

3. Matter waves & Uncertainty Principle

Matter waves, de Broglie's hypothesis - wavelength of matter waves, Properties of matter waves - Davisson and Germer experiment – Phase and group velocities.

Heisenberg's uncertainty principle for position and momentum (x and p), & energy and time (E and t). Experimental verification - Complementarily principle of Bohr.

UNIT-IV (9 hrs)

4. Quantum (wave) mechanics

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 particle in one dimensional infinite box.

UNIT-V (6 hrs)

5. General properties of nuclei:

Basic properties of nucleus – size, mass, charge, spin, magnetic dipole and electric quadrupole moment, Liquid drop model, Shell model (Qualitative), Magic numbers.

UNIT-VI (7 hrs)

6. Radioactive decay:

Alpha decay: basics of alpha decay processes, theory of alpha decay, Gamow's theory, Geiger – Nuttal law. Beta decay, energy kinematics for Beta decay, positron emission, electron capture, neutrino hypothesis.

Note: Topics in Bold & Italic are newly added from this academic year

REFERENCE BOOKS

1. BSc Physics, Vol.4, Telugu Academy, Hyderabad
2. Molecular Structure and Spectroscopy by G. Aruldhas. Prentice Hall of India, New Delhi.
3. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.
4. Modern Physics by G. Aruldhas& P. Rajagopal. Eastern Economy Edition.
5. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
6. Quantum Mechanics, Mahesh C Jain, Eastern Economy Edition.
7. Elements of Solid State Physics, J.P.Srivastava, Prentice Hall of India Pvt., Ltd.
8. Solid State Physics, A.J. Dekker, McMillan India.

P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper – VI – Semester – VI (Model Paper)
2017-18 ADMITTED BATCH

Course Code: PH6203 **No. of credits: 03**

Modern Physics

Note: - Set the question paper as per the blue print given at the end of this model paper.

Time: 2 1/2 Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	1	20
II	1	1	--	15
III	--	2	1	15
IV	1	1	1	20
V	1	--	--	10
VI	1	1	--	15
Total Marks				95

Note: At least two problems should be answered.

QUESTION BANK

SUBJECT: PHYSICS PAPER: VI SEMESTER: V

UNIT-I (Atomic physics)

Essay Questions - 10M

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.

Short Questions - 5M

3. Explain L – S Coupling Scheme.
4. Explain j – j Coupling Scheme.
5. Explain different types of spectra
6. Explain the selection rules of L,S and J.
7. Explain Zeeman effect.

Problems - 5M

8. Prove that for a given principal quantum number n,there are n^2 possible states each of which can accommodate a maximum of 2 electerons.
9. Consider a state with L=1 and S=1/2 .What are the possible spectrum terms.

UNIT-II (Molecular physics)

Essay Questions - 10M

10. What is Raman effect? Explain the formation of Stoke's and Anti Stoke's lines on the basis of quantum theory.
11. What is Raman effect? How it is experimentally studied. Mention any two applications of Raman Effect

Problems - 5M

12. The Exciting line in an experiment is 5460 A and the stokes line is at 5520 A^0.Find the wave length of anti – stokes line.
13. A sample was excited by 4358 A^0 line. A Raman line was observed at 4447 A^0. Calculate the Raman shift.

UNIT III(Matter waves & uncertainty principle)

Short Questions - 5M

14. Write the properties of matter waves.
15. Describe the Davisson and Germer experiment.
16. What are matter waves? Derive an expression for de-Broglie wavelength of matter waves.
17. State and Explain Heisenberg's uncertainty principle.
18. Explain de – Broglie hypothesis of matter waves.
19. State Heisenberg's principle for Energy and Time.

Problems - 5M

20. If the uncertainty in the momentum of an electron is 1.65×10^{-24} kg m/sec. calculate the uncertainty in its position.
21. Calculate the de-Broglie wavelength associated with a proton moving with a velocity equal to $1/20^{th}$ of the velocity of light. Mass of the proton is 1.67×10^{-27}kg)

UNIT – IV(Quantum mechanics)

Essay Questions - 10M

22. Derive Schrodinger time dependent wave equation.
23. Derive Schrodinger time independent wave equation.
24. Obtain an expression for the energy of particle in one dimensional potential well of infinite height.

Short Questions - 5M

25. Mention the basic postulates of quantum mechanics.
26. Explain the physical interpretation of wave function.
27. Explain Eigen finctions and Eigen values.

Problems - 5M

28. Find the least energy of an electron moving in the dimension in an infinitely high potential box of width $1A^0$. Given mass of the electron 9.11×10^{-31} kg and $h=6.63 \times 10^{-34}$ J-s
29. An electron is moving in one dimensional potential box of infinite height of width 25 A^O.Calculate the lowest energy of electron.

UNIT –V (General properties of Nuclei)

Essay Questions - 10M

30. Explain liquid drop model in detail. Write its drawbacks.
31. Explain shell model of nucleus. Mention its merits and demerits.
32. Explain basic properties of nuclei.

UNIT –VI (Radio active decay)

Essay Questions - 10M

33. Explain Gamow's theory of α-decay

Short Questions - 5M

34. Write the Giger-Nuttal law for range of a α - particle.
35. Explain Neutrino hypothesis.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics Practical -VI – Semester – VI
w.e.f. 2017-18 ADMITTED BATCH

Work load: 30 hrs **Duration: 3 hrs/week**

Minimum of 6 experiments to be done and recorded

1. e/m of an electron by Thomson method.
2. Determination of Planck's Constant (photocell).
3. Verification of inverse square law of light using photovoltaic cell.
4. Study of absorption of α-rays.
5. Study of absorption of □-rays.
6. Determination of Range of β-particles.
7. Determination of M & H.
8. Analysis of powder X-ray diffraction pattern to determine properties of crystals.
9. Energy gap of a semiconductor using junction diode.
10. Energy gap of a semiconductor using thermister.
11. Thevinin Norton Theorems/Construction of Ohm Meter
12. L-R & C-R Circuits
13. L & II Filters (Bridge Rectifier)
14. L-D-R Characteristics

P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper – VII(B) – Semester – VI
w.e.f. 2017-18 ADMITTED BATCH

2017 - 2018

Course Code : **No. of credits : 03**

Elective Paper VII(B): Material science

No. of Hours per week: 03 **Total Lectures:45**

UNIT-I (9 hrs)

1.Materials and Crystal Bonding: Materials, Classification, Crystalline, Amorphous, Glasses; Metals, Alloys, Semiconductors, Polymers, Ceramics, Plastics, Bio-aterials, Composites, Bulk and nanomaterials. Review of atomic structure – Interatomic forces Different types of chemical bonds – Ioniccovalent bond or homopolar bond – Metallic bond – Dispersion bond – Dipole bond – Hydrogenbond – Binding energy of a crystal.

UNIT-II (9 hrs)

2. Defects and Diffusion in Materials: Introduction – Types of defects - Point defectsLine defects- Surface defects- Volume defects- Production and removalofdefectsDeformation-irradiation- quenching- annealing- recovery - recrystallization and grain growth. Diffusion in solids- Fick's laws of diffusion.

UNIT-III(9 hrs)

3. Mechanical Behavior of Materials: Different mechanical properties of engineering materials – Creep – Fracture – Technologicalproperties – Factors affecting mechanical properties of a material – Heat treatment - Cold andhot working – Types of mechanical tests – Metal forming process – Powder – Misaligning – Deformation of metals.

UNIT-IV (9 hrs)

4. Magnetic Materials:Dia-, Para-, Ferri- and Ferromagnetic materials, Classical Langevin theory of dia magnetism, Quantum mechanical treatment of paramagnetism. Curie's law, Weiss's theory of ferromagnetism, Ferromagnetic domains.Discussion of BH Curve.Hysteresis and energy Loss.

UNIT-V (9 hrs)

5. Dielectric Materials:Dielectric constant, dielectric strength and dielectric loss, polarizability, mechanism of polarization,factors affecting polarization, polarization curve and hysteresis loop, types of dielectric materials, applications; ferroelectric, piezoelectric and pyroelectric materials, Clausius -Mosotti equation.

Reference books

1. Materials Science by M.Arumugam, Anuradha Publishers. 1990, Kumbakonam.
2.Materials Science and Engineering V.Raghavan, Printice Hall India Ed. V 2004. New Delhi.
3. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India
4. Solid State Physics, M.A. Wahab, 2011, Narosa Publications
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P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper
Elective Paper VII(B) – Semester – VI – Model Paper
w.e.f. 2017-18 ADMITTED BATCH

2017 - 2018

Course Code : Elective B **No. of credits : 03**

Elective Paper VII(B): Material science

Note:- Set the question paper as per the blue print given at the end of this model paper.
Time: 2 1/2 Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I	1	2	20
II	1	1	15
III	1	2	20
IV	1	2	20
V	1	2	20
		Total	95

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics Practical – **VII B – Semester – VI**
w.e.f. 2017-18 ADMITTED BATCH

Duration : 3 hrs

Material science

Minimum of 6 experiments to be done and recorded

1. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method)
2. Measurement of magnetic susceptibility of solids.
3. Determination of coupling coefficient of a piezoelectric crystal.
4. Measurement of the dielectric constant of a dielectric Materials
5. Study the complex dielectric constant and plasma frequency of metal using surface
6. plasmon resonance (SPR)
7. Study the hysteresis loop of a Ferroelectric Crystal.
8. Study the B-H curve of 'Fe' using solenoid and determine energy loss from hysteresis.

P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper – VII (C) – Semester – VI
w.e.f. 2017 - 18 ADMITTED BATCH

Course Code : **No. of credits : 03**

Elective Paper VII (C): Renewable Energy

No. of Hours per week: 03 **Total Lectures:45**

UNIT-I (9 hrs)
Introduction to Energy: Definition and units of energy, power, Forms of energy, Energy flow diagram to the earth. Role of energy in economic and social development.
Environmental Effects: Environmental degradation due to energy production and utilization, air and water pollution, depletion of ozone layer, global warming,

UNIT-II (9hrs)
Global Energy Scenario: Energy consumption in various sectors, energy resources, coal, oil, natural gas, nuclear and hydroelectric power.
Indian Energy Scene: Energy resources available in India, urban and rural energy consumption, nuclear energy - promise and future, need for use of new and renewable energy sources.

UNIT-III (6hrs)
Solar energy: Spectral distribution of radiation, solar water heating system, Applications, Solar cooker. Solar cell, Types of solar cells.

UNIT-IV (6hrs)
Wind Energy: Introduction, Principle of wind energy conversion, Components of wind turbines, Operation and characteristics of a wind turbine, Applications of wind energy.

UNIT-V (8hrs)
Ocean Energy: Introduction, Principle of ocean thermal energy conversion, Tidal power generation, Tidal energy technologies, Energy from waves.
Hydrogen Energy: Hydrogen production methods - Electrolysis of water, Uses of hydrogen as fuel.

U**NIT-VI (7 hrs)**
Bio-Energy
Energy from biomass – Sources of biomass – Conversion of biomass into fuels –Pyrolysis, gasification and combustion – Aerobic and anaerobic bio-conversion – Properties of biomass – Properties and characteristics of biogas.

References:

1. Solar Energy Principles, Thermal Collection &Storage, S.P.Sukhatme: Tata McGraw Hill Pub., New Delhi.
2. Non-Conventional Energy Sources, G.D.Rai, New Delhi.
3. Renewable Energy, power for a sustainable future, Godfrey Boyle, 2004,
4. The Generation of electricity by wind, E.W. Golding.
5. Hydrogen and Fuel Cells: A comprehensive guide, Rebecca Busby, Pennwell corporation (2005)
6. Hydrogen and Fuel Cells: Emerging Technologies and Applications, B.Sorensen, Academic Press (2012).
7. Non-Conventional Energy Resources by B.H. Khan, Tata McGraw Hill Pub., 2009.
8. Fundamentals of Renewable Energy Resources byG.N.Tiwari, M.K.Ghosal, Narosa Pub., 2007.

P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper – VII C – Semester – VI – Model Paper
w.e.f. 2017 - 18 ADMITTED BATCH

No. of credits : 03

Elective Paper VII(C): Renewable Energy

Note:- Set the question paper as per the blue print given at the end of this model paper.
Time: 2 1/2 Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I	1	2	20
II	1	2	20
III	---	2	10
IV	1	1	15
V	1	1	15
VI	1	1	15
Total			95

QUESTION BANK

SUBJECT: PHYSICS **PAPER: VII** **SEMESTER: VI**

RENEWABLE ENERGY

UNIT-I (Introduction to Energy & Environmental effects)

Essay Questions - 10M

36. State law of conservation of energy. Explain different forms of energy.
37. Explain the energy flow diagram to the earth from the sun.
38. Briefly discuss about global warming.
39. Explain the environmental impact of nuclear power of generation.
40. Explain hydroelectric power stations on ecology and environment.

Short Questions - 5M

41. Define energy and power. Write its units.
42. Write a short note on depletion of ozone layer.
43. Explain about air pollution.
44. Explain about water pollution.
45. What is green house effect?

UNIT-II (Global Energy Scenario& Indian Energy Scene)

Essay Questions - 10M

46. Explain the global energy consumption in various sectors.
47. What are the options to generate electricity?
48. Discuss different conventional energy sources available in India.
49. Discuss different non- conventional energy sources available in India.
50. Explain how the energy consumed in urban and rural India.

Short Questions - 5M

51. Explain about fossil fuel.
52. What are the renewable and non renewable energy sources?
53. Why we need new and renewable energy sources.
54. Compare renewable and non renewable energy sources.
55. Explain about fossil fuel.

UNIT-III (Solar energy)

Short Questions - 5M

56. What is solar water heating system? How does it work?
57. Explain about solar energy.
58. What is solar cell? Explain its working principle and draw V-I characteristics.
59. Describe different types of solar cookers.
60. Explain various types of solar cells.

UNIT-IV (Wind Energy)

Essay Questions - 10M

61. What are the components of wind terbine? Explain their operation.
62. What are the characteristics of a wind turbine?

Short Questions - 5M

63. What are the basic principles of wind energy conversion?
64. Write applications of wind energy.

UNIT V (Ocean Energy& Hydrogen Energy)

Essay Questions - 10M

65. Explain the principle and working of tidal power generation.
66. What are the technologies used to obtain tidal energy.
67. Explain Hydrogen production methods.

Short Questions - 5M

68. Explain the principle of ocean thermal energy conversion.
69. Derive an expression for total energy generated from the ocean waves.
70. Write the uses of hydrogen as a fuel.

UNIT –VI (Bio-Energy)

Essay Questions - 10M

71. Explain aerobic and anaerobic bio-conversion.
72. Explain Biomass energy conversion through fermentation-pyrolysis.
73. Explain bio mass conversion through Gasification and Combustion.

Short Questions - 5M

74. Write the properties and characteristics of Biomass.
75. How energy produced from biomass.
76. Explain the sources of biomass.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics Practical – VII C – Semester – VI
w.e.f. 2017 - 18 ADMITTED BATCH

Renewable Energy

Work load: 30 hrs **Duration: 3 hrs/week**
No. of credits: 02

Minimum of 6 experiments to be done and recorded

1. Preparation of copper oxide selective surface by chemical conversion method.
2. Performance testing of solar cooker.
3. Determination of solar constant using pyrheliometer.
4. Measurement of I-V characteristics of solar cell.
5. Study the effect of input light intensity on the performance of solar cell.
6. Study the characteristics of wind.
7. Study the characteristics of photocell

P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper – VIII(B) – Semester – VI
w.e.f. 2017-18 ADMITTED BATCH

No. of credits : 03

Elective Paper VIII(B 1): Fundamentals of Nanoscience

No. of Hours per week: 03 Total Lectures:45

UNIT-I (5 hrs)

1. Background and history: Emergence of Nanoscience with special reference to Feynman and Drexler; Role of particle size; Spatial and temporal scale; Concept of confinement, strong and weak confinement with suitable example;

UNIT-II (5 hrs)

2. Quantum Structures: Development of quantum structures, Basic concept of quantum well, quantum wire and quantum dot. Finite size Zero, One and Two Dimensional Nanostructures, Concept of Surface and Interfacial Energies. Physics of the solid state – size dependence of properties, crystal structures, Lattice vibrations, Energy bands:- Insulators Semiconductors and conductors.

UNIT-III (9hrs)

3. Classification of Nanomaterials: Inorganic nanomaterials: carbon nanotubes and cones, Organic nanomaterials: dendrimers, micelles, liposomes, block copolymers; Bionanomaterials: Biomimtric, bioceramic and nanotherapeutics; Nanomaterials for molecular electronics and optoelectronics.

UNITS-IV (9hrs)

4. Macromolecules: Classification of polymers, chemistry of polymerization, chain polymerization, step polymerization, coordination polymerization. Molecular weight of polymers-number average and weight average molecular weight, degree of polymerization, determination of molecular weight of polymers by viscometry,

UNIT-V (8hrs)

6. **Molecular & Nanoelectronics**:Semiconductors, Transition from crystal technology to nanotechnology. Tiny motors, Gyroscopes and accelerometers. Nano particle embedded wrinkle resistant cloth, Transparent Zinc Oxide sun screens

UNIT-VI (9hrs)

6. Biomaterials: Implant materials: Stainless steels and its alloys, Ti and Ti based alloys, Ceramic implant materials; Hydroxyapatite glass ceramics, Carbon Implant materials, Polymeric Implant materials, Soft tissue replacement implants, Sutures, Surgical tapes and adhesives, heart valve implants, Artificial organs, Hard Tissue replacement Implants, Internal Fracture Fixation Devices, Wires, Pins, and Screws, Fracture Plates.

Reference Books

1. T. Pradeep: Textbook of Nanoscience and Nanotechnology Chapter (McGraw-Hill Professional, 2012), Access Engineering.
2. C. N. R. Rao, A. Mu¨ller, A. K. Cheetham, "The Chemistry of Nanomaterials :Synthesis, Properties and Applications", Wiley-VCH, 2006.
3. C. Breachignac P. Houdy M. Lahmani, "Nanomaterials and Nanochemistry", Springer, 2006.
4. Guozhong Cao, "Nanostructures and Nanomaterials: Synthesis, Properties, and Applications", World Scientific Publishing Private, Ltd., 2011.
5. Zhong Lin Wang, "Characterization of Nanophase Materials", Wiley-VCH, 2004.
6. Carl C. Koch, "Nanostructured Materials: Processing, Properties and Potential Applications", William Andrew Publishing Norwich, 2006. ANNEXURE – II(a)

P.R. GOVERNMENT COLLEGE (A), KAKINADA

w.e.f. 2016-17 ADMITTED BATCH

III B Sc Elective Paper VIII(B 1): Fundamentals of Nanoscience

No. of credits : 03

Note:- Set the question paper as per the blue print given at the end of this model paper.

Time: 2 1/2 Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I	--	2	10
II	1	--	10
III	1	2	20
IV	1	2	20
V	1	1	15
VI	1	2	20
Total			95

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics Practical – VIII (B 1) – Semester – VI
W.e.f. 2017-18 ADMITTED BATCH

Fundamentals of Nano science

Credits: 02 **Duration: 3hrs/Week**

Minimum of 6 experiments to be done and recorded.

1. Determination of the Band Gap of Semiconductor Nan particles.
2. Surface Enhanced Raman Scattering Activity of Silver Nan particles
3. Conversion of Gold Nano rods into Gold Nan particles
4. Bimetallic Nan particles
5. Processing and Development of Nan particle gas sensor
6. Magnetic separation/identification studies of nano particles
7. Harvesting light using nano-solar cells
8. Nano-Forensic analysis to identify, individualize and evaluate evidence using nano phase materials
9. Comparison of the performance of nano particles based conductive adhesives and conventional non conductive adhesives.
10. Electrode position and corrosion behavior of nano structured composite film
11. Photo catalytic activity of nano materials

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III Bask Physics Elective Paper VIII (B 2) – **Semester – VI**
W.e.f. 2016-17 ADMITTED BATCH

Course Code: Cluster Elective VIII (B2) **No. of credits: 03**

Synthesis and Characterization of Nano materials

No. of Hours per week: 03 Total Lectures: 45

Unit-I (5 hrs)

1. Nano materials synthesis: Synthesis and nano fabrication, Bottom-Up and Top-Down approach with examples. Chemical precipitation methods, sol-gel method, chemical reduction, hydrothermal, process.

Unit-II (5 hrs)

2. Nano materials synthesis – II: Physical Methods- ball milling, Physical Vapour deposition (PVD), Sputtering, Chemical Vapor deposition (CVD), pray pyrolysis,

Unit-III (9 hrs)

3. Classification of materials: Types of materials, Metals, Ceramics (Sand glasses) polymers, composites, semiconductors. Metals and alloys- Phase diagrams of single component, binary and ternary systems, diffusion, nucleation and growth.

UNITS-IV (9 hrs)

4. Glasses: The glass transition - theories for the glass transition, Factors that determine the glass-transition temperature. Glass forming systems and ease of glass formation, preparation of glass materials. Applications of Glasses: Introduction: Electronic applications, Electrochemical applications, optical applications, Magnetic applications.

UNITS-V (9 hrs)

5. Liquid Crystals: Mesomorphism of anisotropic systems, Different liquid crystalline phase and phase transitions, Thermal and electrical properties of liquid crystals, Types Liquid Crystals displays, few applications of liquid crystals.

UNITS-VI (9 hrs)

6. Characterization Methods: XRD, SEM, TEM, AFM, XPS and PL characterization techniques for nano materials.

References books

1. Encyclopedia of Nanotechnology by M.Balakrishna Rao and K.Krishna Reddy, Vol.I to X, Campus books.

2. Nano: The Essentials-Understanding Nano science & Nanotechnology by T.Pradeep; Tata Mc. Graw Hill

3. Nanotechnology in Microelectronics & Optoelectronics, J.M Martine Duart, R.J Martin Palma, F. Agullo Rueda, Elsevier

4. Nano electronic Circuit Design, N.K Jha, D Chen, Springer

5. Handbook of Nano physics- Nano electronics & Nano photonics, K.D Sattler, CRC Press

6. Organic Electronics-Sensors & Biotechnology- R. Shinar & J. Shinar, McGraw-Hill

P.R. GOVERNMENT COLLEGE (A), KAKINADA
w.e.f. 2017-18 ADMITTED BATCH

III B.Sc Physics Elective Paper VIII(B 2)– **Semester - VI**

No. of credits : 03

Note:- Set the question paper as per the blue print given at the end of this model paper.
Time: 2 1/2 Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I	---	2	10
II	1	---	10
III	1	2	20
IV	1	2	20
V	1	1	15
VI	1	2	20
Total			95

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics Practical – VIII (B 2) – Semester – VI
W.e.f. 2017-18 ADMITTED BATCH

Cluster Elective: VIII (B2) - Synthesis and Characterization of Nano materials

Credits: 02 **Duration: 3 hrs/Week**

Minimum of 6 experiments to be done and recorded

1. Synthesis of nano crystalline films of II-VI compounds doped with rare earths by chemical process.
2. Synthesis of Alkaline earth aluminates in nano crystalline form by combustion synthesis.
3. Preparation of surface conducting glass plate by spray pyrolysis method
4. Preparation of surface conducting glass plate by chemical route
5. Fabrication of micro fluidic nano filter by polymerisation reaction
6. Absorption studies on the nano crystalline films and determination of absorption coefficient.
7. Determination of band gap from the absorption spectra using Tauc's plots.
8. Study of Hall Effect in semiconductors and its application in nanotechnology.
9. Measurement of electrical conductivity of semiconductor film by Four Probe method and study of temperature variation of electrical conductivity.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III Bask Physics Elective Paper VIII (B 3) – **Semester – VI**
W.e.f. 2017-18 ADMITTED BATCH

Course Code: Cluster Elective VIII (B 3) **No. of credits: 03**

Applications of Nano materials and Devices

No. of Hours per week: 03 Total Lectures: 45

UNIT-I (9 hrs)
1. Optical properties: Coulomb interaction in nanostructures. Concept of dielectric Constant for nanostructures and charging of nano structure. Quasi-particles and Excitons. Excitons in direct and indirect band gap semiconductor nano crystals. Quantitative treatment of quasi-particles and excitons, charging effects.

2. UNIT-II (9 hrs)
2. Electrical transport:
Carrier transport in nano strcutures. Hall effect, extermination of carrier mobility and carrier concentration; Coulomb blockade effect, thermionic emission, tunneling and hoping conductivity. Defects and impurities: Deep level and surface defects.

UNIT-III (9 hrs)
3. Applications: Applications of nano particles, quantum dots, nano wires and thin films for photonic devices (LED, solar cells). Single electron transfer devices (no derivation). CNT based transistors. Nano material Devices: Quantum dots hetero structures lasers, optical switching and optical data storage.

UNIT-IV (8 hrs)
4. Nanoelectronics: Introduction, Electronic structure of Nanocrystals, Tuning the Band gap of Nano scale semiconductors, Excitons, Quantum dot, Single electron devices,
Nano structured ferromagnetism, Effect of bulk nano structuring of magnetic properties,

UNIT-V (5 hrs)
5. Nan biotechnology: Introduction, Biological building blocks size
of building blocks and nanostructures, Peptide nano wires and protein nano particles.

UNIT-VI (5 hrs)

6. Medical application:

DNA double nano wires, Nan materials in drug delivery and therapy, Nano medicine, Targeted gold nano particles for imaging and therapy.

Reference books:

1.C.P. Poole, Jr. Frank J. Owens, Introduction to Nanotechnology (Wiley India Pvt. Ltd.).
2.S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publishing Company).
3. K.K. Chattopadhyay and A.N. Banerjee, Introduction to Nanoscience & Technology (PHI Learning Private Limited).
4. Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons).

P.R. GOVERNMENT COLLEGE (A), KAKINADA
w.e.f. 2017 - 18 ADMITTED BATCH

III B.Sc Physics Elective Paper VIII(B 2)– **Semester - VI**

No. of credits : 03

Note:- Set the question paper as per the blue print given at the end of this model paper.
Time: 2 1/2 Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I	1	2	20
II	1	2	20
III	1	2	20
IV	1	1	15
V	1	---	10
VI	---	2	10
Total			95

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics Practical – VIII (B 3) – Semester – VI
W.e.f. 2017-18 ADMITTED BATCH

Cluster Elective: VIII (B 3) - Synthesis and Characterization of Nano materials

Credits: 02 **Duration: 3 hrs/Week**

Minimum of 6 experiments to be done and recorded

1. Synthesis of metal nanoparticles by chemical route.
2. Synthesis of semiconductor nanoparticles.
3. Surface Plasmon study of metal nanoparticles by UV-Visible spectrophotometer.
4. XRD pattern of nanomaterials and estimation of particle size.
5. To study the effect of size on color of nanomaterials.
6. Prepare a disc of ceramic of a compound using ball milling, pressing and sintering, and study its XRD.
7. Fabricate a thin film of nanoparticles by spin coating (or chemical route) and study transmittance spectra in UV-Visible region.
8. Fabricate a pn-diode by diffusing Al over the surface of n-type Si and study its I-V characteristics.

(OR)

PROJECT

P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper – VIII(C) – Semester – VI
w.e.f. 2017 - 18 ADMITTED BATCH

Course Code : Elective Paper VIII(C 1) **No. of credits : 03**

Elective Paper VIII(C 1): Solar Thermal and Photovoltaic Aspects

No. of Hours per week: 03 **Total Lectures:45**

UNIT-I (5 hrs)
1. Basics of Solar Radiation: Structure of Sun, Solar constant, Concept of Zenith angle and air mass, Definition of declination, hour angle, solar and surface azimuth angles; Direct, diffuse and total solar radiation, Solar intensity measurement –pyrheliometer.

UNIT – II (5 hrs)
2. Radiative Properties and Characteristics of Materials: Kirchoff's law – Relation between absorptance, emittance and reflectance; Selective Surfaces - preparation and characterization, Types and applications; Anti-reflective coating.

UNIT-III (8 hrs)
3. Flat Plate Collectors (FPC) : Description of flat plate collector, Liquid heating type FPC, Energy balance equation, Efficiency, Temperature distribution in FPC, Definitions of fin efficiency and collector efficiency, Evacuated tubular collectors.

Unit-IV (9 hrs)
4. Solar photovoltaic (PV) cell: Physics of solar cell –Type of interfaces, homo, hetero and schottky interfaces, Photovoltaic Effect, Equivalent circuit of solar cell, Solar cell output parameters, Series and shunt resistances and its effect on cell efficiency; Variation of efficiency with band-gap and temperature.

UNIT-V (9 hrs)
5. Solar PV systems: Solar cell module assembly – Steps involved in the fabrication of solar module, Module performance, I-V characteristics, Modules in series and parallel, Module protection –Solar PV system and its components, PV array, inverter, battery and load.

UNIT-VI (9 hrs)

6. Solar thermal applications: Solar hot water system (SHWS), Types of SHWS, Standard method of testing the efficiency of SHWS; Passive space heating and cooling concepts, Solar desalinator and drier, Solar thermal power generation.

Reference Books:

1. Solar Energy Utilization, G. D. Rai, Khanna Publishers
2. Solar Energy- Fundamentals, design, modeling and applications, G.N. Tiwari, Narosa Pub., 2005.
3. Solar Energy-Principles of thermal energy collection & storage, S.P. Sukhatme,TataMc-Graw Hill Publishers, 1999.
4. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
5. Science and Technology of Photovoltaics, P. Jayarama Reddy, BS Publications, 20

P.R. GOVERNMENT COLLEGE (A), KAKINADA
w.e.f. 2017 - 18 ADMITTED BATCH

Cluster Elective Paper VIII(C 1): Solar Thermal and Photovoltaic Aspects

No. of credits : 03

Note:- Set the question paper as per the blue print given at the end of this model paper.
Time: 2 1/2 Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I	---	2	10
II	1	---	10
III	1	1	15
IV	1	2	20
V	1	2	20
VI	1	2	20
Total			95

QUESTION BANK

SUBJECT: PHYSICS PAPER: VIII C1 SEMESTER: VI

SOLAR THERMAL AND PHOTOVOLTAIC ASPECTS

UNIT – I (Basics of Solar Radiation)

Short Questions – 5 M

1. Briefly explain about Pyro heliometers.
2. Define solar constant also derive the value for solar constant.
3. Explain the structure of Sun.
4. Explain the concept of Zenith angle and Air mass in brief.
5. Define Declination, Hour angle, Solar and Surface azimuth angles.
6. Explain Direct, diffuse and total solar radiation in brief

UNIT – II (Radiative properties and characteristics of Materials)

Essay Questions – 10 M

7. Define Kirchhoff's law and also derive the relation between absorptance, emittance and reflectance
8. Write a note on selective surfaces preparation and characterization, explain its types.
9. Write a note on Anti reflective coating.

UNIT – III (Flat Plate Collectors)

Essay Questions – 10 M

10. Give the description of flat plate collector and explain about Liquid heating type FPC
11. Discuss about temperature distribution in FPC

Short Questions – 5 M

12. Write a note on energy balance equation and efficiency of FPC
13. Define fin efficiency and collector efficiency.
14. Write a note on evacuated tubular collectors.

UNIT – IV (Solar Photovoltaic (PV) cell)

Essay Questions – 10 M

15. Explain variation of efficiency with band –gap and temperature
16. Discuss various types of interfaces

Short Questions – 5 M

17. Explain Photo Voltaic Effect.
18. Draw the equivalent circuit of solar cell and write the solar cell output parameters
19. What are Series and shunt resistances and explain its effect on cell efficiency.
20. Write a short note on solar cells.

UNIT – V (Solar PV systems)

Essay Questions – 10 M

21. Write down the steps involved in the fabrication of solar module
22. Explain solar PV system and its components

Short Questions – 5 M

23. Write about solar module protection.
24. Explain performance and I-V characteristics of a solar module.
25. Write a note solar modules in series and parallel combinations

UNIT – VI (Solar thermal applications)

Essay Questions – 10 M

26. Explain different types solar hot water systems (SHWS).
27. Explain standard method of testing the efficiency of SHWS.

Short Questions – 5 M

28. Explain Solar thermal power generation.
29. Write short note on solar desalinator and drier.
30. Write a note on Passive space heating and cooling concepts

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics Practical – VIII (C 1) – Semester – VI
W.e.f. 2017-18 ADMITTED BATCH

Cluster Elective: VIII (C1) - Solar Thermal and Photovoltaic Aspects

Credits: 02 **Duration: 3 hrs/Week**

Minimum of 6 experiments to be done and recorded.

1. Measurement of direct solar radiation using pyrheliometer.
2. Measurement of global and diffuse solar radiation using pyrano meter.
3. Measurement of emissivity, reflectivity and transsivity.
4. Measurement of efficiency of solar flat plate collector.
5. Performance testing of solar air dryer unit.
6. Effect of tilt angle on the efficiency of solar photovoltaic panel.
7. Study on solar photovoltaic panel in series and parallel combination.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics Paper – VIII(C 2) – Semester – VI

w.e.f. 2017 - 18 ADMITTED BATCH

Course Code : Cluster Elective VIII(C 2) **No. of credits : 03**

Cluster Elective Paper VIII(C 2): Wind, Hydro and Ocean Energies

No. of Hours per week: 03 **Total Lectures:45**

UNIT-I(8hrs)

1. Introduction: Wind generation, meteorology of wind, world distribution of wind, wind speed variation with height, Wind speed Statistics, Wind energy conversion principles; General introduction; Types and classification of WECS.

UNIT-II(9hrs)

2. Wind Energy Conversion System: Aerodynamic design principles; Aerodynamic theories; Axial momentum, blade element; Rotor characteristics; Maximum power coefficient.

UNIT-III(9hrs)

3. Wind Energy Application: Wind pumps: Performance analysis, design concept and testing; Principle of wind energy generation; Wind energy in India; Environmental Impacts of Wind farms.

UNIT-IV(9hrs)

4. Small Hydropower Systems: Overview of micro, mini and small hydro systems; Hydrology; Site selection; Speed and voltage regulation.

UNIT-V(5hrs)

5. Ocean Thermal Energy Systems: Ocean Thermal - Introduction, working principle, Electricity generation methods from OCET, Advantages and disadvantages, Applications of OTEC.

UNIT-VI(5hrs)

6.Tidal Energy - Introduction, Origin and nature of tidal energy, Wave Energy – Introduction, Wave energy conversion devices, Advantages and disadvantages, Applications of wave energy.

Reference Books:

1. Dan Charis, Mick Sagrillo, LanWoofenden, “Power from the Wind”, New Society Pub., 2009.
2. Erich Hau, “Wind Turbines-Fundaments, Technologies, Applications, Economics”, 2ndEdition, Springer Verlag, BerlinHeidelberg, NY, 2006.
3. Joshue Earnest, Tore Wizelius, Wind Power and Project Developmen”, PHI Pub., 2011.

4. T. Burton, D. Sharpe, N. Jenkins, E. Bossanyi, Wind Energy Handbook, John Wiley Pub., 2001.
5. Paul Gipe, “Wind Energy Basics”, Chelsea Green Publications, 1999.
6. Khan, B.H., “Non-Conventional Energy Resources”, TMH, 2nd Edition, New Delhi, 2009.
7. Tiwari, G.N., and Ghosal, M.K, Renewable Energy Resources – Basic Principles and applications, Narosa Publishing House,2007.

P.R. GOVERNMENT COLLEGE (A), KAKINADA
w.e.f. 2017 - 18 ADMITTED BATCH

Cluster Elective Paper VIII(C 2): Wind, Hydro and Ocean Energies

Course Code : Cluster Elective VIII(C 2) **No. of credits : 03**

Note:- Set the question paper as per the blue print given at the end of this model paper.
Time: 2 1/2 Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	10	30M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I	1	2	20
II	1	2	20
III	1	1	15
IV	1	1	15
V	--	2	10
VI	1	1	15
Total			95

QUESTION BANK

SUBJECT: PHYSICS PAPER: VIII C2 SEMESTER: VI

WIND, HYDRO & OCEAN ENERGIES

UNIT – I (Introduction)

Essay Questions – 10 M

31. Explain the nature of variation of wind speed with height from the ground.
32. Explain types and classification of WECS.

Short Questions – 5 M

33. Write a short note on wind generations.
34. Classify categories of winds.
35. Explain distribution of wind around the world.
36. Describe the principles of Wind energy conversions.

UNIT – II (Wind Energy Conversion System)

Essay Questions – 10 M

37. Explain Rotor characteristics of a wind turbine.
38. Explain blade element theory to analyse the aerodynamics of the wind turbines.

Short Questions – 5 M

39. Explain maximum power coefficient in wind turbines.
40. Describe Aerodynamic design principle.
41. Explain axial momentum theory to analyse the aerodynamics of the wind turbines in brief.

UNIT – III (Wind Energy Application)

Essay Questions – 10 M

42. Explain Performance analysis and design concept of wind pumps.
43. Explain Environmental impacts of wind farms

Short Questions – 5 M

44. Discuss wind energy in India.
45. Write the principle of wind generation.
46. Describe how wind pumps are testing.

UNIT – IV (Small Hydropower Systems)

Essay Questions – 10 M

47. Explain overview of micro, mini and small hydro systems

Short Questions – 5 M

48. Write about site selection of pumps and turbines.
49. Explain briefly about speed and voltage regulation of hydro power systems.

UNIT – V (Ocean Thermal Energy Systems)

Short Questions – 5 M

50. Write any six applications of OTEC.
51. Explain open cycle method of electricity generation from OTEC.
52. Explain closed cycle method of electricity generation from OTEC.
53. Write the advantages & disadvantages of ocean thermal energy.
54. Explain the working principle of ocean thermal energy conversion.

UNIT – VI (Tidal and Wave Energy Systems)

Essay Questions – 10 M

55. Explain wave energy conversion devices.
56. Discuss the origin and nature of tidal energy

Short Questions – 5 M

57. Discuss the applications of wave energy.
58. What are the advantages and disadvantages of wave energy.

P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Practical – VIII (C 2) – Semester – VI
w.e.f. 2017-18 ADMITTED BATCH

Cluster Elective: VIII (C2) - Wind, Hydro and Ocean Energies

Credits : 02 **Duration: 3 hrs/Week**

Minimum of 6 experiments to be done and recorded

1. Estimation of wind speed using anemometer.
2. Determination of characteristics of a wind generator
3. Study the effect of number and size of blades of a wind turbine on electric power output.
4. Performance evaluation of vertical and horizontal axes wind turbine rotors.
5. Study the effect of density of water on the output power of hydroelectric generator.
6. Study the effect of wave amplitude and frequency on the wave energy generated.

P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper – VIII(C 3) – Semester – VI
w.e.f. 2017-18 ADMITTED BATCH
Course Code : Cluster Elective VIII(C 3) No. of credits : 03

Cluster Elective Paper VIII(C 3): Energy storage devices

No. of Hours per week: 03 Total Lectures:45

UNIT-I (5 hrs)
1. Energy Storage: Need of energy storage; Different modes of energy storage, Flywheel storage, Electrical and magnetic energy storage: Capacitors, electromagnets

UNIT-II (5 hrs)
2. Chemical Energy storage: Thermo-chemical, photo-chemical, electro-chemical, Hydrogen for energy storage.

UNIT-III (9 hrs)
3. Electrochemical Energy Storage Systems: Batteries: Primary, Secondary, Lithium, Solid-state and molten solvent batteries; Lead acid batteries; Nickel Cadmium Batteries; Advanced Batteries. Role of carbon nano-tubes in electrodes

UNIT-IV (9 hrs)
4. Magnetic and Electric Energy Storage Systems: Superconducting Magnet Energy Storage(SMES) systems; Capacitor and battery: Comparison and application; Super capacitor.

UNIT-V (8 hrs)
5. Fuel Cell: Fuel cell definition, difference between batteries and fuel cells, fuel cell components, principle and working of fuel cell, performance characteristics, efficiency, Advantages and disadvantages of fuel cell.

UNIT-VI (9 hrs)
6. Types of Fuel Cells: Classification, Alkaline fuel cell, phosphoric acid fuel cell, molten carbonate fuel cell; solid oxide fuel cell, proton exchange membrane fuel cell, applications of fuel cells.

Reference Books:

1. J. Jensen and B. Squrensen, Fundamentals of Energy Storage, John Wiley, NY, 1984.
2. M. Barak, Electrochemical Power Sources: Primary and Secondary Batteries by, P. Peregrinus,IEE,1980.
3. P.D.Dunn, Renewable Energies, Peter Peregrinus Ltd, London, 1986.
4. B.Viswanathan and M. A. Scibioh, Fuel Cells-Principles and Applications, University Press, 2006.
5. Hart, A.B and G.J.Womack, Fuel Cells: Theory and Application, Prentice Hall, NewYork, 1989.

P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper – VIII(C 3) – Semester – VI
w.e.f. 2017-18 ADMITTED BATCH
Course Code : Cluster Elective VIII(C 3) **No. of credits : 03**

Energy storage devices

Note:- Set the question paper as per the blue print given at the end of this model paper.
Time: 2 1/2 Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I	1	---	10
II	---	2	10
III	1	2	20
IV	1	1	15
V	1	2	20
VI	1	2	20
Total			95

QUESTION BANK

SUBJECT: PHYSICS **PAPER: VIII C 3** **SEMESTER: VI**

ENERGY STORAGE DEVICES

UNIT – I (Energy Storage)

Essay Questions – 10 M

59. Explain Flywheel storage, Electrical and Magnetic energy storages.
60. Explain how capacitors and electromagnets are used for energy storage.

UNIT – II (Chemical Energy storage)

Short Questions – 5 M

61. Explain thermo - chemical energy storage.
62. Explain photo - chemical energy storage.
63. Explain electro - chemical energy storage.
64. Explain how Hydrogen is used as energy storage.

UNIT – III (Electrochemical Energy Storage Systems)

Essay Questions – 10 M

65. Discuss solid state and molten solvent batteries.
66. Discuss Lead acid batteries and Nickel Cadmium Batteries.

Short Questions – 5 M

67. Discuss the role of carbon nano tubes in electrodes.
68. Write a note on Lithium batteries.
69. What are Primary & Secondary cells? What are its uses and defects.

UNIT – IV (Magnetic and Electric Energy Storage Systems)

Essay Questions – 10 M

70. Explain super conducting magnet energy storage(SMES) systems.
71. Compare capacitor and battery and write its applications.

Short Questions – 5 M

72. Write a note on super capacitors.

UNIT – V (Fuel Cell)

Essay Questions – 10 M

73. Explain the principle and working of a fuel cell. Derive the efficiency of a fuel cell.

Short Questions – 5 M

74. Write the differences between Batteries and fuel cells.
75. Write the advantages and disadvantages of fuel cells.
76. What is fuel cell? Write its components.

UNIT – VI (Types of Fuel Cells)

Essay Questions – 10 M

77. Classify fuel cells. Explain Alkaline fuel cell and Phosphoric acid fuel cell.
78. Classify fuel cells. Explain Molten carbonate fuel cell and Solid oxide fuel cell.

Short Questions – 5 M

79. Explain proton exchange membrane fuel cell.
80. Write application of fuel cells.

P.R. GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Practical – VIII (C 2) – Semester – VI
w.e.f. 2017-18 ADMITTED BATCH

Cluster Elective: VIII (C3) – Energy Storage Devices

Credits : 02 **Duration: 3 hrs/Week**

1. Study of charge and discharge characteristics of storage battery.
2. Study of charging and discharging behavior of a capacitor.
3. Determination of efficiency of DC-AC inverter and DC-DC converters
4. Study of charging characteristics of a Ni-Cd battery using solar photovoltaic panel.
5. Performance estimation of a fuel cell.
6. Study of effect of temperature on the performance of fuel cell.

OR

PROJECT

P.R. GOVERNMENT COLLEGE (A), KAKINADA

DEPARTMENT OF PHYSICS & ELECTRONICS

WORK LOAD FOR THE YEAR 2018-19

Name of the Subject : PHYSICS

Total No. of Hours : **164**

No. of Permanent posts sanctioned : 09

No. of Permanent staff working : 03+01

S. No	Strength	Name of the class	Theory hours	Practical Hours	No. of Batches	Total Practical Hours	Total hrs.(Theory + Practical)
1	60	I MPC TM	4	2	4	8	12
2	30	I MPC EM	4	2	2	4	8
3	30	I MPE	4	2	2	4	8
4	30	I MPCS	4	2	2	4	8
5	60	II MPC TM	4	2	4	8	12
6	30	I IMPC EM	4	2	2	4	8
7	30	I IMPE	4	2	2	4	8
8	30	I IMPCS	4	2	2	4	8
9	60	I IIMPC TM Sem V Paper V	3	2	4	8	11
10	60	I IIMPC TM Sem V Paper VI	3	2	4	8	11
11	30	I IIMPC EM Sem V Paper V	3	2	2	4	7
12	30	I IIMPC EM Sem V Paper VI	3	2	2	4	7
13	30	I II MPE Sem V Paper V	3	2	2	4	7
14	30	I II MPE Sem V Paper VI	3	2	2	4	7
15	30	II IMPCS Sem V Paper V	3	2	2	4	7
16	30	II IMPCS Sem V Paper VI	3	2	2	4	7
17	30	Cluster A Sem VI Paper VII	3	2	2	4	7
18	30	Cluster A Sem VI Paper VIII	3	2	2	4	7
19	30	Cluster B Sem VI Paper VIII	3	2	2	4	7
20	30	Cluster C Sem VI Paper VIII	3	2	2	4	7
		Total Work load for the department of PHYSICS					**164**

DEPARTMENT OF PHYSICS & ELECTRONICS

WORK LOAD FOR THE YEAR 2018-19

Name of the Subject : ELECTRONICS

Total No. of Hours : **88**

	Strength	Name of the class	Theory hours	Practical Hours	No. of Batches	Total Practical Hours	Total hrs.(Theory + Practical)
1	30	I MPE	4	2	2	4	8
2	30	I MECS	4	2	2	4	8
3	30	II MPE	4	2	2	4	8
4	30	II MECS	4	2	2	4	8
5	30	III MPE Sem V Paper V	3	2	2	4	7
6	30	III MPE Sem V Paper VI	3	2	2	4	7
7	30	III MECS Sem V Paper V	3	2	2	4	7
8	30	III MECS Sem V Paper VI	3	2	2	4	7
9	30	Cluster A Sem VI Paper VII	3	2	2	4	7
10	30	Cluster A Sem VI Paper VIII	3	2	2	4	7
11	30	Cluster B Sem VI Paper VIII	3	2	2	4	7
12	30	Cluster C Sem VI Paper VIII	3	2	2	4	7
		Total Work load for the department of ELECTRONICS					**88**

15

DEPARTMENT OF PHYSICS & ELECTRONICS

WORK LOAD FOR THE YEAR 2018-19

Name of the Subject : **M Sc., Physics**

Total No. of Hours : **46**

S. No	Strength	Name of the class	Theory hours	Practical Hours	No. of Batches	Total Practical Hours	Total hrs.(Theory + Practical)
1	30	I M Sc	20	3	1	3	23
2	30	II MSc	20	3	1	3	23
		Total Work load for M Sc Physics					**46**

Consolidated Work Load for the Academic Year 2018-19

Group	**Work Load**	**Staff Required**
Physics	164	8
Electronics	88	4
M Sc	46	2
Total Work Load	**298**	**14**

P.R. GOVERNMENT COLLEGE (A), KAKINADA

II B.Sc., Physics – Semester - IV
2019 - 2020

Course Code : **No. of credits : 02** Solar

Power Design & System Integration

(Add-on course)

2 Hour/Week **Total Hours : 50**

Module – 1(10 hrs)

Basic electronics:-Atomic Structure - Semi Conductor Materials - Doping -Silicon N Channel-Silicon P Channel - PN Junction - Biasing-PN Junction as closed Switch-PN Junction as open Switch-Voltage-Current-Power-Solar Cells-Solar Modules

Module – 2(10 hrs)

Solar modules: Standard Voltage Ratings of a Solar Module - Power Rating Of A Solar Module - Designing Of a Solar Module - Calculations of Power Generation through Solar Modules - Calculations on Energy Requirements.

Module – 3 (10 hrs)

Assembling of solar cell: Designing of Solar Power Packs - Solar Street Lights - Circuit Ideas on Control Systems - Designing of Battery Bank - Primary & Secondary Cells - Construction Of La Battery – Banking - Maintenance & Repairs

Module – 4 (10 hrs)

Solar cell maintenance: Solar Power Conditioning unit - MPPT Charge Controller - Dusk To Dawn Operation Sensors - Max. Load Design on PCU - Calculation of Savings from Solar Power Plant - Maintenance & operational Guidelines to user - Service & Repairs of Solar Plant.

Module – 5 (10 hrs)

Solar panel standards: Micro-Controller – Introduction - Control Logics on Power Systems - Fail Safe Techniques - Standards of Materials - IEC Standards - Standard Levels of Installation & Erection

Text books & Reference books

1. Grob's Basic Electronics - Mitchel E.Schultz 10th Edn. Tata McGraw Hill (TMH)
2. A First course in Electronics- AA Khan & KK Day- PHI
3. Basic Electronics D.C. Tayal
4. Basic Electronics Grobb
5. Solar Photovoltaics: Fundamentals, Technologies and Applications
   By Solanki Chetan Singh
6. Solar Panel Efficiency Enhancement [Import]
   By Riasad Amin (Author), MD Ali Imam Hossain (Author), Mowdudur Rahman Dewan (Author)
7. Solar Cell Technology and Applications
   By A. R. Jha
8. Solar Photovoltaics: Fundamentals Technologies And Applications
   By Solank
9. Optoelectronics of Solar Cells
   By Greg P. Smesta
10. Thin Film Solar Cells: Fabrication, Characterization and Applications
    By Jef Poortmans, Vladimir Arkhipov
11. Practical photovoltaics: electricity from solar cells
    By Richard J. Komp
    Aatec Publications
12. Dye-sensitized Solar Cells
    By K. Kalyanasundaram
13. Physics and Technology of Amorphous-Crystalline Heterostructure Silicon ...
    By Wilfried G. J. H. M. van Sark, Lars Korte, Francesco Roca

P.R. GOVERNMENT COLLEGE (A), KAKINADA

II B.Sc., Physics – Semester – IV (Model Paper)
2018 - 2019.

Course Code : **No. of credits : 02**

Solar Power Design & System Integration

(Add-on course)

Note:- Set the question paper as per the blue print given at the end of this model paper.

Time: 3 Hrs. Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10 M = 30 M
B	9	6	6 x 5 M = 30 M
Total	12	8	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
Basic electronics	1	2	20
Solar modules	1	1	15
Assembling of solar cell	1	2	20
Solar cell maintenance	1	2	20
Solar panel standards	1	2	20
Total			95

P R GOVT COLLEGE (A), KAKINADA

LIST OF EXAMINERS/ PAPER SETTERS IN PHYSICS

2019 - 2020

S.No.	Name of the examiner	Subject	Name of the College
1	L.Malleswara Rao 9985137973	Physics	Y.N.College, Narsapur
2.	Dr.A.Nirmala Jyotsna 9490171202	Physics	St.Theresa College for Women, Eluru
3	R.Venkateswararao 9440119231	Physics	M.S.N.Charties, Kakinada
4	K.Ananda Rao	Physics	C.R.R. College (M), Eluru
5	K.Ramesh	Physics	C.R.R. College (M), Eluru
6	K.B.S.Gopal	Physics	C.R.R. College (M), Eluru
7	P.P.Divakar	Physics	C.R.R. College (M), Eluru
8	A.Veerabhadra Rao	Physics	C.R.R. College (M), Eluru
9	L.S.R.Ch.V.K.Nageswararao	Physics	C.R.R. College (M), Eluru
10	R.Suryanarayana Raju	Physics	K.G.R.L.College , Bhimavaram
11	Smt.V.Vidyamallika	Physics	K.G.R.L.College , Bhimavaram
12	P.Rajyalakshmi	Physics	C.R.R. College (W), Eluru
13	K.Sireesha	Physics	C.R.R. College (W), Eluru
14	M.Jayalakshmi Devi	Physics	C.R.R. College (W), Eluru
15	P.Himakar	Physics	S.K.B.R.College, Amalapuram
16	N.S.Satyanarayana Murthy	Physics	S.K.B.R.College, Amalapuram
17	K.Nagavarma	Physics	S.K.B.R.College, Amalapuram
18	V.V.Subba Rao	Physics	S.K.B.R.College, Amalapuram
19	J.Prabhakara Rao	Physics	S.K.B.R.College, Amalapuram
20	S.V.Kumara Sastry	Physics	S.K.B.R.College, Amalapuram
21	V.Radha Krishna	Physics	S.K.B.R.College, Amalapuram
22	K.Srinivasa Rao	Physics	Govt. College , Kotha peta
23	Valluri Srinivasa Rao	Physics	Govt. College (women) Nidadavolu
24	T.K.Visweswara Rao	Physics	Govt. College(women), Nidadavolu
25	E.Nageswara Rao	Physics	Govt. College, Eleswaram
26	Dr.K.Ramachandra Rao	Physics	Govt. College (A), Rajahmundry
27	EsubBasha Sheik	Physics	Govt. College (A),

			Rajahmundry
28	Dr.B.V.Tirupanyam	Physics	Govt. College , Narayanapuram
29	Vobhilineni Srinivasa Rao	Physics	Govt. College , Ramachandrapuram
30	N LV R K Prasad	Physics	Govt. College , Ramachandrapuram
31	P.S. Brahamachari	Physics	Govt. College , Tadepalligudem
32	K.Ganesh Kumar	Physics	Govt. College , Tadepalligudem
33	P. V. L.Narayana	Physics	GDC Tanuku
34	M.Sudhadhar	Physics	GDC Tanuku
35	B.DurgaLakshmi	Physics	GDC Tanuku
36	T.Y.H.A.G.Gandhi	Physics	Govt. College , Ravulupalem
37	Dr. A.R.S. Kumar, Reader	Physics	Y.N. College (A), Narasapur
38	A.P.V. Appa Rao	Physics	Y.N. College (A), Narasapur
39	J. Rammohan	Physics	Y.N. College (A), Narasapur
40	P. Rama Krishna Rao	Physics	Y.N. College (A), Narasapur
41	D. Gangadharudu	Physics	M.R. College, Peddapuram
42	A.Satyanarayana Murthy	Physics	M.R. College, Peddapuram
43	N. Veer Kumar	Physics	M.R. College, Peddapuram
44	N. Sridhar	Physics	M.R. College, Peddapuram
45	S. Rama Rao	Physics	M.R. College, Peddapuram
46	K.G. Krishnam Raju	Physics	D.N.R. College (A), Bhimavaram
47	S. Venkata Raju	Physics	D.N.R. College (A), Bhimavaram
48	Smt. M. Satya vani	Physics	D.N.R. College (A), Bhimavaram
49	M.V.S. Prasad	Physics	D.N.R. College (A), Bhimavaram
50	Smt. N. Udaya Sri	Physics	D.N.R. College (A), Bhimavaram
51	A. Veeraiah	Physics	D.N.R. College (A), Bhimavaram
52	S.S.R. Murthy	Physics	Ideal College (A), Kakinada

P. R. GOVERNMENT COLLEGE (A), KAKINADA

Department of Physics & Electronics
Departmental Activities Planned for 2019-2020

The department of Physics and Electronics is planning the following programmes to conduct for the academic year 2019-2020

S. No.	Activity	Probable date	Remarks
1	Post admission test	June 2nd week	
2	Sensitization on Departmental Activities particularly on Kasarabada Scholarship and Endowment Prizes	June 3rd week	
3	Disbursement of Kasarabada Scholarship both for UG and PG	June 4th week	
4	Student Counselling Discussion on Result Analysis	July 1st week	
5	Inaugural function of Photon club	July 2nd week	
6	Parent Teacher Meeting	July 3rd week	
7	Launching Upkar Scheme	July 4th week	
8	Observing Hiroshima Day Guest Lecture -1	August 2nd week	
9	Awareness programme on IMD	August 3rd week	
10	Study Area Programme	August 4th week	
11	Extension activity to local high schools	September 2nd week	
12	Guest Lecture -2	September 4th week	
13	Student Counseling before commencement of semester end exams	October 1st week	
14	Celebration of Sir C.V. Raman's Birth day Guest lecture - 3	November 7th	
15	Student Consortium	November 4th week	
16	Student Counseling after commencement of semester end exams	December 1st week	
17	Online Quiz programme	December 2nd week	
18	College level Chess Competition	December 3rd week	
19	Guest Lecture - 4	January 1st week	
20	Workshop / Intercollegiate Science	February 2nd week	

	Competitions		
21	National Science day celebrations	February 28th	
22	UPKAR scheme – Disbursement of money to the students	March 1st week	

Certificate

The syllabus and model question papers including **Blue – Print** in Physics subject for 3 years B.Sc. course for the semester I, II, III, IV, V and VI for the academic year **2019-2020**, list of examiners and paper setters, departmental activities which contains pages **64**, is approved in the Board of Studies meeting held in the Department of Physics and Electronics on **04 - 04 - 2019**.

Members of Board of Studies			**Signatures of members**
1	Dr. K. Jyothi	Chair person	
2	Dr. K. Ramachandra Rao	University nominee, Lec. In charge / phy / Government college (A), Rajamahendravaram.	
3	Sri Vobhilineni Srinivasa Rao	Subject Expert, Lec.in charge/ phy/Govt. College, Ramachandrapuram.	
4	Sri K. Venkateswara Rao	Subject Expert, Lec.in charge/ phy/A.S.D. Degree College (W), Kakinada.	
5	Sri A.V.V .V. Prasad	Representative from Industry, solar systems, Kakinada.	
6	Dr. K. Nanda Gopal	Alumni	
7	Dr. M.V.K. Mehar	Member	
8	Sri. U.V.B.B.K. Prasad	Member	
9	Sri L.M.S. Ganesh	Member	
10	Sri B.Srikanth	Member	
11	P. Veerendra	Member	
12	K.Sravani II B. Sc MPCs	Member	
13	K. Anil kumar, II B.Sc MPCs	Student	

14	Md. Gowsia, I B.Sc MPCs	Student	
15	S. Krishna Sai I B.Sc MPCs	Student	

From

Dr. K. Jyothi
In-charge
Department of Physics
P.R.Govt. College (A),
Kakinada.

To

The Principal,
P.R.Govt. College (A),
Kakinada.

Sir,

SUB: Submission of the bills for BOS meetings for the subjects Physics and Electronics – Reimbursement of Amount--request – Reg.

I hereby submit 18 vouchers\bills (Physics -9 and Electronics - 9) for an amount of Rs. 15130/- (Physics -6480/- and Electronics – Rs. 8640/-) which was spent by me for BOS meetings in Physics and Electronics on 10-04-2018. I am here with enclosing a statement showing the said expenditure for your kind perusal.

S. No.	Subject	Expenditure	To be reimbursed
1	Physics	Rs. 4360/-	Rs. 4360/-
2		Rs. 2120/-	Rs.2120/-
3	Electronics	Rs. 6330/-	Rs. 6330/-
4		Rs. 2320/-	Rs. 2320/-
TOTAL		**Rs. 15130/-**	**Rs. 15130/-**

Thanking you Sir

Yours faithfully,

STATEMENT FOR EXPENDITURE

PHYSICS BOS Bills

S.No.	Voucher no./Bill no.	Description	Amount
1	P 1, P2	T.A., D.A. and Sitting Allowance to Dr.K. Srinivasa Rao	1250 + 500 = 1750
2	P3, P4	T.A., D.A. and Sitting Allowance to Dr.M.V.K. Meher	610 + 500=1110
3	P5	Sitting Allowance to S.S.R. Murthy	500
4	P6	Sitting Allowance to AVVV Prasad.	500
5	P7	Sitting Allowance to K. Nanda gopal	500
6	P8	Xerox and Spiral Binding	1070
7	P9	Hospitality	1050
		Total	**6480**

Electronics BOS Bills

S.No.	**Voucher no./Bill no.**	**Description**	**Amount**
1	S 1, S2	T.A., D.A. and Sitting Allowance to Dr. YVV Appa Rao	2250+500 = 2750
2	S3, S4	T.A., D.A. and Sitting Allowance to D. Gangadharudu	510+500=1010
3	S5	T.A., D.A. and Sitting Allowance to NLVRK Prasad	1070 + 500 = 1570
4	S6	Sitting Allowance to B. Sudarshan	500
5	S7	Sitting Allowance to P. Rambabu	500
6	S8	Xerox & Spiral	1200
7	S9	Hospitality	1120
		Total	**8650**

Certificate

The syllabus, Question Bank including Blue – Print in Physics subject for 3 years B.Sc. course of all the semesters for the academic year **2019 - 20**, list of examiners and paper setters, departmental activities is approved in the Board of Studies meeting held in the Department of Physics and Electronics on **04 – 04 - 2019**.

Total No. of Pages: **88**

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3	Sri Vobhilineni Srinivasa Rao	Subject Expert, Lec.in charge/ phy/Govt. College, Ramachandrapuram.	4/4/19
4	Sri K. Venkateswara Rao	Subject Expert, Lec.in charge/ phy/A.S.D. Degree College (W), Kakinada.	4/4/19
5	Sri A.V.V .V. Prasad	Representative from Industry, solar systems, Kakinada.	04/04/19.
6	Dr. K. Nanda Gopal	Alumni	
7	Dr. M.V.K. Mehar	Member	
8	Sri. U.V.B.B.K. Prasad	Member	
9	K.Jayadev	Member	
10	Sri L.M.S. Ganesh	Member	
11	Sri B.Srikanth	Member	
12	P. Veerendra	Member	
13	Kum. Sk. Shafia Begum	Member	
14	Kum G. Devi	Member	
15	K.Sravani	II B. Sc MPCs Student	