SRI VENKATESWARA UNIVERSITY :: TIRUPATI

FIRST YEAR B.Sc. PHYSICS (WITH MATHEMATICS)
FIRST SEMESTER

Revised Syllabus Under CBCS W.E.F. 2020-21

STRUCTURE

Year	***Semester***	***Course***	***Title of the Course***	***Marks***	***No.ofHrs /Week***	***No.of Credits***
I	I	I	Mechanics, Waves and Oscillations	100	4	03
			Practical Course- I	50	2	02

SRI VENKATESWARA UNIVERSITY :: TIRUPATI

FIRST YEAR B.Sc. PHYSICS (WITH MATHEMATICS)
FIRST SEMESTER

Revised Syllabus Under CBCS W.E.F. 2020-21

Course I: MECHANICS, WAVES AND OSCILLATIONS

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

Course outcomes:

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

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

- *Figure outthe formation of harmonics and overtones in a stretched string and acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.*

UNIT-I:

1. **Mechanics of Particles** **(5 hrs)**

Review of Newton's Laws of Motion, Motion of variable mass system, Motion of a rocket, Multistage rocket, Concept of impact parameter, scattering cross-section, Rutherford scattering- Derivation.

2. **Mechanics of Rigid bodies** **(7 hrs)**

Rigid body, rotational kinematic relations, Equation of motion for a rotating body, Angular momentum and Moment of inertia tensor, Euler equations, Precession of a spinning top, Gyroscope, Precession of the equinoxes

Unit-II:

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

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, Equation of motion under a central force, Kepler's laws of planetary motion- Proofs, Motion of satellites, Basic idea of Global Positioning System (GPS),

UNIT-III:

4. **Relativistic Mechanics** **(12hrs)**

Introduction to relativity, Frames of reference, Galilean transformations, absolute frames, Michelson-Morley experiment, negative result, Postulates of Special theory of relativity, Lorentz transformation, time dilation, length contraction, variation of mass with velocity, Einstein's mass-energy relation

Unit-IV:

5. **Undamped, Damped and Forced oscillations: (07 hrs)** Simple harmonic oscillator and solution of the differential equation, Damped harmonic oscillator, Forced harmonic oscillator – Their differential equations and solutions, Resonance, Logarithmic decrement, Relaxation time and Quality factor.

6. **Coupled oscillations:** **(05 hrs)**

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

Unit-V:

7. **Vibrating Strings:** **(07 hrs)**

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

8. **Ultrasonics:** **(05 hrs)**

Ultrasonics, General Properties of ultrasonic waves, Production of ultrasonics by piezoelectric and magnetostriction methods, Detection of ultrasonics, Applications of ultrasonic waves.

REFERENCE BOOKS:

- B. Sc. Physics, Vol.1, Telugu Academy, Hyderabad
- Fundamentals of Physics Vol. I - Resnick, Halliday, Krane ,Wiley India 2007
- College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
- University Physics-FW Sears, MW Zemansky& HD Young,Narosa Publications, Delhi
- Mechanics, S.G.Venkatachalapathy, Margham Publication, 2003.
- Waves and Oscillations. N. Subramanyam and Brijlal, VikasPulications.
- Unified Physics - Waves and Oscillations, Jai PrakashNath&Co.Ltd.
- Waves & Oscillations. S.Badami, V. Balasubramanian and K.R. Reddy, Orient Longman.
- The Physics of Waves and Oscillations, N.K.Bajaj, Tata McGraw Hill
- Science and Technology of Ultrasonics- Baldevraj, Narosa, New Delhi,2004

BOS Chairman

Practical Course 1: Mechanics, Waves and Oscillations

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

Course outcomes (Practicals):

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

- Perform experiments on Properties of matter such as the determination of moduli of elasticity *viz.*, Young's modulus, Rigidity modulus of certain materials; Surface tension of water , Coefficient of viscosity of a liquid , Moment of inertia of some regular bodies by different methods and compare the experimental values with the standard values.
- Know how to determine the acceleration due to gravity at a place using Compound pendulum and Simple pendulum.
- Notice the difference between flat resonance and sharp resonance in case of volume resonator and sonometer experiments respectively.
- Verify the laws of transverse vibrations in a stretched string using sonometer and comment on the relation between frequency, length and tension of a stretched string under vibration.
- Demonstrate the formation of stationary waves on a string in Melde's string experiment.
- Observe the motion of coupled oscillators and normal modes.

Minimum of 6 experiments to be done and recorded:

1. Young's modulus of the material of a bar (scale) by uniform bending
2. Young's modulus of the material a bar (scale) by non- uniform bending
3. Surface tension of a liquid by capillary rise method
4. Viscosity of liquid by the flow method (Poiseuille's method)
5. Bifilar suspension –Moment of inertia of a regular rectangular body.
6. Fly-wheel -Determination of moment of inertia
7. Rigidity modulus of material of a wire-Dynamic method (Torsional pendulum)
8. Volume resonator experiment

9. Determination of 'g' by compound/bar pendulum
10. Simple pendulum- normal distribution of errors-estimation of time period and the error of the mean by statistical analysis
11. Determination of the force constant of a spring by static and dynamic method.
12. Coupled oscillators
13. Verification of laws of vibrations of stretched string –Sonometer
14. Determination of frequency of a bar –Melde's experiment.
15. Study of a damped oscillation using the torsional pendulum immersed in liquid-decay constant and damping correction of the amplitude.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

MEASURABLE

- Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
- Student seminars (on topics of the syllabus and related aspects (individual activity)
- Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams)
- Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity)
- Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

GENERAL

- Group Discussion
- Visit to Research Stations, Science Museum Centres to understand the basic principles of mechanics with live examplesand related industries
- Visit to Satellite launching station at Sri Harikota.

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adopted;

- The oral and written examinations (Scheduled and surprise tests)
- Problem-solving exercises
- Practical assignments and Observation of practical skills
- Individual and group project reports
- Efficient delivery using seminar presentations
- Viva voce interviews.

BOS Chairman

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SRI VENKATESWARA UNIVERSITY :: TIRUPATI

B.Sc PHYSICS

[For Mathematical Combination] - W.E.F. 2020-21

Model question paper

Time: 3 hrs Max. Marks: 75

SECTION–A

(Short Answer Type Questions)

Answer any five out of the following eight questions 5x5=25

1. Write a note on scattering cross-section.
2. Write Euler's equations for a rigid rotating body.
3. If the mean distance of Mars from the Sun is 1.524 times that of the earth. Find the period of revolution of Mars about the Sun.
4. What is length contraction and obtain an expression for it
5. At what speed the mass of an object will be double of its value at rest.
6. Write briefly on forced oscillations
7. Write a short note on coupled oscillators
8. Write any five applications of ultrasonic waves

SECTION-B

(Essay type questions)

Answer All questions with internal choice from each Unit 5x10=50

9. a).Derive an expression for the velocity of a rocket moving under the influence of earth's gravitational field.

Or

b).Define rigid body. Deduce an equation of motion for a rotating rigid body.

10. a).What is a central force? Deduce an equation of motion of a particle underthe action of central force.

Or

b).State and prove Kepler's laws of planetary motion.

11. a).Describe the Michelson-Morley experiment and explain the significance ofnegative result.

Or

b).State postulates of special theory of relativity. Derive Einstein's mass energy relation

12. a).What is simple harmonic motion and derive an equation of motion of asimple harmonic oscillator.

Or

b).Determine spring constant of springs in series method by dynamic method.

13. a).What are transverse waves? Derive an expression for its velocity along astretched string.

Or

b).What are Ultrasonics? Derive any method of production of Ultrasonics.

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Revised CBCS w.e.f. 2020-21

SKILL DEVELOPMENT COURSES

SCIENCE STREAM

Syllabus of

ELECTRICAL APPLIANCES

Total 30 hrs (02h/wk), ***02 Credits & Max Marks :50***

Learning Outcomes:

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

1. *Acquire necessary skills/hand on experience/ working knowledge on multimeters, galvanometers, ammeters, voltmeters, ac/dc generators, motors, transformers, single phase and three phase connections, basics of electrical wiring with electrical protection devices.*
2. *Understand the working principles of different household domestic appliances.*
3. *Check the electrical connections at house-hold but will also learn the skill to repair the electrical appliances for the general troubleshoots and wiring faults.*

SYLLABUS:

UNIT-I **(6 hrs)**

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

UNIT-II **(10 hrs)**

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

UNIT-III **(10 hrs)**

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

Co-curricular Activities (Hands on Exercises): (04 hrs)

[Any four of the following may be taken up]

1. Studying the electrical performance and power consumption of a given number of bulbs connected in series and parallel circuits.
2. Measuring parameters in combinational DC circuits by applying Ohm's Law for different resistor values and voltage sources

3. Awareness of electrical safety tools and rescue of person in contact with live wire.
4. Checking the specific gravity of lead acid batteries in home UPS and topping-up with distilled water.
5. Identifying Phase, Neutral and Earth on power sockets.
6. Identifying primary and secondary windings and measuring primary and secondary voltages in various types of transformers.
7. Observing the working of transformer under no-load and full load conditions.
8. Observing the response of inductor and capacitor with DC and AC sources.
9. Observing the connections of elements and identify current flow and voltage drops.
10. Studying electrical circuit protection using MCBs, ELCBs
11. Assignments, Model exam etc.

Reference Books:

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

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V. Ballow

BOS CHAIRMAN

SRI VENKATESWARA UNIVERSITY, TIRUPATI

I SEMESTER - MODEL QUESTION PAPER

SKILL DEVELOPMENT COURSES

SCIENCE STREAM

ELECTRICAL APPLIANCES

Max. Marks : 50 Time :1 ½ hrs (90 minutes)

(4x5M=20 Marks)

SECTION – A

Answer any four questions. Each answer carries 5 Marks

1. Define current and resistance?
2. Explain the Ohm's law
3. What is earthling and why is it necessary?
4. Define RMS & Peak values?
5. What in over loading explain?
6. Explain Induction heater
7. Write brief note on refrigerator
8. Write a note on IS codes and IE codes.

SECTION - B (3x10M=30 Marks)

Answer any four questions. Each answer carries 10 Marks

9. Derive equivalent resistance when resistors are connected in parallel?
10. Explain the Star equivalent for delta connected network
11. Explain working of Fuse, MCB and Inverter
12. Explain the Principal and working of Electric fan
13. Describe Electric bulbs, CFL and LED Lights

Course II: WAVE OPTICS
(For Mathematics Combinations)

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

Course outcomes:

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

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

UNIT-I Interference of light: (12hrs) Introduction, Conditions for interference of light, Interference of light by division of wave front and amplitude,Phase change on reflection-Stokes' treatment, Lloyd's single mirror,Interference in thin films: Plane parallel and wedge-shaped films, colours in thin films, Newton's rings in reflected light-Theory and experiment, Determination of wavelength of monochromatic light, Michelson interferometer and determination of wavelength.

UNIT-II Diffraction of light:(12hrs)

Introduction, Types of diffraction: Fresnel and Fraunhoffer diffractions, Distinction between Fresnel and Fraunhoffer diffraction,Fraunhoffer diffraction at a single slit, Plane diffraction grating,Determination of wavelength of light using diffraction grating, Resolving power of grating, Fresnel's half period zones, Explanation of rectilinear propagation of light, Zone plate, comparison of zone plate with convex lens.

UNIT-III Polarisation of light:(12hrs)

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

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

Monochromatic aberrations, Spherical aberration, Methods of minimizing spherical aberration, Coma, Astigmatism and Curvature of field, Distortion; Chromatic aberration-the achromatic doublet; Achromatism for two lenses (i) in contact and (ii) separated by a distance.

Fibre optics: Introduction to Fibers, different types of fibers, rays and modes in an optical fiber, Principles of fiber communication (qualitative treatment only), Advantages of fiber optic communication.

UNIT-V Lasersand Holography:(12hrs)

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

REFERENCE BOOKS:

- BSc Physics, Vol.2, Telugu Akademy, Hyderabad
- A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand& Co.
- Optics-Murugeshan, S.Chand& Co.
- Unified Physics Vol.IIOptics, Jai PrakashNath&Co.Ltd., Meerut
- Optics,F.A. Jenkins and H.G.White, McGraw-Hill
- Optics, AjoyGhatak,TataMcGraw-Hill.
- Introduction of Lasers – Avadhanulu, S.Chand& Co.
- Principles of Optics- BK Mathur, Gopala Printing Press, 1995

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SRI VENKATESWARA UNIVERSITY

B.Sc. DEGREE COURSE IN PHYSICS (**WITH** MATHS)

FIRST YEAR - SECOND SEMESTER
(Under CBCS W.E.F. 2020-21)

PRACTICAL COURSE II: WAVE OPTICS

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

Course outcomes (Practicals):

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

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

Minimum of 6 experiments to be done and recorded

1. Determination of radius of curvature of a given convex lens-Newton's rings.
2. Resolving power of grating.
3. Study of optical rotation –polarimeter.
4. Dispersive power of a prism.
5. Determination of wavelength of light using diffraction grating-minimum deviation method.
6. Determination of wavelength of light using diffraction grating-normal incidence method.
7. Resolving power of a telescope.
8. Refractive index of a liquid-hallow prism
9. Determination of thickness of a thin wire by wedgemethod
10. Determination of refractive index of liquid-Boy'smethod.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

MEASURABLE

- Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
- Student seminars (on topics of the syllabus and related aspects (individual activity)
- Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams)
- Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

GENERAL

- Group Discussion
- Visit to Research Stations/laboratories and related industries

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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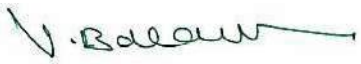

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SRI VENKATESWARA UNIVERSITY
B.Sc. DEGREE COURSE IN PHYSICS (WITH MATHS)

FIRST YEAR - SECOND SEMESTER
(Under CBCS W.E.F. 2020-21)

COURSE II: WAVE OPTICS
[For Mathematical Combination]

MODEL QUESTION PAPER

Time: 3 hrs Max. Marks: 75

SECTION-A
(Short Answer Type Questions)

Answer any five out of the following ten questions **5x5=25**

1. Explain the conditions for interference of light.
2. In an experiment with Michelson interferometer it is found that 40 tings to merge the centre, the mirror had to be moved through 0.01 mm. calculate the wavelength of the light used.
3. What is diffraction of light and discuss its types.
4. Write a short note on Fresnel's half period zones.
5. Explain law of Malus.
6. A half wave plate is construct for a wavelength of 6000 A^0. For what wavelength does it work as a quarter wave plate.
7. Find the focal lengths of the two component lenses of an achromatic doublet of focal length 25 cm. the dispersive powers of the crown and flint glasses are 0.022 and 0. 044 respectively.
8. Explain the advantages of optical fibres in communication systems.
9. Distinguish between spontaneous and stimulated emission.
10. State some applications of holography.

SECTION–B
(Essay type questions)

Answer All questions with internal choice from each Unit **5x10=50**

11. What is meant by phase change on reflection. Describe an experimental arrangement for observation and measurement of Lloyd's mirror fringes.

    Or

    Describe Newton's rings experiment to determine the wavelength of monochromatic light.

12. Discuss the fraunhoffer diffraction at a single slit and deduce intensity distribution.

    Or

    Explain construction and working of Zone plate. Derive the formula for its focal length.

13. Describe the construction and working of a Nicol's prism. Explain how it can be used as a polarizer and analyser.

    Or

    Describe the construction and working of Laurent's half shade polarimeter. Determine the specific heat of rotation of sugar solution.

14. Explain chromatic aberration. Obtain an expression for chromatic aberration of a thin lens when the object situated at infinity.

    Or

    What is an optical fibre and describe different types of fibres based on refractive index.

15. Define Einstein coefficients and obtain relationship between them.

    Or

    What is holography? Describe the basic principle of holography

SRI VENKATES WARA UNIVERSITY
SKILL DEVELOPMENT COURSE
SCIENCE STREAM
FIRST YEAR - SECOND SEMESTER
(UNDER CBCS W.E.F. 2020-21)

SOLAR ENERGY

Total 30 hrs (02h/wk), *02 Credits & Max Marks: 50*

Learning Outcomes:

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

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

SYLLABUS:

UNIT-I – Solar Radiation: **(6 hrs)**

Sun as a source of energy, Solar radiation, Solar radiation at the Earth's surface, Measurement of Solar radiation-Pyroheliometer, Pyranometer, Sunshine recorder, Prediction of available solar radiation, Solar energy-Importance, Storage of solar energy, Solar pond

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

Principle of conversion of solar radiation into heat, Collectors used for solar thermal conversion: Flat plate collectors and Concentrating collectors, Solar Thermal Power Plant, Solar cookers, Solar hot water systems, Solar dryers, Solar Distillation, Solar greenhouses.

UNIT-III – Solar Photovoltaic Systems: **(10 hrs)**

Conversion of Solar energy into Electricity - Photovoltaic Effect, Solar photovoltaic cell and its working principle, Different types of Solar cells, Series and parallel connections, Photovoltaic applications: Battery chargers, domestic lighting, street lighting and water pumping

Co-curricular Activities (Hands on Exercises): (04 hrs)

[Any four of the following may be taken up]

1. *Plot sun chart and locate the sun at your location for a given time of the day.*
2. *Analyse shadow effect on incident solar radiation and find out contributors.*
3. *Connect solar panels in series & parallel and measure voltage and current.*
4. *Measure intensity of solar radiation using Pyranometer and radiometers.*
5. *Construct a solar lantern using Solar PV panel (15W)*
6. *Assemble solar cooker*
7. *Desigining and constructing photovoltaic system for a domestic house requiring 5kVA power*
8. Assignments/Model Exam.

Reference Books:

1. Solar Energy Utilization, G. D. Rai, Khanna Publishers
1. Solar Energy- Fundamentals, design, modeling & applications, G.N. Tiwari, Narosa Pub., 2005.
2. Solar Energy-Principles of thermal energy collection & storage, S.P. Sukhatme, Tata Mc-Graw Hill Publishers, 1999.
3. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
4. Science and Technology of Photovoltaics, P. Jayarama Reddy, BS Publications, 2004.

V. Balaji

BOS chairman

SRI VENKATES WARA UNIVERSITY
SKILL DEVELOPMENT COURSE
SCIENCE STREAM
FIRST YEAR - SECOND SEMESTER
(UNDER CBCS W.E.F. 2020-21)

SOLAR ENERGY

MODEL QUESTION PAPER

Max. Marks : 50 Time :1 ½ hrs (90 minutes)

(4x5M=20 Marks)

SECTION – A

Answer any four questions. Each answer carries 5 Marks

1. Explain solar Radiation at the Earth's surface
2. Write short note on solar pond.
3. Explain Pyranometer.
4. Explain the Principal of conversion of solar radiation into heat
5. Write a note on solar green houses
6. Describe about solar cookers
7. Write a note on battery charges.
8. Mention the applications of photo voltaic system

SECTION - B (3x10M=30 Marks)

Answer any four questions. Each answer carries 10 Marks

1. Explain solar energy storage systems
2. Describe the experimental set up used in measurement of solar radiation by pyroheliometer.
3. Explain the flat plate collectors
4. Explain the concentrating collectors
5. What is photo voltaic effect? describe working Principal of solar photo voltaic cell
6. Explain various solar cells.

SRI VENKATESWARA UNIVERSITY

B.Sc. DEGREE COURSE IN PHYSICS (WITH MATHS)

III - SEMESTER

(Under CBCS W.E.F. 2021-22)

Course-III: HEAT AND THERMODYNAMICS

(For Mathematics Combinations)

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

Course outcomes:

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

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

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

Kinetic Theory of gases-Introduction, Maxwell's law of distribution of molecular velocities (qualitative treatment only) and its experimental verification, Mean free path, Degrees of freedom, Principle of equi partition of energy (Qualitative ideas only), Transport phenomenon in ideal gases: viscosity, Thermal conductivity and diffusion of gases.

UNIT-II: Thermodynamics: (12hrs)

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

UNIT-III: Thermodynamic Potentials and Maxwell's equations: (12hrs)

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

UNIT-IV: Low temperature Physics: (12hrs)

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

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

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

REFERENCE BOOKS:

- B.Sc. Physics, Vol.2, Telugu Academy, Hyderabad
- Thermodynamics, R.C.Srivastava, S.K.Saha&AbhayK.Jain, Eastern Economy Edition.
- Unified Physics Vol.2, Optics & Thermodynamics, Jai PrakashNath & Co .Ltd., Meerut
- Fundamentals of Physics. Holiday/Rudnick/Walker. Wiley India Edition 2007
- Heat and Thermodynamics -N Barilla, P Subrahmanyam, S.Chand& Co.,2012
- Heat and Thermodynamics- MS Yadav, An mol Publications Pvt. Ltd, 2000
- University Physics, HD Young, MW Zemansky, FW Sears, Nervosa Publishers, New Delhi

BOS Chairman

SRI VENKATESWARA UNIVERSITY

B.Sc. DEGREE COURSE IN PHYSICS (WITH MATHS)

III- SEMESTER

(Under CBCS W.E.F. 2021-22)

Practical Course-III: Heat and Thermodynamics

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

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

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

Minimum of 6 experiments to be done and recorded

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

RECOMMENDED CO-CURRICULAR ACTIVITIES:

MEASURABLE

- Assignments (in writing and doing forms on

the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)

- Student seminars (on topics of the syllabus and related aspects (individual activity))

- Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams)
- Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity)
- Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

GENERAL

- Group Discussion
- Visit to Research Stations/laboratories and related industries
- Others

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adopted;

- The oral and written examinations (Scheduled and surprise tests),
- Problem-solving exercises,
- Efficient delivery using seminar presentations,
- Viva voce interviews.

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BOS Chairman

SRI VENKATESWARA UNIVERSITY

B.Sc COURSE IN PHYSICS

IV SEMESTER

(CBCS) REVISED SYLLABUS – 2021-22

For Mathematics Combinations

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:

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

UNIT-I

1. Electrostatics: (6hrs)

Gauss's law-Statement and its proof, Electric field intensity due to (i) uniformly charged solid sphere and (ii) an infinite conducting sheet of charge, Deduction of Coulomb's law from Gauss law, Electrical potential–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 and its application to Solenoid,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,Phasor and Vector diagrams, LCR series and parallel resonant circuit, Q –factor, Power in ac circuits, Power factor.

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

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

UNIT-IV

7.Basic Electronic devices: (12 hrs)

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

UNIT-V:

8.Digital Electronics: (12 hrs)

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

SRI VENKATESWARA UNIVERSITY

B.Sc COURSE IN PHYSICS

IV SEMESTER – W.E.F. 2021-22

For Mathematics Combinations

Practical Course IV: Electricity, Magnetism and Electronics

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

Course outcomes (Practical's):

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*

RECOMMENDED CO-CURRICULAR ACTIVITIES:

MEASURABLE

- *Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)*
- *Student seminars (on topics of the syllabus and related aspects (individual activity))*
- *Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams)*
- *Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity)*
- *Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)*

GENERAL

- *Group Discussion*
- *Visit to Research Stations/laboratories and related industries*
- *Others*

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adopted;

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

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SRI VENKATESWARA UNIVERSITY

B.Sc COURSE IN PHYSICS

IV SEMESTER

(CBCS) REVISED SYLLABUS – 2021-22

For Mathematics Combinations

Course V: MODERN PHYSICS

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

Course outcomes:

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

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

UNIT-I :

1.Atomic and Molecular Physics:(12 hrs)

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 (i) one dimensional potential box of infinite height(Infinite Potential Well) and (ii) one dimensional harmonic oscillator

UNIT-IV:

4.Nuclear Physics: (12 hrs)

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

UNIT-V:

5.Nano materials: (7hrs)

Nanomaterials – Introduction, Electron confinement, Size effect, Surface to volume ratio, Classification of nano materials– (0D, 1D, 2D); Quantum dots, Nano wires, Fullerene, CNT, Graphene(Mention of structures and properties),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*

SRI VENKATESWARA UNIVERSITY

B.Sc COURSE IN PHYSICS

IV SEMESTER

(CBCS) REVISED SYLLABUS – 2021-22

For Mathematics Combinations

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 a-rays and β-rays, Range of β-particles and the characteristicsof 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 vacuumdiode.*
6. *Study of absorption of a-rays.*
7. *Study of absorption of β-rays.*
8. *Determination of Range of β-particles.*
9. *Determination of M & H.*
10. *Analysis of powder X-ray diffraction pattern to determine properties of crystals.*
11. *Energy gap of a semiconductor using junction diode.*
12. *Energy gap of a semiconductor using thermistor*
13. *GM counter characteristics*

RECOMMENDED CO-CURRICULAR ACTIVITIES:

MEASURABLE

- *Assignments (in writing and doing forms on the aspects of*

syllabus content andoutside the syllabus content. Shall be individual and challenging)

- *Student seminars (on topics of the syllabus and related aspects (individual activity)*
- *Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))*
- *Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity)*
- *Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)*

GENERAL

- *Group Discussion*
- *Visit to Research Stations/laboratories and related industries*
- *Others*

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adopted;

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

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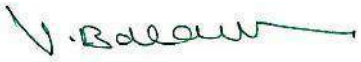

BOS Chairman

Note:

1. *The duration of the examination for each theory course is 3.00 hrs.The duration of each practical examination is 3 hrs with 50 marks*

2. *Each course in theory is of 100 marks and practical course is of 50 marks.*
   - *Semester End University Examination in Theory Course: 75*

marks [Externalevaluation]

- *Mid-Semester Examination in Theory Course at the college level: 25 marks [Internal evaluation]*

3. *The University (external) examination for Theory and Practical shall be conducted atthe end of each Semester.*

4. *In each semester the evaluation in Practical courses shall be done by an externalexaminer appointed by the University.*
   There shall not be Internal valuation in any semester end practical examinations.

5. *The candidate shall prepare and submit at the time of practical examination a certified Record based on the practical course with a minimum of* **6** *experiments from each semester.*

6. *Numerical Problems must be solved at the end of every chapter of all Units.*

7. *Numerical problems, each having a weightage of 4 marks, should be asked in theSemester end University examinations.*

8. *The minimum passing marks in each theory course is 40 (External:30 and Internal:10) The minimum passing marks in each Practical/Lab course is 20.*

9. *The teaching work load per week for semesters I to IV is 4 hours for theory courseand 2 hours for all laboratory (practical) courses.*

10. *Visits to industry, national research laboratories, and scientific exhibitions should beencouraged.*

11. *The syllabus for Practical courses is same for both Mathematics and Non-Mathematics combinations.*

12. *The marks distribution for the Semester End practical examination is as follows:*

(i) Formula/ Principle / Statement with explanation of symbols and	*05*
(ii) Diagram/Circuit Diagram / Tabular Columns … … … … …	*10*
(iii) Setting up of the experiment and taking readings/Observations	*10*
(iv) Calculations (explicitly shown) + Graph + Result with Units…	*10*
(v) Viva-voce … … … … … … … … … … … … … … … … …	*05*
(vi) Class Records (to be valued at the time of practical	*10*
Total Marks :	**50**

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BOS Chairman

B.Sc. PHYSICS

[For Mathematics combinations]

W.E.F. 2021-22

MODEL QUESTION PAPER

Time : 3 hrs *Max marks : 75*

SECTION-A

(Essay Type Questions) *Marks : 5x10M = 50M*

Answer All questions with internal choice from each Unit

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

(Short Answer Type Questions) *Marks : 5x5M = 25M*

Answer any five out of the following ten questions

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

*[***Note:** Question Paper setters are instructed to add Numerical Problems (each of 4 marks) with a maximum weightage of 16 marks either in Section-A or Section-B covering all the fiveunits in the syllabus]*

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REVISEDUGSYLLABUS UNDERCBCS **ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION**

(A Statutory body of the Government of Andhra Pradesh)

(ImplementedfromAcademicYear2020-21)

PROGRAMME: FOUR YEAR B.Sc. (Hons)

Domain Subject**: PHYSICS**

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

Structure of SECs for Semester–V

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

Univ. Code	Course No. 6&7	Name of Course	Th. Hrs / Week	IE Marks	EE Marks	Credits	Prac Hrs/ Wk	Marks	Credits
	6A	Optical Instruments and Optometry	3	25	75	3	3	50	2
	7A	Optical Imaging and Photography	3	25	75	3	3	50	2
		OR							
	6B	Low Temperature Physics & Refrigeration	3	25	75	3	3	50	2
	7B	Solar Energy and Applications	3	25	75	3	3	50	2
		OR							
	6C	Applications of Electricity & Electronics	3	25	75	3	3	50	2
	7C	Electronic Instrumentation	3	25	75	3	3	50	2

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

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

A.P. STATE COUNCIL OF HIGHER EDUCATION

Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four-year B.Sc. (Hons)

Domain Subject: **PHYSICS**

IV Year B. Sc.(Hons) – Semester – V

Max Marks: 100+50

Course 6A: OPTICAL INSTRUMENTS AND OPTOMETRY

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

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

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

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

UNIT-I OPTICAL MICROSCOPES (10hrs)

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

UNIT-II TELESCOPES (10hrs)

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

UNIT-III APPLICATIONS OF OPTICAL INSTRUMENTS (10hrs)

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

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

UNIT-IVOPTICAL VISION (10hrs)

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

UNIT-V OPHTHALMIC TECHNIQUES AND OPTOMETRY (10hrs)

Ophthalmoscope and keratometer and their working principles, Evaluation of eye disorders, Guidelines for standardized eye chart preparation, Simple phoropter and its working principle and its uses, Checking the power of lenses, Principles of Computer based eye testing

References:

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

Course 6A: Optical Instruments and Optometry –

PRACTICAL SYLLABUS *(30 Hrs. Max Marks: 50)*

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

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

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

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

VI. Lab References:

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

http://www.phy.olemiss.edu/~thomas/weblab/Optics_lab_Items/Telescope_Microscope_PROCED_Spring_2018.pdf

VII. Co-Curricular Activities

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

1. **For Teacher**: Training of students by the teacher (if necessary, by a local expert) in laboratory/field for a total of not less than 15 hours on the field techniques/skills on the familiarization of various optical instruments available in the laboratory; construction of different types of telescopes and their comparison in construction, operation and their utility and limitations; the details of construction of eye and various defects in the eye sight, emerging techniques in the design of eye lenses including contact lenses and making the student to understand on the testing of a biological sample using a clinical microscope

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

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

(b) <u>Suggested Co-Curricular Activities</u>

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

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

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

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

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

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

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A.P. STATE COUNCIL OF HIGHER EDUCATION

Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four-year B.Sc. (Hons)

Domain Subject: **PHYSICS**

IV Year B. Sc.(Hons) – Semester – V

Max Marks: 100+50

Course 7A: OPTICAL IMAGING AND PHOTOGRAPHY

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

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

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

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

Unit-I: INTRODUCTION TO PHOTOGRAPHY: (10 hrs)

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

Unit-II: DIGITAL PHOTOGRAPHY: (10 hrs)

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

Unit-III: PHOTOGRAPHIC LIGHT SOURCES: (10 hrs)

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

Unit-IV: PHOTOGRAPHIC SHOOTING TECHNIQUES: (10 hrs)

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

Unit-V : PHOTO MANIPULATION : (10 hrs)

Developing and printing the photographs, equipment and materials used in developing and printing, image mixing and printing, Image editing through image editing software's like Adobe Photoshop – Adjustment of Brightness, Contrast, Tonal and Colour Values, Factors influencing quality of digital image, Methods of storing and processing, Image transportation through Pendrive, CD, HDD and CLOUD [Internet]

III Reference Books:

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

Course 7A: Optical Imaging and Photography

PRACTICAL SYLLABUS *(30 Hrs, Max Marks: 50)*

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

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

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

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

VI. Lab References:

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

VII. Co-Curricular Activities

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

1. **For Teacher**: Training of students by the teacher (if necessary, by a local expert) in laboratory/field for not less than 15 hours on the field techniques/skills of Image formation by using lenses and mirrors. Also to make students to understand the construction, operation and the Physics principles involved in a normal Camera and Digital Camera.

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

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

(b) Suggested Co-Curricular Activities:

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

A.P. STATE COUNCIL OF HIGHER EDUCATION

Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four-year B.Sc. (Hons)

Domain Subject: **PHYSICS**

IV Year B. Sc.(Hons) – Semester – V

Max Marks: 100+50

Course 6B: LOW TEMPERATURE PHYSICS & REFRIGERATION

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

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

1. Identify various methods and techniques used to produce low temperatures in the Laboratory.
2. Acquire a critical knowledge on refrigeration and air conditioning.
3. Demonstrate skills of Refrigerators through hands on experience and learns about refrigeration components and their accessories.
4. Understand the classification, properties of refrigerants and their effects on environment.
5. Comprehend the applications of Low Temperature Physics and refrigeration.

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

UNIT-I PRODUCTION OF LOW TEMPERATURE (10 hrs)

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

UNIT-II MEASUREMENT OF LOW TEMPERATURE (10 hrs)

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

UNIT-III PRINCIPLES OF REFRIGERATION (10 hrs)

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

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

UNIT-IV COMPONENTS OF REFIGERATOR (10 hrs)

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

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

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

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

III. References:

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

https://nptel.ac.in

Course 6B: Low Temperature Physics & Refrigeration

PRACTICAL SYLLABUS *(30 Hrs. Max Marks: 50)*

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

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

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

1. Record the Principles and applications of Refrigerators and Freezers.
2. Measure the temperatures below Melting point of Ice using a thermometer available in the Lab.
3. Make a freezing mixture by adding different salts viz., Sodium chloride, Potassium Hydrate (KOH), Calcium chloride to ice in different proportions and observe the temperature changes.
4. Study the operation of a refrigerator and understand the working of different parts.
5. Study the properties of refrigerants like chlorofluorocarbons-hydrochlorofluoro- carbons and record the lowest temperatures obtained.
6. Consider a simple faulty refrigerator and try to troubleshoot the simple problems by understanding its working.

7. Understand the practical problem of filling the Freon Gas into the Refrigerator.
8. Get the Liquid Nitrogen or Liquid Helium from nearby Veterinary Hospital and measure their temperatures using chromel-alumel thermocouple or mercury thermometer and observe their physical properties like colour, smell etc and precautions to be taken for their safe handling.
9. Preparation of freeze drying food with Dry ice and liquid nitrogen
10. Preparation of freeze drying food with liquid nitrogen

VI. Lab References:

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

VII. Co-Curricular Activities:

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

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

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

(b) Suggested Co-Curricular Activities

1. Training of students by related Factory, industrial experts.
2. Assignments (including technical assignments like identifying tools in Refrigerators, Freezers and their handling, operational techniques with safety and security)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in Low Temperatures and applications.
5. Collection of material/figures/photos related to substances used in Freezing Mixtures, their Properties and availability etc., writing and organizing them in a systematic way in a file.
6. Visits to Ice plants and labs in universities, research organizations, private firms, etc.
7. Making your own mini refrigerator at home
8. Build your own water cooler with the materials available at home.
9. Making hand launched liquid nitrogen rockets
10. Experiments with Liquid nitrogen and strawberry/ banana/ lemon/ onion/ mushroom/ egg etc. (*To be tried under professional supervision only*).
11. Invited lectures and presentations on related topics by field/industrial experts
12. Identification of different Ozone-depleting substances (ODS) that damage the ozone layer in the upper atmosphere.
13. Demonstration to illustrate the greenhouse effect and the role of carbon dioxide as a greenhouse gas using plastic water bottles, flood light lamp, beakers and temperature sensors and observe the temperature changes.

    https://edu.rsc.org/experiments/modelling-the-greenhouse-effect/1543.article
    https://sealevel.jpl.nasa.gov/files/archive/activities/ts1hiac1.pdf

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A.P. STATE COUNCIL OF HIGHER EDUCATION

Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code**:**

Four-year B.Sc. (Hons)

Domain Subject**: Physics**

IV Year B. Sc.(Hons) – Semester – V

Max Marks: 100+50

Course 7B: Solar Energy and Applications

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

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

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

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

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

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

Unit - II: SOLAR THERMAL COLLECTORS (10hrs)

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

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

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

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

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

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

Unit – V: SOLAR PHOTOVOLTAIC SYSTEMS (10hrs)

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

III. References:

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

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

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

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

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

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

VI. Lab References:

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

VII. Co-curricular Activities:

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

1. **For Teacher**: Training of students by the teacher in the in the laboratory/field for not less than 15 hours on the field techniques/skills related to measurement of direct, diffused and global solar radiation; demonstration of procedures used in the performance evaluation of solar flat plate collectors, solar photovoltaic cells and modules measurement of different parameters in the calculation of efficiency.

2. **For Student**: Students shall visit to solar thermal and photovoltaic laboratories in universities/research organizations/ nearby industries to observe and understand the techniques and procedures used for evaluation of solar collector, solar cell and module efficiencies. They shall write their observations and submit to the teacher hand-written Fieldwork/Project work not exceeding 10 pages in the given format.

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

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

5. Unit tests (IE).

(b) Suggested Co-Curricular Activities

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

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A.P. STATE COUNCIL OF HIGHER EDUCATION

Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four-year B.Sc. (Hons)

Domain Subject: **PHYSICS**

IV Year B. Sc.(Hons) – Semester – V

Max Marks: 100+50

Course 6C: APPLICATIONS OF ELECTRICITY & ELECTRONICS

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

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

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

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

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

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

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

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

Unit-III Alternating Currents (10 hrs)

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

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

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

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

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

III. References:

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

Course 6C: Applications of Electricity & Electronics–

PRACTICAL SYLLABUS *(30 hrs, Max Marks:50)*

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

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

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

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

VI. Lab References:

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

VI. Co-Curricular Activities:

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

1. **For Teacher**: Training of students by the teacher (if necessary, by a local expert) in laboratory/field for not less than 15 hours on the understanding of various electronic &electrical components and devices. And also understand the functional knowledge of these components and devices so that the student can safely handle these electronic components.

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

(b) <u>Suggested Co-Curricular Activities</u>

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

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A.P. STATE COUNCIL OF HIGHER EDUCATION

Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four-year B.Sc. (Hons)

Domain Subject: **PHYSICS**

IV Year B. Sc.(Hons) – Semester – V

Max Marks: 100+50

Course 7C: ELECTRONIC INSTRUMENTATION

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

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

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

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

UNIT-I INTRODUCTION TO INSTRUMENTS (10 hrs)

Types of electronic Instruments- Analog instruments & Digital Instruments, DC Voltmeter and AC Voltmeter, Construction and working of an Analog Multimeter and Digital Multimeter (Block diagram approach),Sensitivity, 3½display and 4½ display Digital multimeters, Basic ideas on Function generator

UNIT-II OSCILLOSCOPE (10 hrs)

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

UNIT-III TRANSDUCERS (10 hrs)

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

UNIT-IVDISPLAY INSTRUMENTS (10 hrs)

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

UNIT-VBIOMEDICAL INSTRUMENTS (10 hrs)

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

III Reference Books:

1. Electronic Instrumentation by H.S.Kalsi , TMH Publishers
2. Electronic Instrument Hand Book by Clyde F. Coombs , McGraw Hill
3. Introduction to Biomedical Instrumentation byMandeep Singh, PHI Learning.

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

Course 7C: Electronic Instrumentation– PRACTICAL SYLLABUS

(30 Hrs. Max Marks: 50)

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

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

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

1.Familiarisation of digital multimeter and its usage in the measurements of (i) resistance (ii) current, (iii) AC & DC voltages and for (i) continuity test (ii) diode test and (iii) transistor test

2. Measure the AC and DC voltages, frequency using a CRO and compare the values Measured with other instruments like Digital multimeter.

3. Formation of Sine, Square wave signals on the CRO using Function Generator and measure their frequencies. Compare the measured values with actual values.

4. Display the numbers from 0 to 9 on a single Seven Segment Display module by Applying voltages.

5. Display the letters **a** to **h** on a single Seven Segment Display module by applying voltages.

6. Measurement of body temperature using a digital thermometer and list out the error and corrections.

7. Measurement of Blood Pressure of a person using a B.P. meter and record your values and analyze them.

8. Get acquainted with an available ECG machine and study the ECG pattern to understand the meaning of various peaks

9. Observe and understand the operation of a Digital Pulse oxymeter and measure the pulse rate of different people and understand the working of the meter.

VI. Lab References:

1. Electronic Measurement and Instrumentation by J.P. Navani. ,S Chand & Co Ltd
2. Principles of Electronic Instrumentation by A De Sa, Elsevier Science Publ.
3. Electronic Measurements and Instrumentation by S.P.Bihari, YogitaKumari, Dr. Vinay Kakka, Vayu Education of India .
4. Laboratory Manual For Introductory Electronics Experiments by Maheshwari, New Age
International (P) Ltd., Publishers.

5. Electricity-Electronics Fundamentals: A Text-lab Manual by Paul B. Zbar ,Joseph Sloop, & Joseph G. Sloop, McGraw-Hill Education.
6. Web sources suggested by the teacher concerned.

VII. Co-Curricular Activities

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

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

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

   Observations shall be recorded in a hand-written Fieldwork/Project work not exceeding 10 pages in the given format to be submitted to the teacher.
2. Max marks for Fieldwork/Project work: 05.
3. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements*.
4. Unit tests (IE)

(b)Suggested Co-Curricular Activities

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

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Draft syllabus prepared by,

Dr. M. Ravi Kumar, Principal, T.R.R. Govt Degree College, Kandukur, PrakasamDist
Dr. Y. Narasimha Murthy, Associate Prof of Physics, S.S.B.N.College, Anantapur
Prof. K.T. Ramakrishna Reddy, Professor, Dept. of Physics, S.V.University, Tirupati.

Paper V: Electricity, Magnetism& Electronics

(For Maths Combinations)

V SEMESTER

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

UNIT-I (12 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)charged spherical shell and uniformly charged sphere.

2. Dielectrics:

Electric dipolemoment 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-II (12 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.

4. Electromagnetic induction

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.Transformer - energy losses - efficiency.

UNIT-III (12 hrs)

5. Alternating currents and electromagnetic waves

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

6. Maxwell's equations

Idea of displacement current - Maxwell's equations (integral and differential forms) (no derivation), Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves.Poynting theorem (statement and proof), production of electromagnetic waves (Hertz experiment).

UNIT-IV (12 hrs)

7. Basic electronics:

PN juction diode, Zener diode, Tunnel diode, I-V characteristics, PNP and NPN transistors, CB, CE and CC configurations – Relation betweenα, β and γ - transistor (CE) characteristics -Determination of hybrid parameters, Transistor as an amplifier.

UNIT-V: (12 hrs)

8. 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.

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, Mc GrawHill Edition.

Practical Paper V:Electricity, Magnetism & Electronics

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

Minimum of 6 experiments to be done and recorded

1. Figure of merit of a moving coil galvonometer.
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.
6. PN Junction Diode Characteristics
7. Zener Diode Characteristics
8. Transistor CE Characteristics- Determination of hybrid parameters
9. Logic Gates- OR,AND,NOT and NAND gates. Verification of Truth Tables.
10. Verification of De Morgan's Theorems.

Suggested student activities
Student seminars, group discussions, assignments, field trips, study project and experimentation using virtual lab

Examples
Seminars - A topic from any of the Units is given to the student and asked to give a brief seminar presentation.
Group discussion - A topic from one of the units is given to a group of students and asked to discuss and debate on it.
Assignment - Few problems may be given to the students from the different units and asked them to solve.
Field trip - Visit to Satish Dhawan Space Centre, Sriharikota / Thermal and hydroelectric power stations / Science Centres, any other such visit etc.
Study project - Web based study of different satellites and applications.

Domain skills:
Logical derivation, experimentation, problem solving, data collection and analysis, measurement skills

***** Documental evidence is to be maintained for the above activities.**

Paper VI: Modern Physics

(For Maths Combinations)

V SEMESTER

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

UNIT-I (12 hrs)

1. Atomic and molecular physics

Introduction –Drawbacks of Bohr's atomic model- Sommerfeld's elliptical orbits-relativistic correction (no derivation).Vector atom model and Stern-Gerlach experiment - quantum numbers associated with it. L-S and j- j coupling schemes.Zeeman effect and its experimental arrangement.

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

UNIT-II (12 hrs)

2. 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 - Complementarity principle of Bohr.

UNIT-III (12 hrs)

3. 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-IV(12 hrs)

4. General Properties of Nuclei

Basic ideas of nucleus -size, mass, charge density (matter energy), binding energy, angular momentum, parity, magnetic moment, electric moments. Liquid drop model and Shell model (qualitative aspects only) - Magic numbers.

5. Radioactivity decay:

Alpha decay: basics of α-decay processes. Theory of α-decay, Gamow's theory, Geiger Nuttal law.β-decay, Energy kinematics for β-decay, positron emission, electron capture, neutrino hypothesis.

UNIT-V (12 hrs)

6. Crystal Structure

Amorphous and crystalline materials, unit cell, Miller indices, reciprocal lattice, types of lattices, diffraction of X-rays by crystals, Bragg's law, experimental techniques, Laue's method and powder diffraction method.

7. Superconductivity:

Introduction - experimental facts, critical temperature - critical field - Meissner effect – Isotope effect - Type I and type II superconductors - BCS theory (elementary ideas only) - applications of superconductors.

REFERENCE BOOKS

1. BSc Physics, Vol.4, Telugu Akademy, 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. Nuclear Physics, Irving Kaplan, Narosa publishing House.
8. Nuclear Physics, D.C.Tayal, Himalaya Publishing House.
9. Elements of Solid State Physics, J.P.Srivastava, Prentice Hall of India Pvt., Ltd.
10. Solid State Physics, A.J. Dekker, McMillan India.

Practical Paper VI:Modern Physics

Work load: 30 hrs **2 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 β-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.

Note: For all the above 8 practical papers the book "B.Sc Practical Physics" by C.L. Arora Published by S.Chand & Co, New – Delhi may be followed.

NOTE: Problems should be solved at the end of every chapter of all units.

Suggested student activities

Student seminars, group discussions, assignments, field trips, study project and experimentation using virtual lab

Examples

Seminars - A topic from any of the Units is given to the student and asked to give a brief seminar presentation.

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Study project - Web based study of different satellites and applications.

Domain skills:

Logical derivation, experimentation, problem solving, data collection and analysis, measurement skills

***** Documental evidence is to be maintained for the above activities.**

Paper V : Electricity, Magnetism& Electronics

(For Non-Maths Combinations)

V SEMESTER

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

UNIT-1(15 hrs)

1. Electric field and potential

Coulomb's law – electric field and intensity of electric field –intensity of electric field due to i) a point charge–electric dipole and dipole moment. Electric lines of force, Electric flux.Gauss's law statement and its proof- applications of Gauss Law to (1) Uniformly charged sphere (2) an infinite conducting sheet of charge (No Derivation- qualitative ideas only). Electrical potential – equi-potential surfaces- potential due to i) a point charge, ii)charged spherical shell.Equi-potential surfaces with examples.

UNIT-II(10 hrs)

2. Capacitance and dielectrics

Derivation of expression for capacity due to i) a parallel plate capacitor with and without dielectric, ii) a spherical capacitor. Energy stored in a capacitor, electric capacitance. Electric dipole moment Di-electrics with examples, effect of electric field-electric displacement D, electric polarization P, permeability &susceptibility (Definitions only) – relation between D,E and P.Dipolemoment of heart.

UNIT-III (10 hrs)

3. Current electricity

Current and current density, drift velocity expression, Kirchhoff's laws –statement and explanation and application to Wheatstone bridge, sensitivity of Wheatstone bridge, Carey-Foster's bridge- experimentalmeasurement of temperature coefficient of resistance- strain gauge-piezoelectric transducers (applications only)

UNIT-IV (15 hrs)

5. Electromagnetism

Magnetic induction B, magnetic flux – Biot –Savart's law, magnetic induction due to (i) a long straight conductor carrying current (ii) on the axis of a circular coil carrying current (iii) solenoid, (No derivation-qualitative treatment only) Ampere's law – derivation of expression for the force on (i) charged particles and (ii) current carrying conductor in the magnetic field, Hall effect and its importance-electromagnetic pumping.

Faraday's law of electromagnetic induction, Lenz's law - Construction, theory and working of a Moving Coil Ballistic Galvanometer,application of B.G. damping correction, Self induction, Mutual induction and their units- Electromagnetic measurement of blood flow.

UNIT-V(12 hrs)

6. Basic Electronics

PN junction diode, Zener diode and its V-I characteristics, half and full wave rectifiers(semiconductor type) (working qualitative ideas only).Bridge type full wave rectifier.Action of filters- Land π type.PNP and NPN transistors and charactrestics,Configurations Transistor configurations – CE transistor characteristics – h-parameters – Transistor as an amplifier.

Number system, conversion of binary to decimal and vice versa, De Morgans's theorems statements - logic gates – verification of truth tables, NAND and NOR gates as universal gates, Half and Full adders.

REFERENCE BOOKS

1. B.Sc., Physics, Vol.3, Telugu Academy, Hyderabad
2. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath – S. Chand & Co.
3. Electricity and Magnetism, Brijlal and Subramanyam. RatanPrakashanMandir.
4. Physics for Biology & Premedical Students –DN Burns & SG MacDonald, Addison Wiley.
5. Principles of Electronics, V.K. Mehta, S.Chand & Co.,
6. Digital Principles and Applications, A.P. Malvino and D.P.Leach, Mc GrawHill Edition.

Practical Paper V: Electricity, Magnetism& Electronics

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

Minimum of 6 experiments to be done and recorded

1. Figure of merit of a moving coil galvonometer.
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.
6. PN Junction Diode Characteristics
7. Zener Diode Characteristics
8. Transistor CE Characteristics- Determination of hybrid parameters
9. Logic Gates- OR, AND,NOT and NAND gates. Verification of Truth Tables.
10. Verification of De Morgan's Theorems.

Suggested student activities

Student seminars, group discussions, assignments, field trips, study project and experimentation using virtual lab

Examples

Seminars - A topic from any of the Units is given to the student and asked to give a brief seminar presentation.

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Assignment - Few problems may be given to the students from the different units and asked them to solve.

Field trip - Visit to Satish Dhawan Space Centre, Sriharikota / Thermal and hydroelectric power stations / Science Centres, any other such visit etc.

Study project - Web based study of different satellites and applications.

Domain skills:

Logical derivation, experimentation, problem solving, data collection and analysis, measurement skills

***** Documental evidence is to be maintained for the above activities.**

Paper VI: Modern Physics

(For Non-Maths Combinations)

V SEMESTER

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

UNIT-1(10 hrs)

1. Spectroscopy

Introduction - Zeeman effect - Experimental verification – Paschen Back effect – Stark effect – Explanations (elementary ideas only) - Raman effect, hypothesis, classical and quantum theory of Raman effect. Experimental arrangement for Raman effect and its application.

UNIT-II (12 hrs)

1. Fundamentals of quantum mechanics

Photoelectric effect – Explanation through demonstration, Einstein's Photoelectric equation – its verification by Millikan's experiment –theory of Compton effect (no derivation) and its experimental verification –Bohr's theory of Hydrogen atom – Derivation of expression for energy levels and spectral series of Hydrogen atom, atomic excitation, Frank Hertz experiment.

UNIT-III (10 hrs)

3. Matter Waves and uncertainty principle

Dual nature of radiation- de Broglie's theory of matter waves, expression for wavelength, properties of matter waves, Davisson and Germer experiment on electron diffraction – Discussion of results, Wave velocity and group velocity.
Heisenberg's uncertainty principle for position and momentum (x and p), energy and time (E and t).Experimental illustrations of uncertainty principal, Complementary principle of Bohr.

UNIT-IV: (12 hrs)

4. Radioactivity and radiation protection

The nature of radioactive emissions, the law of Radioactive decay, derivation, decay constant, Half life and mean life periods - derivations, units of radio activity, Carbon and Uranium dating (explanation) - Age of earth and rocks, Radioactive isotopes as tracers, radio cardiography. Principles of radiation protection– protective materials-radiation effects – somatic, genetic stochastic & deterministic effect, Natural radioactivity, Biological effects of radiation, Radiation monitors**.**

UNIT-V (16 hrs)

5. Crystal Structure

Amorphous and crystalline materials, unit cell, Miller indices, reciprocal lattice, types of lattices, diffraction of X-rays by crystals, Bragg's law, experimental techniques, Laue's method and powder diffraction method.

6. Superconductivity:

Introduction - experimental facts, critical temperature - critical field - Meissner effect – Isotope effect - Type I and type II superconductors - BCS theory (elementary ideas only) - applications of superconductors.

REFERENCE BOOKS

1. B.Sc Physics, Vol.4, Telugu Academy, Hyderabad.
2. Molecular Structure and Spectroscopy by G. Aruldhas. Prentice Hall of India, New Delhi.
3. Physics for Biology & Premedical Students –D.N. Burns & SG Mac Donald, Addison Wiley.
4. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.
5. Basic Radiological Physics Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)
6. Physics of Radiation Therapy : F M Khan - Williams and Wilkins, Third edition (2003)
7. The Physics of Radiology-H E Johns and Cunningham.

Practical Paper VI: Modern Physics& Medical Physics

Work load: 30 hrs **2 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 β-rays.
6. Determination of M & H.
7. Analysis of powder X-ray diffraction pattern to determine properties of crystals.
8. Energy gap of a semiconductor using junction diode.
9. Energy gap of a semiconductor using thermister.
10. Characteristics of LDR.

Suggested student activities

Student seminars, group discussions, assignments, field trips, study project and experimentation using virtual lab

Examples

Seminars - A topic from any of the Units is given to the student and asked to give a brief seminar presentation.

Group discussion - A topic from one of the units is given to a group of students and asked to discuss and debate on it.

Assignment - Few problems may be given to the students from the different units and asked them to solve.

Field trip - Visit to Satish Dhawan Space Centre, Sriharikota / Thermal and hydroelectric power stations / Science Centres, any other such visit etc.

Study project - Web based study of different satellites and applications.

Domain skills:

Logical derivation, experimentation, problem solving, data collection and analysis, measurement skills

***** Documental evidence is to be maintained for the above activities.**

Note: For all the above 8 practical papers the book "B.Sc Practical Physics" by C.L.Arora Published by S.Chand& Co, New – Delhi may be followed.

NOTE: Problems should be solved at the end of every chapter of all units.

MODEL PAPER

THREE YEAR B.Sc DEGREE EXAMINATION
CHOICE BASED CREDIT SYSTEM
FIFTH SEMESTER: PART II: PHYSICS
PAPER V: ELECTRICITY AND MAGNETISM
(FOR NON MATHEMATICS COMBINATIONS)

Time: 3 Hours Max. Marks: 75

Section-A (Essay type)

Answer All questions **Marks :10x5 = 50**

1. (a) Define Electric flux. State and prove Gauss law in electrostatics.

(OR)

(b) Define the electrical potential and derive an expression for the potential due to a charged spherical shell.

2. (a) Derive an expression for the capacitance of a parallel plate capacitor with and without dielectric medium.

(OR)

(b) Define electric displacement (D), electric field (E) and electric polarization (P) and derive the relation between D, E and P.

3. (a) Describe an experiment to measure the temperature coefficient of resistance of a material using Carey-Foster's Bridge.

(OR)

(b) State and explain Hall effect and write its importance.

4. (a) Explain Biot-Savart`s law and derive an expression for magnetic induction due to on the axis of a circular coil carrying current.

(OR)

(b) Describe the construction and working of Ballistic Galvanometer with necessary theory and write it`s uses.

5. (a) Explain half wave and full wave rectifiers using semiconductor diodes and draw input and output waveforms.

(OR)

(b) Explain the construction and working of OR, AND and NOT logic gates and verify with truth tables.

(Dr. N. Venugopal Reddy)
H.O.D of physics
S.V. Arts college, Tirupati.

Section-B (Short answer type)

Answer any three questions **Marks: 5 x3 = 15**

6. Explain equipotential surfaces with examples.

7. Derive an expression for energy stored in a capacitor.

8. State and explain Kirchoff's laws.

9. Write a short note on the electromagnetic measurement of blood flow.

10. State and prove de Morgans theorems.

Section-C

Answer any two questions **Marks: 5x2 = 10**

11. Radius of the gold nucleus is 6.6×10^{-15}m and its atomic number is 79. Calculate the potential on the surface of the gold nucleus.

12. A parallel plate capacitor with area of plates $1m^2$ and distance between the plates 0.1 mm, has a dielectric constant 5 as the medium between the plates. If this capacitor is charged to 100 V, calculate the energy stored in it.

13. A galvanometer of resistance 50Ω has current maximum 1mA. How this galvanometer is Converted into 0 to 10mA ammeter and 0 to 5 V voltmeter.

14. Calculate the self inductance of a solenoid of length 1m and area of cross section 0.01 m^2 with 200 turns.

15. Find the decimal equivalent of $(11001.011)_2$

N. Venkateswara Reddy

(DR. N. VENKATESWARA REDDY)
H.O.D of PHYSICS
S.V. ARTS COLLEGE, TIRUPATI.

MODEL PAPER

THREE YEAR B.Sc DEGREE EXAMINATION
CHOICE BASED CREDIT SYSTEM
FIFTH SEMESTER: PART II: PHYSICS
PAPER VI : MODERN PHYSICS AND ELECTRONICS
(FOR NON MATHEMATICS COMBINATIONS)

Time: 3 Hours Max. Marks: 75

Section-A (Essay type)

Answer All questions **Marks :10x5 = 50**

1. (a) What is Zeeman effect ? Explain the experimental verification for Zeeman effect.

(OR)

(b) What is Raman effect ? Explain the experimental arrangement for Raman effect .

2. (a) What is Compton effect ? Explain its experimental verification.

(OR)

(b) Explain the Frank Hertz experiment and write its uses.

3. (a) Define de Broglie wave? Explain how Davisson and Germer predicated experimentally the electron waves predicated by de Broglie.

(OR)

(b) Explain the Heisenberg`s uncertainty principle. Describe the experimental illustrations of uncertainty principle using gamma ray microscope.

4.(a) Explain the law of Radioactive decay and derive expressions for decay constant, half life and mean life periods.,

(OR)

(b) Explain Carbon and Uranium dating with examples.

5. (a) What is Bragg`s law ? Explain Bragg`s X-ray spectrometer to determine the wave length Of X- rays.

(OR)

(b) Define the phenomenon of super conductivity, explain Meissner effect and write the uses of superconductors.

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Section-B (Short answer type)

Answer any three questions **Marks: 5 x3 = 15**

6. Write the applications of Raman effect.
7. Explain the Einstein`s photoelectric effect equation.
8. Explain the complementary principle of Bohr.
9. Discuss the biological effects of nuclear radiation.
10. Write the properties of superconducting materials.

Section-C

Answer any two questions **Marks: 5x2 = 10**

11. The original line in an Raman experiment is 5460 A^o and the stokes line is at 5520 A^o Find the wavelength of anti-stokes line.
12. A photon of wavelength 3310 A^o falls on a photo cathode and ejects an electron of maximum energy $3x10^{-9}$ joules. Calculate the work function of the cathode material. Given that $h=6.62x10^{-34}$J-S, $c=3x10^8$ m/sec.
13. An electron has a speed of 600 m/s with an accuracy of 0.005% . Calculate the certainty with which we can locate the position of the electron. Given that $h = 6.6x10^{-34}$ joule-sec, $m = 9.1x10^{-31}$ kg.
14. The half-life period of radium is 1590 years. In how many years willone gram of pure element be reduced to one centigram ?.
15. The spacing between the principle planes of NaCl crystal in 2.82 A^o. It is found that the first order Bragg reflection occurs at an angle of 10^0. What is the wavelength of X-rays. Given that sin 10^0=0.1736.

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MODEL PAPER

THREE YEAR B.Sc DEGREE EXAMINATIONS, NOV/DEC 2017

CHOICE BASED CREDIT SYSTEM

FIFTH SEMESTER

PART II : PHYSICS

PAPER V: Electricity, Magnetism and Electronics

(For maths combination)

(Revised syllabus w.e.f 2017-18)

Time: 3 Hours Max.Marks:75

SECTION – A (Essay type)

Answer ALL questions (5 x 10 = 50)

అన్నీ ప్రశ్నలకు సమాధానములు వ్రాయుము.

1. (a) Define electric potential. Derive an expression for the potential due to uniformly charged sphere.
విద్యుత్ శక్మమును నిర్వచించుము. ఏకరీతి ఆవేశ పూరిత గోళము వలన కలుగు విద్యుత్ శక్మమునకు సమీకరణమును రాబట్టుము.

OR

(b) Define electric field intensity (E), electric displacement (D), dielectric polarization (P); Obtain the relation between them.
విద్యుత్ క్షేత్ర తీవ్రత (E), విద్యుత్ స్థాన భ్రంశము (D) మరియు రోధక ధ్రువణము (P) లను నిర్వచించి, వాటి మధ్య సంబంధమును ఉత్పాదించుము.

2. (a) State Biot – Savart's law. By using it calculate magnetic induction 'B' due to long straight wire.
బయోట్ – సావర్ట్ నియమమును తెల్పుము. ఈ నియమమునుపయోగించి పొడవైన తిన్నని తీగ వలన కలుగు అయస్కాంత ప్రేరణ B ను కనుగొనుము.

OR

(b) State Faraday's laws of electromagnetic induction. Derive an expression for the self inductance of a solenoid.
విద్యుత్ అయస్కాంత ప్రేరణ కు సంబంధించిన ఫారడే నియమములను తెల్పుము. సొలినాయిడ్ యొక్క స్వయం ప్రేరణ కు సమీకరణమును రాబట్టుము.

3. (a) Obtain the expression for the resonance of a parallel LCR circuit. Find its Q-Factor.
సమాంతర LCR వలయము యొక్క అనునాద సమీకరణమును రాబట్టుము. వలయము యొక్క Q – గుణకమును కనుగొనుము.

OR

(b) State and prove Poynting theorem
పాయింటింగ్ సిద్ధాంతమును నిర్వచించి, నిరూపించుము.

4. (a) What is a Zener diode? In what way it is different from PN junction diode? Explain Zener mechanism.
జీనర్ డయోడు అనగానేమి? జీనర్ డయోడు PN సంధి డయోడు కంటె ఏవిధముగ విభిన్న మైనది? జీనర్ ప్రక్రియను వివరించుము.

OR

(b) What are hybrid parameters of a transistor? How they are determined.
ట్రాన్సిస్టరు యొక్క హైబ్రీడ్ పరామితులు అనగానేమి? వాటిని ఎలా కనుగొంటారు.

5. (a) Explain binary addition and substraction by 1's and 2's complement method.
ఒకట్ల మరియు రెండ్ల పూరక పద్ధతిని రెండు ద్వాంశ సంఖ్యల మొత్తము మరియు వాటి భేదాలను వివరించుము.

OR

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(b) Discuss the working of half adder and full adder and give their truth tables.
అర్ధ సంకలని మరియు పూర్ణ సంకలని లు పని చేయు విధానమును వివరించి, వాటి సత్య పట్టికలను వ్రాయండి.

SECTION – B

ANSWER ANY THREE QUESTINONS (5 x 3 = 15)

ఏవైనా మూడు ప్రశ్నలకు సమాధనములు వ్రాయుము

6. State and prove Gauss law.
గౌస్ నియమమును తెల్పి, నిరూపించుము.

7. State and explain Hall effect
హాల్ ఫలితమును తెల్పి, వివరించుము.

8. Write Maxwell's equations in differential form.
మాక్స్ వేల్ సమీకరణములను అవకలన రూపములో వ్రాయుము.

9. Explain the working of a transistor as an amplifier.
ట్రాన్సిస్టరు వర్ధకముగ పనిచేయు విధానమును వివరించుము.

10. State and prove De-Morgan's laws.
డీ మోర్గాన్ నియమములను తెల్పి నిరూపించుము.

SECTION – C

ANSWER ANY TWO QUESTINONS (5 x 2 =10)

ఏవైనా రెండు ప్రశ్నలకు సమాధనములు వ్రాయుము

11. Dielectric constant of a material is 5. Find its permittivity and susceptibility.
ఒక పదార్థము యొక్క రోధక స్థిరాంకము 5. ఆ పదార్థము య్క్క ప్రవేశ్య శీలత మరియు ససెప్టబిలిటి లను కనుగొనుము.

12. Calculate the energy stored in the magnetic field of a solenoid of inductance 5mH, when a maximum current of 3A flows through it.
5mH ప్రేరణ గల సాలినాయిడ్ గుండా గరిష్ట విద్యుత్ ప్రవాహము 3A అయిన ఆ సాలినాయిడ్ లో ఏర్పడిన అయస్కాంత క్షేత్రము లో నిల్వ ఉన్న శక్తి ఎంత?

13. A 60Hz a.c.circuit has an inductor of 10mH and 2Ω resistance. Calculate its power factor.
60Hz పౌనఃపున్యము గల వలయము 10mH ప్రేరణ మరియు 2 Ω నిరోధమును కలిగి ఉంది. ఆ a.c. వలయము యొక్క సామర్థ్య గుణకమును కనుగొనండి.

14. The d.c. current gain of a transistor in common – emitter (CE) configuration is 200. Find the d.c.current gain in CB configuration.
ఉమ్మడి ఉద్గారి విన్యాసములో ఒక ట్రాన్సిస్టరు యొక్క d.c. కరెంటు వృద్ధి గుణకము 200 అయితే ఉమ్మడి ఆధారి విన్యాసంలో కరెంటు వృద్ధి గుణకమును కనుగొనండి.

15. Convert the decimal numbers 18 and 123 into binary numbers.
18 మరియు 123 దశాంశ సంఖ్యలను, ద్వి సంఖ్యామానములోనికి మార్చండి.

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THIRD YEAR PHYSICS EXAMINATIONS

Paper-VI: **MODERN PHYSICS** (For Maths combination)

V SEMISTER

TIME:: 3Hours Max.Marks:: 75

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Answer ALL questions from Part –A, Three from Part –B, Two from Part – C

Part –A లో అన్నిప్రశ్నలకు, Part –B లో మూడు ప్రశ్నలకు, Part – C లో రెండు ప్రశ్నలకు జవాబులు వ్రాయుము

Part –A **5X10=50Marks**

1.a) What is Zeeman effect? Describe its experimental arrangement.
జీమన్ ఫలితము అనగా ఏమి? దీని ప్రయోగ ఏర్పాటును వివరించుము

OR

b) Explain Raman Effect. Describe its experimental arrangement. Give its applications.
రామన్ ఫలితం అనగానేమి? రామన్ ఫలితం ప్రయోగ ఏర్పాట్లు వివరించుము. దాన్ని అనువర్తనాలు ఏమి?

2.a) Describe Davisson – Germer experiment with a neat sketch.
చక్కటి పటముతో డేవిస్సన్-గేర్మెర్ ప్రయోగమును వివరించండి

OR

b) Explain Heisenberg Uncertainty Principle. Describe Gamma ray microscope
హైసన్ బర్గ్ అనిశ్చితత్వ నియమును వివరింపుము. గామ కిరణ సూక్ష్మ దర్శినిని వివరీకరించుము

3.a) Derive Schrodinger time independent and time dependent wave equations
(or) శ్రోడింగర్ కాలస్వతంత్ర మరియు కాలాధర తరంగ సమీకరణాలు ఉత్పాదించండి.

OR

b) Derive Schrodinger wave equation to particle in one dimensional box.
ఏకమితీయ పెట్టెలోని కణమునకు ష్రోడింగర్ సమీకరణమును ఉత్పాదించుము.

4.a) Describe the Liquid drop model of the nucleus
కేంద్ర ద్రవబిందు నమూన గురించి విపులముగా వివరించండి

OR

b) Explain Gamow's theory of Alpha decay
ఆల్ఫా క్షీణతకు గామో సిద్ధాంతం వివరింపుము.

5.a)Derive Bragg's law. Explain the Powder method to determine crystal structure.
బ్రాగ్ సూత్రము ఉత్పాదించండి. స్పటిక నిర్మాణం కనుగొనడానికి చూర్ణ పద్ధతిని వివరించండి.

OR

b) Explain Type I and Type II Super Conductors.
మొదటి మరియు రెండొవ రకము అతివాహకాలను వివరింపుము

Part –B **3X5=15 Marks**

6. Explain L-S and J-J Coupling
L-S మరియు J-J సంధానములను వివరించుము

7. Write Properties of matter waves.
ద్రవ్య తరంగాల ధర్మాలను వ్రాయుము

8. Eplain postulates of quantum Mechanics
క్వాంటమ్ యాంత్రిక శాస్త్రము యొక్క ప్రతిపాదనలు వ్రాయుము

9. Explain Geiger Nuttal law
గైగర్ న్యూటల్ నియమమును వివరింపుము

10.Explain Meissner effect.
మెస్నర్ ఫలితమును వివరింపుము.

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Part –C 2X5=10 Marks

11. In a Raman experiment the sample is excited by 5460 A^0 and the Stokes line is at 5560A^0. Find the wavelength of the anti stokes line.
రామన్ ప్రయోగంలో పదార్థాన్ని 5460 A^0 రేఖతో దీపనం చేసారు. స్టోక్స్ రేఖ తరంగ ధైర్ఘ్యం 5560A^0. విరుద్ధ స్టోక్స్ రేఖ తరంగ ధైర్ఘ్యం కనుగొనండి.

12. Find the energy of the Neutron in eV whose deBroglie wavelength is $1A^0$. $h=6.6x10^{-34}$ j-s
ఒక న్యూట్రాన్ తరంగధైర్ఘ్యం $1A^0$, $h=6.62x10^{-34}$ j-s అయితే దాని శక్తి కనుగొనండి.

13. An electron of mass $9x10^{-31}$Kg is inside a box of length 10^{-8}cm. Find its minimum energy.
$9x10^{-31}$Kg ద్రవ్యరాశి గల ఒక ఎలెక్ట్రాన్ 10^{-8}cm పొడవు గల ఒక పేటికలో చలిస్తుంటే, దాని కనిష్ట శక్తి ఎంత.

14. Determine the binding energy of deuteron nucleus,Mass of deuteron nucleus is 2.013553 amu.
డ్యూటరాన్ బంధన శక్తికి లెక్కించుము. డ్యూటరాన్ కేంద్రక ద్రవ్యరాశి 2.013553 amu.

15. Calculate the critical current which can flow through a long thin superconductor wire of diameter 10^{-3}m. given $\mu_c = 7.9x10^3$ amp/m.
ఒక సన్నని అతి వాహక తీగ వ్యాసం 10^{-3}m, దానిలో ప్రవహించే సంధిగ్ధ విద్యుత్ ప్రవాహాన్ని లెక్కించండి.
$\mu_c = 7.9x10^3$ amp/m

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Andhra Pradesh State Council of Higher Education
B.Sc. PHYSICS SYLLUBUS UNDER CBCS
w.e.f. 2015-16 (Revised in April 2016)

First Semester
Paper I : Mechanics & Properties of Matter
Practical I (Lab-1)

Second Semester
Paper II: Waves & Oscillations
Practical 2 (Lab2)

Third Semester
Paper III: Wave Optics
Practical 3. (Lab 3)

Fourth Semester
Paper IV: Thermodynamics & Radiation Physics
Practical 4.(Lab 4)

Fifth Semester
Paper V: Electricity, Magnetism & Electronics
Paper VI: Modern Physics
Practical 5.(Lab 5)
Practical 6.(Lab 6)

Sixth Semester
PaperVII: Elective (One)
Paper VIII: Cluster Electives (Three)
Practical 7 (Lab 7)
Practical 8 (Lab 8)

Proposed Electives in Semester - VI

Paper – VII (one elective is to be chosen from the following)

Paper VII-(A): Analog and Digital Electronics
Paper VII-(B): Materials Science
Paper VII-(C): Renewable Energy

Paper – VIII (one cluster of electives (A-1,2,3 or B-1,2,3 or C-1,2,3) to be chosen *preferably* relating to the elective chosen under paper – VII (A or B or C)

Cluster 1
Paper VIII-A-1. Introduction to Microprocessors and Microcontrollers
Paper VIII-A-2.Computational Physics and Programming
Paper VIII-A-3. Electronic Instrumentation

Cluster 2

Paper VIII-B-1.Fundamentals of Nanoscience
Paper VIII-B-2.Synthesis and Characterization of Nanomaterials
Paper VIII-B-3.Applications of Nanomaterials and Devices

Cluster 3

Paper VIII-C-1.Solar Thermal and Photovoltaic Aspects
Paper VIII-C-2.Wind, Hydro and Ocean Energies
Paper VIII-C-3.Energy Storage Devices

NOTE: Problems should be solved at the end of every chapter of all Units.

1. Each theory paper is of 100 marks and practical paper is also of 50 marks.
   Each theory paper is 75 marks University Exam (external) + 25 marks mid Semester Exam (internal). Each practical paper is 50 marks external
2. The teaching work load per week for semesters I to VI is 4 hours per paper for theory And 2 hours for all laboratory (practical) work.
3. The duration of the examination for each theory paper is 3.00 hrs.
4. The duration of each practical examination is 3 hrs with 50 marks, which are to be distributed as30 marks for experiment
   10 marks for viva
   10 marks for record

Practicals	**50 marks**
Formula & Explanation	6
Tabular form +graph +circuit diagram	6
Observations	12
Calculation, graph, precautions & Result	6
Viva-Voce	10
Record	10

***NOTE: Practical syllabus is same for both Mathematics and Non Mathematics combinations**

B.Sc. (Physics) (Maths Combinations)

Scheme of instruction and examination to be followed w.e.f. 2015-2016

S. No	Semester	Title of the paper	Instruc-tion hrs/week	Duration of exam(hrs)	Max Marks (external)
Thoery					
1	First	Paper I: Mechanics& Properties of Matter	4	3	75
2	Second	Paper II: Waves & Oscillations	4	3	75
3	Third	Paper III: Wave Optics	4	3	75
4	Fourth	Paper IV: Thermodynamics & Radiation Physics	4	3	75
5	Fifth	Paper V:Electricity, Magnetism& Electronics Paper VI: Modern Physics	4 4	3 3	75 75
6	Sixth	PaperVII :Elective (One) Paper VIII: Cluster Electives (Three)	4 4	3 3	75 75
Practicals					
1	First	Practical 1	2	3	50
2	Second	Practical II	2	3	50
3	Third	Practical III	2	3	50
4	Fourth	Practical IV	2	3	50
5	Fifth	Practical V	2	3	50
6		Practical VI	2	3	50
7	Sixth	Practical VII	2	3	50
8		Practical VIII	2	3	50

Model question Paper for all theory papers

Time : 3 hrs **Max marks: 75**

Section-A (Essay type)

Answer All questions with internal choice from all units Marks: 10x5 = 50

(Two questions are to be set from each unit with either or type)

Section-B (Short answer type)

Answer any three out of 5 questions from all units (I to V) Marks: 5 x3 = 15

At least one question should be set from each unit.

Section-C

Answer any two out of 5 questions set from all units Marks: 5x2 = 10

Paper VII-(B) Elective (Materials Science)

Semester –VI
Elective Paper –VII-(B): Materials Science

No. of Hours per week: 04 **Total Lectures:60**

UNIT-I (12 hrs)
1.Materials and Crystal Bonding: Materials, Classification, Crystalline, Amorphous, Glasses; Metals, Alloys, Semiconductors, Polymers, Ceramics, Plastics, Bio-materials, Composites, Bulk and nanomaterials. Different types of chemical bonds – Ionic covalent bond or homopolar bond – Metallic bond – Dispersion bond – Dipole bond – Hydrogen bond – Binding energy of a crystal.

UNIT-II (12 hrs)
2. Defects and Diffusion in Materials: Introduction – Types of defects - Point defects- Line defects- Surface defects- Volume defects- Production and removal of defects- Deformation- irradiation- quenching- annealing- recovery. Diffusion in solids- Fick's laws of diffusion.

UNIT-III(12 hrs)
3. Mechanical Behavior of Materials: Different mechanical properties of engineering materials – Creep – Fracture – Technological properties – Factors affecting mechanical properties of a material – Heat treatment - Cold and hot working – Types of mechanical tests – Deformation of metals.

UNIT-IV (12 hrs)
4. Magnetic Materials: Dia-, Para-, Ferri- and Ferromagnetic materials, Classical Langevin theory of dia magnetism. Curie's law, Weiss's theory of ferromagnetism, Ferromagnetic domains. Discussion of B-H Curve. Hysteresis and energy Loss.

UNIT-V (12 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

Elective Paper-VII-B Practical: Materials Science **2hrs/Week**

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 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.
9. Energy gap of a metaloxide semiconductor (thermistor).
10. Determination of activation energy using creep method.
11. Determination of crystallite size of given polycrystalline materials using x-ray diffractogram.

Semester –VI: Cluster Electives – VIII-B
Cluster Elective Paper VIII-B-1: Fundamentals of Nanoscience

No. of Hours per week: 04 **Total Lectures: 60**

UNIT-I (12hrs)

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; Development of quantum structures, Basic concept of quantum well, quantum wire and quantum dot.

Size dependence of properties, crystal structures, Lattice vibrations, Energy bands:- Insulators Semiconductors and conductors.

UNIT-II (12hrs)

2. 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-III (12hrs)

3. 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. Preparation and application of polyethylene, PVC, Teflon.

UNIT-IV (12hrs)

4. 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. Bio-systems, Nanoscale processes in environment. Nanoscale structures and quantum computing. Single electron transistors.

UNIT-V (12hrs)

5. 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.

Elective Paper- VIII-B-1: Practical: Fundamentals of Nanoscience 2hrs/Week

A project based on any of the concepts of Fundamentals of Nanoscience covered in the theory paper (VIII-B-1)

Semester –VI

Cluster Elective Paper –VIII-B-2: Synthesis and Characterization of Nanomaterials

No. of Hours per week: 04 **Total Lectures: 60**

Unit-I (12 hrs)

1. Nanomaterials synthesis: Synthesis and nanofabrication, Bottom-Up and Top-Down approach with examples. Chemical precipitation methods, sol-gel method, chemical reduction, hydrothermal, process. Physical Mehtods- ball milling, Physical Vapour deposition (PVD), Sputtering, Chemical Vapor deposition (CVD), spray pyrolysis, Biological methods- Synthesis using micro organisms and bacteria, Synthesis using plant extract.

Unit-II (12 hrs)

2. 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. Mechanical properties. Metallic glasses. Preparation, structure and properties like electrical, magnetic, thermal and mechanical, applications.

UNITS-III (12 hrs)

3. 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-IV (12 hrs)

4. 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-V (12 hrs)

5. Characterization Methods: XRD, SEM, TEM, AFM, XPS and PL characterization techniques for nano materials. Electrical and mechanical properties, Optical properties by IR and Raman Spectroscopy.

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 Nanoscinece & 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. Nanoelectronic Circuit Design, N.K Jha, D Chen, Springer
5. Handbook of Nanophysics- Nanoelectronics & Nanophotonics, K.D Sattler, CRC Press
6. Organic Electronics-Sensors & Biotechnology- R. Shinar & J. Shinar, McGraw-Hill.

Cluster Elective Paper- VIII-B-2: Practical: Synthesis and Characterization of Nanomaterials **2hrs/Week**

Minimum of 6 experiments to be done and recorded

1. Synthesis of nanocrystalline films of II-VI compounds doped with rare earths by chemical process.
2. Synthesis of Alkaline earth aluminates in nanocrystalline 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 nanofilter by polymerisation reaction
6. Absorption studies on the nanocrystalline 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.
10. Determination of the Band Gap of Semiconductor Nanoparticles.

Semester –VI

Cluster Elective Paper –VIII-B-3: Applications of Nanomaterials and Devices

No. of Hours per week: 04 **Total Lectures: 60**

UNIT-I (12 hrs)

1. Optical properties: Coulomb interaction in nanostructures. Concept of dielectric constant for nanostructures and charging of nanostructure. Quasi-particles and excitons. Excitons in direct and indirect band gap semiconductor nanocrystals. Quantitative treatment of quasi-particles and excitons, charging effects. Radiative processes: General formalization-absorption, emission and luminescence. Optical properties of heterostrctures and nanostructures.

UNIT-II (12 hrs)

2. Electrical transport:

Carrier transport in nanostrcutures. Hall effect, determination 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 (12 hrs)

3. Applications: Applications of nanoparticles, quantum dots, nanowires and thin films for photonic devices (LED, solar cells). Single electron transfer devices (no derivation). CNT based transistors. Nanomaterial Devices: Quantum dots heterostructures lasers, optical switching and optical data storage. Magnetic quantum well; magnetic dots - magnetic data storage. Micro Electromechanical Systems (MEMS), Nano Electromechanical Systems (NEMS).

UNIT-IV(12 hrs)

4. Nanoelectronics: Introduction, Electronic structure of Nanocrystals, Tuning the Band gap of Nanoscale semiconductors, Excitons, Quantum dot, Single electron devices, Nanostructured ferromagnetism, Effect of bulk nanostructuring of magnetic properties, Dynamics of nanomagnets, Nanocarbon ferromagnets, Giant and colossal magneto-resistance, Introduction of spintronics, Spintronics devices and applications.

UNIT-V (12 hrs)

5. Nanobiotechnology and Medical application: Introduction, Biological building blocks- size of building blocks and nanostructures, Peptide nanowires and protein nanoparticles, DNA double nanowires, Nanomaterials in drug delivery and therapy, Nanomedicine, Targeted gold nanoparticles 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).

Cluster Elective Paper-VIII-B-3: Practical: Applications of Nanomaterials and Devices 2hrs/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.

B.Sc. (Physics) (Non-Mathematics Combinations)
Scheme of instruction and examination to be followed w.e.f. 2016-2017

S.No	Semester	Title of the paper	Instruction Hrs/week	Duration o f exam (hrs)	Max Marks (external)
Theory					
1	First	Paper I: Mechanics & Properties of Matter	4	3	75
2	Second	Paper II: Waves & Oscillations	4	3	75
3	Third	Paper III: Optics	4	3	75
4	Fourth	Paper IV: Thermodynamics & Radiation Physics	4	3	75
5	Fifth	Paper V: Electricity, Magnetism & electronics Paper VI: Modern Physics & Medical Physics	4 4	3 3	75 75
6	Sixth	PaperVII : Elective Paper VIII: Cluster Electives	4 4	3 3	75 75
Practical					
1	First	Practical 1	2	3	50
2	Second	Practical II	2	3	50
3	Third	Practical III	2	3	50
4	Fourth	Practical IV	2	3	50
5	Fifth	Practical V	2	3	50
6		Practical VI	2	3	50
7	Sixth	Practical VII	2	3	50
8		Practical VIII	2	3	50

B.Sc. Physics under CBCS for Non-Mathematics Combinations

w.e.f. 2015-16 (Revised in April, 2016)

Paper VII-(B) Elective (Materials Science)

Semester –VI

Elective Paper –VII-(B): Materials Science

No. of Hours per week: 04 **Total Lectures:60**

UNIT-I (12 hrs)

1.Materials and Crystal Bonding: Materials, Classification, Crystalline, Amorphous, Glasses; Metals, Alloys, Semiconductors, Polymers, Ceramics, Plastics, Bio-materials, Composites, Bulk and nanomaterials. Different types of chemical bonds – Ionic covalent bond or homopolar bond – Metallic bond – Dispersion bond – Dipole bond – Hydrogen bond – Binding energy of a crystal.

UNIT-II (12 hrs)

2. Defects and Diffusion in Materials: Introduction – Types of defects - Point defects- Line defects- Surface defects- Volume defects- Production and removal of defects- Deformation- irradiation- quenching- annealing- recovery. Diffusion in solids- Fick's laws of diffusion.

UNIT-III(12 hrs)

3. Mechanical Behavior of Materials: Different mechanical properties of engineering materials – Creep – Fracture – Technological properties – Factors affecting mechanical properties of a material – Heat treatment - Cold and hot working – Types of mechanical tests – Deformation of metals.

UNIT-IV (12 hrs)

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

UNIT-V (12 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

Elective Paper-VII-B Practical: Materials Science **2hrs/Week**

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 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.
9. Energy gap of a metaloxide semiconductor (thermistor).
10. Determination of activation energy using creep method.
11. Determination of crystallite size of given polycrystalline materials using x-ray diffractogram.

Semester –VI: Cluster Electives – VIII-B
Cluster Elective Paper VIII-B-1: Fundamentals of Nanoscience

No. of Hours per week: 04 **Total Lectures: 60**

UNIT-I (12hrs)

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; Development of quantum structures, Basic concept of quantum well, quantum wire and quantum dot.

Size dependence of properties, crystal structures, Lattice vibrations, Energy bands:- Insulators Semiconductors and conductors.

UNIT-II (12hrs)

2. 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-III (12hrs)

3. 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. Preparation and application of polyethylene, PVC, Teflon.

UNIT-IV (12hrs)

4. 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. Bio-systems, Nanoscale processes in environment. Nanoscale structures and quantum computing. Single electron transistors.

UNIT-V (12hrs)

5. 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.

Elective Paper- VIII-B-1: Practical: Fundamentals of Nanoscience 2hrs/Week

A project based on any of the concepts of Fundamentals of Nanoscience covered in the theory paper (VIII-B-1)

Semester –VI

Cluster Elective Paper –VIII-B-2: Synthesis and Characterization of Nanomaterials

No. of Hours per week: 04 **Total Lectures: 60**

Unit-I (12 hrs)

1. Nanomaterials synthesis: Synthesis and nanofabrication, Bottom-Up and Top-Down approach with examples. Chemical precipitation methods, sol-gel method, chemical reduction, hydrothermal, process. Physical Mehtods- ball milling, Physical Vapour deposition (PVD), Sputtering, Chemical Vapor deposition (CVD), spray pyrolysis, Biological methods- Synthesis using micro organisms and bacteria, Synthesis using plant extract.

Unit-II (12 hrs)

2. 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. Mechanical properties. Metallic glasses. Preparation, structure and properties like electrical, magnetic, thermal and mechanical, applications.

UNITS-III (12 hrs)

3. 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-IV (12 hrs)

4. 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-V (12 hrs)

5. Characterization Methods: XRD, SEM, TEM, AFM, XPS and PL characterization techniques for nano materials. Electrical and mechanical properties, Optical properties by IR and Raman Spectroscopy.

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 Nanoscinece & 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. Nanoelectronic Circuit Design, N.K Jha, D Chen, Springer
5. Handbook of Nanophysics- Nanoelectronics & Nanophotonics, K.D Sattler, CRC Press
6. Organic Electronics-Sensors & Biotechnology- R. Shinar & J. Shinar, McGraw-Hill.

Cluster Elective Paper- VIII-B-2: Practical: Synthesis and Characterization of Nanomaterials **2hrs/Week**

Minimum of 6 experiments to be done and recorded

1. Synthesis of nanocrystalline films of II-VI compounds doped with rare earths by chemical process.
2. Synthesis of Alkaline earth aluminates in nanocrystalline 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 nanofilter by polymerisation reaction
6. Absorption studies on the nanocrystalline 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.
10. Determination of the Band Gap of Semiconductor Nanoparticles.

Semester –VI

Cluster Elective Paper –VIII-B-3: Applications of Nanomaterials and Devices

No. of Hours per week: 04 **Total Lectures: 60**

UNIT-I (12 hrs)

1. Optical properties: Coulomb interaction in nanostructures. Concept of dielectric constant for nanostructures and charging of nanostructure. Quasi-particles and excitons. Excitons in direct and indirect band gap semiconductor nanocrystals. Quantitative treatment of quasi-particles and excitons, charging effects. Radiative processes: General formalization-absorption, emission and luminescence. Optical properties of heterostrctures and nanostructures.

UNIT-II (12 hrs)

2. Electrical transport:

Carrier transport in nanostrcutures. Hall effect, determination 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 (12 hrs)

3. Applications: Applications of nanoparticles, quantum dots, nanowires and thin films for photonic devices (LED, solar cells). Single electron transfer devices (no derivation). CNT based transistors. Nanomaterial Devices: Quantum dots heterostructures lasers, optical switching and optical data storage. Magnetic quantum well; magnetic dots - magnetic data storage. Micro Electromechanical Systems (MEMS), Nano Electromechanical Systems (NEMS).

UNIT-IV(12 hrs)

4. Nanoelectronics: Introduction, Electronic structure of Nanocrystals, Tuning the Band gap of Nanoscale semiconductors, Excitons, Quantum dot, Single electron devices, Nanostructured ferromagnetism, Effect of bulk nanostructuring of magnetic properties, Dynamics of nanomagnets, Nanocarbon ferromagnets, Giant and colossal magneto-resistance, Introduction of spintronics, Spintronics devices and applications.

UNIT-V (12 hrs)

5. Nanobiotechnology and Medical application: Introduction, Biological building blocks- size of building blocks and nanostructures, Peptide nanowires and protein nanoparticles, DNA double nanowires, Nanomaterials in drug delivery and therapy, Nanomedicine, Targeted gold nanoparticles 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).

Cluster Elective Paper-VIII-B-3: Practical: Applications of Nanomaterials and Devices 2hrs/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.

THREE YEAR B.Sc. DEGREE EXAMINATIONS
CHOICE BASED CREDIT SYSTEM
SIXTH SEMESTER
PART – II : PHYSICS
PAPER : VII (B) : MATERIALS SCIENCE
(w.e.f. 2018)
MODEL PAPER

TIME : 3 Hours **Max. Marks : 75**

Section – A
విభాగము – ఎ

(Essay Questions)
(వ్యాసరూప ప్రశ్నలు)

5 x 10 = 50 M

Answer All Questions.
(అన్ని ప్రశ్నలకు సమాధానములు వ్రాయుము)

1. (a) Discuss metallic and hydrogen bonding in crystals with examples.
స్ఫటికాలలో లోహ బంధము మరియు హైడ్రోజన్ బంధములను ఉదాహరణలతో వివరించుము.

OR

(b) Discuss about polymers and Bio-materials.
పాలిమర్స్ మరియు బయో పదార్థములను గూర్చి వివరించుము.

2. (a) What are different types of defects in solids? Explain the types of point defects with examples.
ఘన పదార్థములలో దోషముల రకములను తెల్పుము. బిందు దోషములలోని రకములను ఉదాహరణలతో వివరించుము.

OR

(b) State and explain Fick's laws of diffusion. How does diffusion coefficient depend on temperature?
వ్యాపనమునకు సంబంధించిన ఫిక్స్ నియమములను తెల్పి, వివరించుము. వ్యాపన గుణకము, ఉష్ణోగ్రతపై ఏ విధముగ ఆధారపడుతుందో తెల్పుము.

3. (a) Define creep. Explain the mechanism of creep in materials. Give some applications of creep.
ప్రాకుట అనగానేమి? పదార్థములలో ప్రాకుట అను ప్రక్రియను వివరించుము. ప్రాకుట యొక్క అనువర్తనములను తెల్పుము.

OR

(b) Explain about cold working and hot working states of materials.
పదార్థముల చల్లని పనిచేయు స్థితి మరియు వేడి పనిచేయు స్థితులను వివరించుము.

4. (a) Discuss Langevin's theory of diamagnetism. Derive an expression for the change of magnetic moment.
డయా అయస్కాంతత్వము నకు సంబంధించిన లాంజివాన్ సిద్ధాంతమును చర్చించుము. అయస్కాంత భ్రామకము లోని మార్పునకు సమీకరణమును ఉత్పాదించుము.

OR

(b) Draw and explain B – H curve for a ferromagnetic material. Identify retentivity and coercive fields on the curve.
ఫెర్రో అయస్కాంత పదార్థములకు సంబంధించిన B – H వక్రమును గీచి, వివరించుము. వక్రములో రిటెంటివిటి మరియు కొయార్సివ్ ప్రాంతములను గుర్తించుము.

13/12/18

5. (a) Explain the mechanism of polarization. Explain the factors affecting polarization.
ధ్రువణ ప్రక్రియను వివరించుము. ధ్రువణమును ప్రభావితముచేయు అంశములను వివరించుము.

OR

(b)Explain about ferroelectric and piezo electric materials.
ఫెర్రో విద్యుత్ మరియు పీడన విద్యుత్ పదార్థములను గూర్చి వివరించుము.

Section – B
విభాగము – బి

(Short answer questions)
(స్వల్ప సమాధాన ప్రశ్నలు)

5 x 5 = 25M

Answer any five questions
ఏవేని ఐదు ప్రశ్నలకు సమాధానములు వ్రాయుము.

6. Discuss about composites.
కాంపోజిట్ లను గూర్చి చర్చించుము.

7. Distinguish between ionic and covalent bonds.
అయానిక మరియు సమయోజనీయ బంధాల మధ్య తేడాలను తెల్పుము.

8. Explain annealing with examples.
యనీలింగ్ ప్రక్రియను ఉదాహరణలతో వివరించుము.

9. Discuss briefly about line defects.
రేఖీయ దోషములను సంక్షిప్తముగ వివరించుము.

10. Mention factors affecting mechanical properties of materials.
పదార్థముల యంత్రిక ధర్మాములను ప్రభావితము చేయు అంశములను తెల్పుము.

11. Define fracture. What are brittle and ductile fractures.
పగులు అనగానేమి? పెళుసైన పగులు మరియు మెత్తని పగులు అనగానేమి?

12. State and explain weiss's theory of ferromagnetism.
ఫెర్రో అయస్కాంతత్వమునకు సంబంధించిన వీస్ సిద్ధాంతమును తెల్పి, వివరించుము.

13. Discuss about ferromagnetic domains.
ఫెర్రో అయస్కాంత డొమైన్ లను గూర్చి చర్చించుము.

14. Define dielectric constant, dielectric strength and dielectric loss.
రోధక స్థిరాంకము, రోధక సత్వము మరియు రోధక క్షీణతలను నిర్వచించుము.

15. Discuss briefly about pyroelectricity.
ఫెర్రో విద్యుత్ ను గూర్చి సంక్షిప్తముగ చర్చించుము.

19/2/18

THREE YEAR B.Sc. DEGREE EXAMINATIONS (CBCS), 2017-18

VI Semester, Part-II: Physics

***Paper VIII B-1, Cluster Elective: Fundamentals* of Nanoscience**

Model paper

Time: 3 hrs Max. Marks: 75

Section - A

Answer any FIVE questions from the following (5X10 = 50 M)

ఏవేని ఐదు ప్రశ్నలకు సమాధానాలిమ్ము

1. Write a note on emergence of nano science with special reference to Feynman and Drexler.

   నానో శాస్త్రము అభివృద్ధిని ఫిన్‌మెన్ మరియు డ్రెక్స్‌లేర్ పరంగా తెలపండి

2. Write a note on development of quantum structures. Explain the concept of quantum confinement.

   క్వాంటమ్ నిర్మాణాల అభివృద్ధిపై టీకా వ్రాయండి. క్వాంటమ్ కన్‌ఫైన్‌మెంట్ భావనను వివరించండి.

3. Explain the classification of nano materials giving suitable examples for each class.

   నానో పదార్థాల వర్గీకరణను తగిన ఉదాహరణలతో వివరించండి.

4. Describe the applications of carbon nanotubes.

   కార్బన్ నానో గోట్టాల అనువర్తనాలను వివరించండి.

5. Describe the various ways by which polymers can be classified.

   పాలిమర్ల వర్గీకరణలో వివిధ పద్ధతులను వివరించండి.

6. Explain with examples the process of step-growth polymerization.

   స్టెప్ - గ్రోత్ పోలీమరీ కరణమును ఉదాహరణలతో వివరించండి.

7. Discuss the transition from crystal technology to nanotechnology.

   నానో సాంకేతిక పరిజ్ఞానానికి స్ఫటిక సాంకేతిక పరిజ్ఞానం నుండి జరిగిన పరివర్తనను చర్చించండి.

8. Explain the reason for transparent Sum-screens using ZnO nanoparticles.

   ZnO నానో కణాలను సూర్యరశ్మినుండి చర్మాన్ని కాపాడేందుకు ఉపయోగించడం లో కారణాలను తెలపండి.

9. Write note on Ti and its alloys as implant material

   Ti మరియు దాని మిశ్రమలోహాల ను గూర్చి టీకా రాయండి

10. What are the various soft tissue implants? Mention the list of materials used for fabrication of these implants.

    మృదు కణజాల implants ను తెలిపి వానిని తయారుచేయడంలో ఉపయోగించే పదార్థలను పేర్కొనండి?

15/2/18

B-1

Section-B

Answer any Five questions from the following (5 x 5=25 M)

ఏవేని ఐదు ప్రశ్నలకు సమాధానాలిమ్ము

11. Write a note on energy bands in insulators, semiconductors and conductors.

వాహకాలు, అర్ధ వాహకాలు మరియు బందకాల వర్గీకరణను శక్తి పట్టి ల ఆధారంగా వివరించండి.

12. Explain quantum wire.

క్వాంటమ్ తీగ ను వివరించండి.

13. What are the properties of carbon nanotubes?

కార్బన్ నానో గోట్టాల ధర్మాలను తెలపండి.

14. Write short note on Block copolymers.

Block copolymers ల గూర్చి లఘుటీకా రాయండి.

15. What are the applications of Polyethylene?

Polyethylene అనువర్తనాలను తెలపండి.

16. What are number average and weight average molecular weights of polymers?

polymer ల సగటు మరియు భార సగటు అణుభారాలు అనగా నేమి?

17. Write short note on nanoscale processes in environment.

ప్రకృతిలో నానో పరిధి పద్దతుల పై లఘు టీకా వ్రాయండి.

18. Write short note on single electron transistor.

single electron transistor అనగా నేమి?

19. What are the ceramic implant materials?

సిరామిక్ implant పదార్థలు అనగా నేమి?

20. Discuss various internal fracture fixation nano devices.

వివిధ అంతర పగుళ్ళను (లోపాలను) సరిచేసుకొను నానో పరికరాలను గూర్చి వివరించండి.

19/2/18

MODEL PAPER

THREE YEAR B.Sc. DEGREE EXAMINATION/CHOICE BASED CREDIT SYSTEM
SIXTH SEMESTER
PART-II : PHYSICS CLUSTER ELECTIVE
PAPER VIII BH-2: **SYNTHESIS AND CHARACTERIZATION OF NANO MATERIALS**

TIME: 3 HOURS MAX MARKS:75

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SECTION-A

Answer any FIVE Questions. Marks: 5x10=50

1. Define Top - Down process. Explain Ball Milling Method for synthesis of nano particals.
   పై నుండి క్రిందకు పద్ధతిని నిర్వచించుము. బాల్ మిల్లింగ్ పద్ధతి ద్వారా నానోకణాల సంశ్లేషణమును వివరింపుము.
2. Define Bottom-Up process. Explain Sol-Gel method for synthesis of nano materials?
   క్రింది నుండి పైకు పద్ధతిని నిర్వచింపుము. Sol-Gel పద్ధతి ద్వారా నానోకణాల సంశ్లేషణమును వివరింపుము.
3. Explain Composite Materials and Polymers. Write its applications.
   మిశ్రమ పదార్థములు మరియు పాలిమర్‌లను వివరింపుము. వీటి అనువర్తనాలను వ్రాయుము.
4. What are Metallic Glasses? Mention a few metallic Glasses. How are Metallic glasses prepared?
   లోహపు గాజు అనగా ఏమి? కొన్ని లోహపు గాజులను తెలుపుము. లోహపు గాజును ఏ విధంగా తయారు చేస్తారు?
5. What is meant by glass transition temperature? How glass materials are prepared?
   గాజు సంక్రమణ ఉష్ణోగ్రత అనగా ఏమి? గాజు పదార్థాలను ఏ విధముగా తయారు చేస్తారు.
6. Discuss Electronic application, optical application and Magnetic application of glasses?
   గాజు యొక్క ఎలక్ట్రానిక్ అనువర్తనాలు, దృశ్యా అనువర్తనాలు మరియు అయస్కాంత అనువర్తనాలను చర్చించుము?
7. What are Liquid crystals? Explain different Liquid Crystal phases?
   ద్రవ స్ఫటికాలు అనగా ఏమి? ద్రవ స్ఫటికాల వివిధ దశలను వివరింపుము.

8. Explain Thermal and Electrical properties of Liquid crystals?

   ద్రవస్ఫటికాల ఉష్ణ ధర్మాలు మరియు విద్యుత్తు ధర్మాలను వివరింపుము.

9. Explain the Transmission Electron Microscope (TEM)? Give the advantages of TEM.

   ట్రాన్స్‌మిషన్ ఎలక్ట్రాన్ మైక్రోస్కోపు (TEM) ను వివరింపుము. TEM ఉపయోగాలను తెలుపుము.

10. Explain Atomic force Microscope (AFM). Give the uses of AFM.

    పరమాణబలము మైక్రోస్కాపు (AFM) ను వివరింపుము. AFM ఉపయోగాలను తెలుపుము.

SECTION-B

Answer any FIVE Questions. **Marks: 5x5=25**

11. Explain Chemical vapor deposition method for Synthesis of nanomaterials.

    రసాయనిక ఆవిరుల నిక్షేపము పద్ధతి ద్వాని నానోకణాల సంశ్లేశణమును వివరింపుము.

12. How are nanomaterials produced using bacteria?

    బాక్టీరియాను ఉపయోగించి, నానోపదార్థాలను ఏ విధముగా ఉత్పత్తి చేస్తారు.

13. Explain the Electrical and Magnetic properties of Metallic Glasses.

    లోహపు గాజు యొక్క విద్యుత్తు ధర్మాలు మరియు అయస్కాంత ధర్మాలను వివరింపుము.

14. Write a short note on diffusion.

    విసరణము మీద లఘు వ్యాఖ్యను వ్రాయుము.

15. State Theories for the glass transition.

    గాజు సంక్రమణ సిద్ధాంతమును తెలుపుము.

16. Write Electro Chemical application of Glasses.

    గాజు యొక్క విద్యుత్తు రసాయన అనువర్తనాలను వ్రాయుము.

17. Discuss the applications of Liquid Crystals

    ద్రవస్ఫటికాల అనువర్తనాలను చర్చించుము.

18. What are the types of Liquid Crystals displays?

    ద్రవ స్ఫటికా డిస్‌ప్లేల రకాలు ఏవి?

19. Explain XRD characterization Technique for nano materias.

    నానో పదార్థాల కొరకు XRD అభిలక్షణ పద్ధతి ని వివరింపుము.

20. Write Electrical properties of nano materials.

    నానో పదార్థాల విద్యుత్తు ధర్మాలను వ్రాయుము.

MODEL PAPER

THREE YEAR B.Sc DEGREE EXAMINATION CHOICE BASED CREDIT SYSTEM

SIXTH SEMESTER: PART II: PHYSICS CLUSTER ELECTIVE

Paper VIII-B-3: Applications of Nanomaterials and Devices

Time: 3 Hours | Max. Marks: 75

Section-A (Essay type)

Answer any Five questions | **Marks: 5x10 = 50**

ఏవేని ఐదు ప్రశ్నలకు సమాధానాలిమ్ము

1. Eplain the Coulomb interaction in nanostructures and write the concept of dielectric constant for nanostructures.
   నానో రూపాల మధ్య కూలూంబ్ అన్యోన్య చర్యలను వివరించండి మరియు నానో నిర్మాణాల రోదక స్థిరాంకముల భావనను తెలపండి.
2. Explain optical properties of heterostructures and nanostructures.
   విషమ (hetero) నిర్మాణాలు మరియు నానో రూపాల దృశ ధర్మాలను వివరించండి.
3. Define Hall effect in nanostructures and explain how the carrier mobility and carrier concentration are determined in nanostructures.
   నానో రూపాల లో హాల్ ప్రభావం ను తెలిపి వాహకాల చలనం మరియు వాహకాల కణాల సాంద్రత ను ఏవిధంగా కనుగోందురో వివరించండి.
4. Explain the tunneling and hoping conductivity in nanostructures.
   నానో రూపాలలో టనలింగ్ మరియు హూపింగ్ వాహకత్వాలను వివరించండి.
5. Explain quantum dots and nano wires and their applications.
   క్వాంటమ్ బిందువులు మరియు క్వాంటమ్ తీగల అనువర్తానాల తెలపండి.
6. Explain Optical switching and optical data storage nanomaterial devices.
   Optical switching మరియు optical datastorage నానో పదార్ధ పరికరాల ను గూర్చి వివరించండి.
7. Explain the electronic structure of nanocrystals and tuning of band gap of nanoscale semiconductors.
   నానో స్ఫటికాల ఎలక్ట్రానిక్ నిర్మాణం మరియు నానో పరిధి అర్ధ వాహకాల పట్టీ అంతరాన్ని మార్చడాన్ని వివరించండి.
8. What are Spintronics, spintronics devices and write their applications.
   Spintronics, spintronics పరికారలు అనగా నేమి? వాని అనువర్తాలను తెలపండి.
9. What are Peptide nanowires and protein nanoparticles and write their applications.
   Peptide nanowires and protein nanoparticles అనగా నేమి? వాని అనువర్తాలను తెలపండి.
10. Explain the role of nanomaterials in drug delivery and therapy.
    రోగ చికిత్స లో మందుల సరఫరా చేయడంలో నానో పదార్ధల పాత్రను విశదీకరించండి.

19/12/18

Section-B (Short answer type)

Answer any Five questions **Marks: 5 x5 = 25**

ఏవేని ఐదు ప్రశ్నలకు సమాధానాలిమ్ము

11. What are quasi-particles and excitons? Explain.
quasi-particles మరియు excitons అనగా నేమి ? వానిని గూర్చి వివరించండి .

12. Explain the process of luminescence in nanomaterials.
నానో పదార్థాలలో ప్రతి దీప్తి ప్రక్రియను వివరించండి .

13. Explain the Coulomb blackade effect.
Coulomb blackade ప్రభావం అనగా నేమి ?

14. Write short note on thermionic emission in nanostructures.
నానో రూపాలలో జరిగే ఉష్ణ ఉత్సర్గం గూర్చి లఘు టీకా వ్రాయండి ?

15. What are CNT based transistors? Explain.
CNT ఆధార transistors అనగా నేమి ? వివరించండి .

16. What are MEMS? Write their applications.
MEMS అనగా నేమి ? వాటి అనువర్తనాలను తెలపండి.

17. Explain nanostructured ferromagnetism.
నానో రూప ఫేర్రో అయస్కాంతత్వమును వివరించండి.

18. Explain the dynamics of nanomagnets.
నానో అయస్కాంతాల గతిశీలతను వివరించండి.

19. What are DNA double nanowires? Write their applications
DNA double నానో తీగలు అనగా నేమి ? వాని అనువర్తనాలను తెలపండి .

20. Explain medical application of targeted gold nanoparticles.
targeted బంగారు నానో కణాల వైద్యశాస్త్ర అనువర్తనాలను తెలపండి .

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19/2/18