RAYALASEEMA UNIVERSITY, KURNOOL

ANDHRA PRADESH

B.Sc., Physics Syllabus

Semesters - IV(wef 2020-21)

B.O.S OF PHYSICS

Physics Board of Studies

S.No	Name & Designation of Person	Mobile No.	Chairman/ Member
1.	**Dr. D. Ramakrishna Reddy** **Principal** **GTRM Govt. Degree College, Yerraguntla, Nandyal District**	**9347291971**	Chairman
2.	**Sri Y. Gishnu Nag Vijay** **Lecturer in Physics** **PSC & KVSC Govt. College, Nandyal, Nandyal District**	**9395122131**	Member
3.	**Smt. R. Shashikala** **Lecturer in Physics** **PSC & KVSC Govt. College, Nandyal, Nandyal District**	**9618488128**	Member

Minutes of Meeting

The following resolutions made in the meeting of Physics BOS held on 29.09.2022

1. It is resolved to follow the Common core syllabus of APSCHE for B.Sc. Physics for the Semesters I, II, III, IV & V w.e.f from 2020-21 Academic year
2. The members of the board of studies Committee thoroughly discussed the syllabi proposed by APSCHE in its Model curriculum and accordingly framed syllabi of B.Sc. Physics.
3. It is Resolved to implement Choice Based Credit System **(CBCS) f**rom 2020-21 for three year B.Sc. Physics Course.

RAYALASEEMA UNIVERSITY, KURNOOL

B.Sc. PHYSICS SYLLABUS UNDER CBCS

[For Mathematics combinations]

w.e.f. 2020-21 (Revised in May 2020)

First Semester
Course I: Mechanics, Waves and Oscillations
Practical Course I (Lab-1)

Second Semester
Course II: Wave Optics
Practical Course II (Lab-2)

Third Semester
Course III: Heat and Thermodynamics
Practical Course III (Lab-3)

Fourth Semester
Course IV: Electricity, Magnetism and Electronics
Practical Course IV (Lab- 4)

Course V:Modern Physics
Practical Course V (Lab-V)

B.Sc. PHYSICS COURSE STRUCTURE UNDER CBCS

Year	*Semester*	*Course*	*Title of the Course*	*Marks*	*No.of.Hrs /Week*	*No.of Credits*
I	I	I	Mechanics, Waves and Oscillations	100	4	03
			Practical Course- I	50	2	02
	II	II	Wave Optics	100	4	03
			Practical Course – II	50	2	02
II	III	III	Heat and Thermodynamics	100	4	03
			Practical Course – III	50	2	02
	IV	IV	Electricity, Magnetism and Electronics	100	4	03
			Practical Course – IV	50	2	02
		V	Modern Physics	100	4	03
			Practical Course –V	50	2	02
Total No. of Courses : **05 (Five)**						

RAYALASEEMA UNIVERSITY, KURNOOL

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CBCS w.e.f 2020-2021

B. Sc. Physics – Scheme of Instruction – 2020-21.

A - Theory

Semester	Paper	Teaching Hours/ Week	Total Hours	Total Marks	University Exam	Internal Exam	Credits
I	I	4	60	**100**	70	30	**03**
II	II	4	60	**100**	70	30	**03**
III	III	4	60	**100**	70	30	**03**
IV	IV	4	60	**100**	70	30	**03**
	V	4	60	**100**	70	30	**03**

B-Internal Assessment Examination(IAE)

MID-I	MID-II	Average of Tests I & II A	Assignment B	Seminar/ Any Other Co-curricular Activity C	TOTAL Marks (A+B+C)
20	20	20	05	05	**30**

C - Practical

Semester	Practical Course	Hours/ week	Total Hours	Total Marks	Credits
I	I: Mechanics, Waves and Oscillations	2	30	**50**	**02**
II	II: Wave Optics	2	30	**50**	**02**
III	III: Heat and Thermodynamics	2	30	**50**	**02**
IV	IV: Electricity, Magnetism and Electronics	2	30	**50**	**02**
	V: Modern Physics	2	30	**50**	**02**

Question Paper Pattern

Semester End Examinations

The Pattern of Question Paper for Semester End Examination for B.Sc. Physics is as follows:

The Semester End Examination is for 70 Marks. The time duration is 3 Hours.

Section. A: Essay type Questions: One Question from each unit with Internal choice. Each carries 10 marks. 5x10M = 50 Marks

Section. B: Short Answer types Questions: At least one from each unit. Five to be answered out of Eight. Each carries 4 marks. 5x4M = 20 Marks

Internal Assessment Examinations

Pattern Of Internal Assessment Examination for B.Sc. Physics is as follows:

The **Internal Assessment** is for **30** marks. The Internal Assessment consists of two Midterm theory examination for **20** marks with1 Hour duration.

5 marks for **Assignment** and **5** marks for **Seminar / Project Work /Field Trip / Any other Co-curricular activity**

Average of Two Midterms is taken for Final Evaluation: In each course / paper two internaltheory examinations for 20 marks are to be conducted per semester and the average oftwo examinations should be taken for final evaluation for 20 marks.

Practical Examinations

Scheme of valuation for Practical Examination

External Practical Examination	50 Marks
Formula and explanation of symbols, Tabular forms with circuit diagram(wherever necessary)	10 Marks
Observations	10 Marks
Calculation and graph	10 Marks
Result with Units	05 Marks
Viva-voce	05 Marks
Practical Record	10 Marks

RAYALASEEMA UNIVERSITY, KURNOOL

B.Sc. PHYSICS SYLLABUS UNDER CBCS

For Mathematics Combinations

[2020-21 Batch onwards]

II Year B.Sc.-Physics: IV Semester

Course IV: ELECTRICITY, MAGNETISM AND ELECTRONICS

Work load:60 hrs per semester **4 hrs/week**

Course outcomes:

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

CO1: *Understand the Gauss law and its application to obtain electric field in different cases and formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant.*

CO2: *Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.*

CO3:*Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.*

CO4: *Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.*

CO5: *Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor and the comparative study of series and parallel resonant circuits.*

CO6: *Describe the operation of p-n junction diodes, zener diodes, light emitting diodes and transistors*

CO7: *Understand the operation of basic logic gates and universal gates and their truth tables.*

UNIT-I

1. Electrostatics: (6hrs)

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

2.Dielectrics: (6 hrs)

Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics, Dielectric strength, Capacitance of a parallel plate condenser with dielectric slab between the plates, Electric displacement D, electric polarization P, Relation between D, E and P, Dielectric constant and electric susceptibility.

UNIT-II

3.Magnetostatics: (6 hrs)

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

4.Electromagnetic Induction: (6 hrs)

Faraday's laws of electromagnetic induction, Lenz's law, Self induction and Mutual induction,Self inductance of a long solenoid, Mutual inductance of two coils, Energy stored in magnetic field, Eddy currents and Electromagnetic damping

UNIT-III

5.Alternating currents: (6 hrs)

Alternating current - Relation between current and voltage in LR and CR circuits, LCR series and parallel resonant circuit, Q –factor, Power in ac circuits, Power factor.

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

Idea of displacement current, Maxwell's equations-Derivation, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves, Poyntingtheorem(Statement and proof)

UNIT-IV

6. Basic Electronic devices: (12 hrs)

PN junction diode, Zenerdiode andLight Emitting Diode (LED) and their I-V characteristics, Zener diode as a voltage regulator- Transistors and its operation, CB, CE and CC configurations, Input and output characteristicsofa transistor in CE mode, Relation between alpha, beta and gamma; Transistor as an amplifier.

UNIT-V

7. Digital Electronics: (12 hrs)

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

REFERENCE BOOKS

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

Practical Course IV: Electricity, Magnetism and Electronics

Work load: 30 hrs **2 hrs/week**

Course outcomes (Practicals):

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

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

Minimum of 6 experiments to be done and recorded

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

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RAYALASEEMA UNIVERSITY, KURNOOL

B.Sc. PHYSICS SYLLABUS UNDER CBCS

For Mathematics Combinations

[2020-21 Batch onwards]

II Year B.Sc.-Physics: IV Semester

Course V: MODERN PHYSICS

Work load:60 hrs per semester **4 hrs/week**

Course outcomes:

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

CO1*: Develop an understanding on the concepts of Atomic and Modern Physics, basicelementary quantum mechanics and nuclear physics.*

CO2*: Develop critical understanding of concept of Matter waves and Uncertainty principle.*

CO3*: Get familiarized with the principles of quantum mechanics and the formulation ofSchrodinger wave equation and its applications.*

CO4*: Examine the basic properties of nuclei, characteristics of Nuclear forces, salientfeatures of Nuclear models and different nuclear radiation detectors.*

CO5*: Classify Elementary particles based on their mass, charge, spin, half life and interaction.*

CO6*: Get familiarized with the nano materials, their unique properties and applications.*

CO7*: Increase the awareness and appreciation of superconductors and their practical applications.*

UNIT-I

1. Atomic and Molecular Physics: (12 hrs)

Vector atom model and Stern-Gerlach experiment, Quantum numbers associated with it, Angular momentum of the atom, Coupling schemes, Spectral terms and spectral notations, Selection rules, Intensity rules, Fine structure of Sodium D-lines, Zeeman effect, Experimental arrangement to study Zeeman effect; Raman effect, Characteristics of Raman effect, Experimental arrangement to study Raman effect, Quantum theory of Raman effect, Applications of Raman effect.

UNIT-II

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

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

UNIT-III

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

Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equations-Derivations, Physical interpretation of wave function, Eigen functions, Eigen values, Application of Schrodinger wave equation to one dimensional potential box of infinite height(Infinite Potential Well)

UNIT-IV

4. Nuclear Physics: (12 hrs)

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

UNIT-V

5. Nano materials: (7hrs)

Nano materials – Introduction, Electron confinement, Size effect, Surface to volume ratio, Classification of nano materials– (0D, 1D, 2D); Distinct properties of nano materials (Mention-*mechanical, optical, electrical, and magnetic properties*); Mention of applications of nano materials: (*Fuel cells, Phosphors for HD TV, Next Generation Computer chips, elimination of pollutants, sensors*)

6. Superconductivity: (5 hrs)

Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic field, Meissner effect , Isotope effect, Type I and Type II superconductors, BCS theory (elementary ideas only),Applications of superconductors

REFERENCE BOOKS

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

Practical Course V:Modern Physics

Work load: 30 hrs **2 hrs/week**

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

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

Minimum of 6 experiments to be done and recorded

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

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adopted;

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

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B.Sc. PHYSICS

[For Mathematics combinations]

w.e.f. 2020-21 (Revised in May 2020)

MODEL QUESTION PAPER PATTERN FOR END SEMESTER EXAMINATION FOR ALL THE ABOVE COURSES

Time: 3 hrs. **Max. marks: 70**

SECTION-A

Answer all the following questions

Marks: 5x10M = 50M

1. Essay type question from Unit-I

OR

Essay type question from Unit-I

2. Essay type question from Unit-II

OR

Essay type question from Unit-II

3. Essay type question from Unit-III

OR

Essay type question from Unit-III

4. Essay type question from Unit-IV

OR

Essay type question from Unit-IV

5. Essay type question from Unit-V

OR

Essay type question from Unit-V

SECTION - B

Answer any five out of the following eight questions.

Marks: 5x4M = 20M

6. Short answer type question from Unit-I
7. Short answer type question from Unit-II
8. Short answer type question from Unit-II
9. Short answer type question from Unit-III
10. Short answer type question from Unit-III
11. Short answer type question from Unit-IV
12. Short answer type question from Unit-IV
13. Short answer type question from Unit-V

PHYSICS BOARD OF STUDIES

1. Dr. D. Ramakrishna Reddy
   Principal
   GTRM Govt. Degree College.
   Yerraguntla, Nandyal District

2. Sri Y. Gokula Nag Vijay
   Lecturer in Physics
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