SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA : : VIJAYAWADA-10
(An autonomous college in the jurisdiction of Krishna University)

DEPARTMENT OF PHYSICS

PHYSICS	**PHYT11 B**	**2020-21**	**B.Sc., MPC, MPCS**

Semester: I

Course- I

No. of Credits: 4

Course I: MECHANICS, WAVES AND OSCILLATIONS (NEW SYLLABUS)

UNIT-I: (Online teaching)

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

1.1 Review of Newton's Laws of Motion (1hr)
1.2 Motion of variable mass system, Motion of a rocket (1hr)
1.3 Multistage rocket (1hr)
1.4 Concept of impact parameter, scattering cross-section, Rutherford scattering-Derivation. (2hrs)

2. Mechanics of Rigid bodies (Online teaching) (7 hrs)

2.1 Rigid body, rotational kinematic relations (1hr)
2.2 Equation of motion for a rotating body (1hr)
2.3 Angular momentum and Moment of inertia tensor, Euler equations (2hrs)
2.4 Precession of a spinning top, Gyroscope (2hrs)
2.5 Precession of atom and nucleus in magnetic field (1hr)

Unit-II:

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

3.1Central forces, definition and examples, characteristics of central forces, conservative nature of central forces (3hrs)
3.2 Equation of motion under a central force (3hrs)
3.3 Kepler's laws of planetary motion- Proofs (3hrs)
3.4 Motion of satellites, Basic idea of Global Positioning System (GPS), weightlessness, Physiological effects of astronauts (3hrs)

UNIT-III:

4. Relativistic Mechanics (Online teaching) (12hrs)

4.1Introduction to relativity, Frames of reference (2hrs)
4.2 Galilean transformations, absolute frames (2hrs)
4.3 Michelson-Morley experiment, negative result (2hrs)
t4.4 Postulates of Special theory of relativity, Lorentz transformation, time dilation, length contraction, variation of mass with velocity (5hrs)
4.5 Einstein's mass-energy relation (1hr)

Unit-IV:

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

5.1Simple harmonic oscillator and solution of the differential equation (2hrs)
5.2, Damped harmonic oscillator, Forced harmonic oscillator – Their differential equations and solutions (3hrs)
5.3 Resonance, Logarithmic decrement, Relaxation time and Quality factor. (2hrs)

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

6.1Coupled oscillators-Introduction, Two coupled oscillators, Normal coordinates and Normal mode (3hrs)
6.2- N-coupled oscillators and wave equation (2hrs)

Unit-V:

7. Vibrating Strings: (Online teaching) (07 hrs)

7.1Transverse wave propagation along a stretched string (1hr)
7.2 General solution of wave equation and its significance (2hrs)

7.3 Modes of vibration of stretched string clamped at end both ends (1hr)
7.4, Overtones and Harmonics (1hr)
7.5Melde's strings. (2hrs)

8. Ultrasonics: (Online teaching) (05 hrs)

8.1Ultrasonics, General Properties of ultrasonic waves (1hr)
8.2 Production of ultrasonics by piezoelectric and magnetostriction methods (2hrs)
8.3 Detection of ultrasonics (1hr)
8.4 Applications of ultrasonic waves, SONAR (1hr)

TEXT BOOK

- B. Sc. Physics, Vol.1, Telugu Academy, Hyderabad
- Fundamentals of Physics Vol. I - Resnick, Halliday, Krane ,Wiley India 2007
- Unified Physics - Waves and Oscillations, Jai PrakashNath&Co.Ltd.
- Waves & Oscillations. S.Badami, V. Balasubramanian and K.R. Reddy, Orient Longman.

REFERENCE BOOKS:

- 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, Vikas Publications.
- The Physics of Waves and Oscillations, N.K.Bajaj, Tata McGraw Hill
- Science and Technology of Ultrasonics- Baldev Raj, Narosa, New Delhi,2004

PHYSICS	**PHYP11 B**	**2020-21**	**B.Sc., MPC, MPCS**

PRACTICAL- I **No. of Credits: 1**

PRACTICAL COURSE 1: MECHANICS, WAVES AND OSCILLATIONS (NEW PRACTICAL)

Work load: 30 hrs per semester (At the end of semester-I). 2 hrs/week

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. Simple pendulum- normal distribution of errors-estimation of time period and the error of the mean by statistical analysis
5. Determination of 'g' by compound/bar pendulum
6. Verification of laws of vibrations of stretched string –Sonometer
7. Bifilar suspension –Moment of inertia of a regular rectangular body.
8. Rigidity modulus of material of a wire-Dynamic method (Torsional pendulum)
9. Volume resonator experiment
10. Viscosity of liquid by the flow method (Poiseuille's method)
11. Determination of the force constant of a spring by static and dynamic method. Coupled oscillators
12. Determination of frequency of a bar –Melde's experiment.

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PHYSICS	**PHYT21 C**	**2020-21**	**B.Sc., MPC, MPCS**

SEMESTER- II Course- II

No. of Credits: 4

WAVE OPTICS

UNIT-I Interference of light: (12hrs)

Division of Wave front: Introduction, Conditions for interference of light, Interference of light by division of wave front and amplitude, Phase change on reflection- Stokes' treatment, Fresnel's Bi-Prism-Determination of Wavelength of Light.

Division of Amplitude: Cosine law - colors in thin films, Newton's rings in reflected light-Theory and experiment - Determination of wavelength of monochromatic light, Michelson interferometer and determination of wavelength.

UNIT-II Diffraction of light: (12hrs)

Fraunhofer Class: Distinction between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction at a single slit, Double slit and N-slits(No Derivation for N-Slits), Determination of wavelength of light using diffraction grating, Resolving power of grating

Fresnel's Class: Fresnel's half period zones, Zone plate, comparison of zone plate with convex lens.

UNIT-III Polarisation of light: (12hrs)

Polarized light: Methods of production of plane polarized light - Polarisation by reflection (Brewster's law), Malus law, Double refraction, Nicol prism, Nicol prism as polarizer and analyzer

Types and production of polarized Light: 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 (12hrs)

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

Fibre Optics: 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 Lasers and 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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PHYSICS	**PHYP21 B**	**2020-21**	**B.Sc., MPC, MPCS**

SEMESTER- II

PARTICAL – II **No .of Credits: 1**

WAVE OPTICS (NEW PRACTICAL)

Workload:30hrs **2 hrs/week**

Minimum of 6 experiments to be done and recorded

1. Determination of radius of curvature of a given convex lens-Newton's rings.
2. Resolving power of grating.
3. Study of optical rotation –polarimeter.
4. Dispersive power of a prism.
5. Determination of wavelength of light using diffraction grating-minimum 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 wedge method
10. Determination of refractive index of liquid-Boy's method.

SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA : VIJAYAWADA – 520 010

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HEAT AND THERMODYNAMICS

Semester-III **PHY T31A No of Credits - 3** **Paper-III**

UNIT-I: Kinetic Theory of gases: (12 hrs)
1.1 Kinetic Theory of gases-Introduction, Derivation of Maxwell's law of distribution of molecular velocities, Mean free path, Degrees of freedom, Principle of equipartition of energy (Qualitative ideas only),
1.2 Transport phenomenon in ideal gases: viscosity, Thermal conductivity and diffusion of gases.

UNIT-II: Thermodynamics (12hrs)
2.1 Introduction to Thermodynamics
Introduction- Isothermal and Adiabatic processes - Work done in these processes, Heat engines - Reversible and irreversible processes, Carnot's engine and its efficiency, Second law of thermodynamics, Carnot's theorem, Thermodynamic scale of temperature and its identity with perfect gas scale.
2.2 Entropy
Entropy and its 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 (Qualitative).

UNIT-III:

Thermodynamic Potentials and Maxwell's equations: (12hrs) (NO PROBLEM)
3.1 Thermodynamic potentials - Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy and their significance, Derivation of Maxwell's thermodynamic relations from thermodynamic potentials,
3.2 Applications of Maxwell's thermodynamic relations: (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)
4.1 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
4.2 Production of low temperature: Adiabatic demagnetization Derivation, Principle of Refrigeration, effects of chloro and fluoro carbons on ozone layer.

UNIT-V:
5.1 Radiation Laws: (7 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.
5.2 Measurement of Radiation (5 hrs)
Pyrometers: Angstrom pyroheliometer and determination Solar constant, Estimation of surface temperature of Sun.

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PHYSICS	**PHY P31A**	**Semester-III**	**HEAT AND THERMODYNAMICS**

45 Hrs

No of Credits:2 List of experiments

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

Note:

1. 8 (Eight) experiments are to be done and recorded in the lab.These experiments willbe evaluated in CIA
2. Minimum of 7 experiments must be done and recorded by student who had put in75 % of attendance in the lab.
3. Best 6 experiments are to be considered for CIA
4. 10 marks for CIA
5. 40 marks for practical exam

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Semester-IV Paper-IV No of Credits-3 60Hrs

PHY T01 Paper IV: Modern Physics

UNIT-I :

1.1. Atomic Physics: (07 hrs)

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

1.2. Molecular Physics (05 hrs)

Raman effect, Characteristics of Raman effect, Experimental study of Raman effect, Quantum theory of Raman effect, Applications of Raman effect.

UNIT-II: (12 hrs)

2.1. Matter waves & de-Broglie's hypothesis (06 hrs)

Failures of Classical Mechanics, Matter waves – de-Broglie's hypothesis, Derivation for de-Broglie wave length of matter waves, Properties of matter waves, Davisson and Germer's experiment, Phase and group velocities (Qualitative),

2.2. Uncertainty Principle and Quantization (06 hrs)

Heisenberg's uncertainty principle for position and momentum (x and p), & energy and time (E and t), 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:

Quantum (Wave) Mechanics: (12 hrs)

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

UNIT-IV: (12 hrs)

4.1. Structure of Nuclei and Nuclear Models: (06 hrs)

Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; Nuclear forces, Characteristics of nuclear forces, Yukawa's meson theory (Qualitative), Nuclear Models: Liquid drop model, Shell model, Magic numbers.

4.2. Elementary Particle Physics (06 hrs)

Elementary Particles and their classification, Fundamental Interactions – gravitational, electromagnetic, strong & week; Properties of Leptons, Mesons and Baryons

UNIT-V:

5.1 Nano materials: (07hrs)

Origin of Nano materials - Quantum confinement, Size effect, Surface to volume ratio,

Classification of nano materials - (0D, 1D, 2D); Nano wires, Fullerene, CNT, Graphene (Mention of structures and properties), Distinct properties of nano materials (Mention-mechanical, optical, electrical,

and magnetic properties); Applications of nano materials: (Fuel cells, Phosphors for HD TV, Sensors)
5.2 Superconductivity: (05 hrs)
Introduction – Properties of superconductors - critical temperature (T c), critical magnetic field (T m), Meissner effect, Isotope effect, Type I and Type II superconductors, BCS theory (Qualitative), High Tc superconductors, Applications of superconductors.

TEXT BOOKS
1. BSc Physics, Vol.4, Telugu Akademy, Hyderabad
2. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.
3. Nano materials, A K Bandopadhyay, New Age International Pvt Ltd (2007)
REFERENCE BOOKS:
1. Atomic Physics by J.B. Rajam; S. Chand& Co.,
2. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
3. Nuclear Physics, D.C. Tayal, Himalaya Publishing House.
4. S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publ.Co.)
5. K. K. Chattopadhyay & A.N. Banerjee, Introd.to Nanoscience and Technology (PHI Learning Priv. Limited).
6. Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj, BB Rath and J Murday-Universities Press-IIM
LIBRARY ACTIVITY
Student visit library to refer and gather information regarding seminar topics and assignments.
Course Delivery method: Face-to-face / Blended
Course has focus on: Foundation & Employability
Course has focus on : Employability
Websites of Interest :
Co-curricular Activities:
1. Assignments
2. Student seminars
3. Quiz
4. Field Visit Report
5. Project Works

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PHYSICS	**PHY P01**	**Modern Physics**	**B.Sc.(PMC & PMCS)**

Practical Paper IV: **45Hrs**

No of Credits:2

List of experiments

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

Note :

1. 8 (Eight) experiments are to be done and recorded in the lab. These experimentswill be evaluated in CIA
2. Minimum of 7 experiments must be done and recorded by student who had put in75 % of attendance in the lab.
3. Best 6 experiments are to be considered for CIA
4. 10 marks for CIA
5. 40 marks for practical exam

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PHYSICS	**PHYT41A**	**ELECTRICITY, MAGNETISM AND ELECTRONICS**	**B.Sc.(PMC & PMCS)**

UNIT-I

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) point charge (ii) uniformly charged sphere

Dielectrics: (6 hrs)

Dielectrics-Polar and Non-polar dielectrics - Electric displacement D, electric polarization P, Relation between D, E and P, Dielectric constant and electric susceptibility.

UNIT-II

Magnetostatics: (6 hrs)

Biot-Savart's law and its applications: (i) calculation of B due to long straight wire and (ii) solenoid, Ampere's Circuital Law and its application to Solenoid, Hall effect, determination of Hall coefficient and applications.

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

Alternating currents: (6 hrs) Alternating current - Relation between current and voltage in LR and CR circuits, Phase and Vector diagrams, LCR series and parallel resonant circuit, Q –factor, Power in ac circuits, Power factor.

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

Basic Electronic devices: (12 hrs)

Diodes: PN junction diode, Zener diode and Light Emitting Diode (LED) and their I-V characteristics, Zener diode as a regulator

Transistors: Transistors and its operation, CB, CE and CC configurations, Input and output characteristics of a transistor in CE mode, Relation between alpha, beta and gamma; Hybrid parameters, Determination of hybrid parameters from transistor characteristics; Transistor as an amplifier.

UNIT-V:

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, Basic logic gates, DeMorgan's laws-Statements and Proofs, 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.

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PHYSICS	**PHYP41A**	**ELECTRICITY, MAGNETISM AND ELECTRONICS**	**B.Sc.(PMC & PMCS)**

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

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PHYSICS	PHY T51	2017-18 2018-19	III B.Sc. (PMC & PMCS)

Paper V: Electricity, Magnetism& Electronics

(For Maths Combinations)

V Semester **No of Credits:3**

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 circularcurrent loop and solenoid – Lorentz force – Hall effect – determination of Hall coefficientand 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,vectordiagrams, 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 between□, □ and □ - 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 Graw Hill Edition.

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PHYSICS	PHY P51	2017-18 2018-19	III B.Sc. (PMC & PMCS)

Practical Paper V

Electricity, Magnetism & Electronics

Minimum of 6 experiments to be done and recorded **45 Hours**

No of Credits:2

1. Figure.of merit of a moving coil galvonometer.
2. LCR circuit series resonance-determination of resonance frequency & Q factor.
3. LCR circuit parallel resonance--determination of resonance frequency
4. Verification of Kirchoff's laws.
5. Field along the axis of a circular coil carrying current.
6. PN Junction Diode Characteristics
7. Zener Diode Characteristics
8. Transistor CE Characteristics

SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA : VIJAYAWADA – 520 010

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PHYSICS	**PHY T52**	**2017-18**	**III B.Sc.(PMC&PMCS)**
		2018-19	

Paper VI: Modern Physics

(For Maths Combinations)

V Semester **No of Credits:3**

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 **12Hrs**

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 **12Hrs**

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 **12Hrs**

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 **12Hrs**

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.

PHYSICS	PHY P52	2017-18 2018-19	III B.Sc.(PMC& PMCS)

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Practical Paper VI: Modern Physics

Minimum of 6 experiments to be done and recordedNo. of Credits:2

45 Hours

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 M & H.
5. Logic gates –verification of truth tables
6. Energy gap of a semiconductor using junction diode.
7. Energy gap of a semiconductor using thermister.8.Demorgan's theorems.

Reference Book : B.Sc practical physics by C.L.Arora published by S.Chand&Co.

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PHYSICS	PHY TEL62	2017 -18 2018-19	B.Sc.(PMC&PMCS)

II ELECTIVE

Paper VII-(B) Elective (Materials Science)

Semester –VI No of Credits:3

Elective Paper –VII-(B): Materials Science

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.Review of atomic structure – Interatomic forces – Different types of chemical bonds – Ionic covalent bond or homopolar bond – Metallic bond – Dispersion bond – Dipole bond – Hydrogenbond – Binding energy ofa 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.

UNIT-III 12 Hrs

3. Mechanical Behavior of Materials: Different mechanical properties of engineering materials – Creep –Fracture – Technologicalproperties.

UNIT-IV 12 Hrs

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

UNIT-V 12 Hrs

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

Reference books

1. Materials Science by M.Arumugam, Anuradha Publishers. 1990, Kumbakonam.

2.Materials Science and Engineering V.Raghavan, Printice Hall India Ed. V 2004. New Delhi.

3. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India

4. Solid State Physics, M.A. Wahab, 2011, Narosa Publications

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PHYSICS	PHY PEL62	2017 -18 2018-19	B.Sc.(PMC&PMCS)

Elective Paper-VII-B Practical: Materials Science **45 Hours** **No of Credits:2**

Minimum of 5 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 hysteresis loop of a Ferroelectric Crystal.
6. Study the B-H curve of 'Fe' using solenoid and determine energy loss from hysteresis.

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PHYSICS	**PHY TCL64**	**2017 -18** **2018-19**	**B.Sc.(PMC&PMCS)**

Semester –VI **No of Credits:3**

Cluster Electives – VIII-B

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

UNIT-I **12Hrs**

1. Background and history: Concept of confinement, strong and weak confinement with suitable example; Development of quantum structures, Basic concept of quantum well, quantum wire and quantum dot. Finite size Zero, One and Two Dimensional Nanostructures, Concept of Surface and Interfacial Energies. Physics of the solid state – size dependence of properties, crystal structures, Lattice vibrations, Energy bands:- Insulators Semiconductors and conductors

UNIT-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 weightaverage molecular weight, degree of polymerization, determination of molecular weight of polymers by viscometry, Osmometry and light scattering methods.

UNIT-IV **12Hrs**

4. Molecular & Nanoelectronics: Semiconductors, Transition from crystal technology to nanotechnology. Tiny motors, Gyroscopes and accelerometers. Nano particle embedded wrinkle resistant cloth.

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.

PHYSICS	PHY PCL64	2017 -18 2018-19	B.Sc.(PMC&PMCS)

Semester –VI :Cluster Electives – VIII-B No of Credits:2

Cluster Elective Paper- VIII-B-1: Practical: Fundamentals of Nanoscience

Minimum of 3 experiments to be done and recorded 45 Hours

1. Determination of the Band Gap of Semiconductor Nanoparticles.
2. Measurement of electrical conductivity of semiconductor film by fourprobe method
3. Study of temperature variation of electrical conductivity of semiconductor film by fourprobe method
4. Bimetallic Nanoparticles
5. Harvesting light using nano-solar cells.

PHYSICS	PHY TCL65	2017 - 18 2018-19	B.Sc.(PMC&PMCS)

Semester –VI **No of**

Credits:3Cluster Elective

Paper –VIII B-2

Renewable Energy

UNIT-I **12 Hrs**

1. Introduction to Energy: Definition and units of energy, power, Forms of energy, Conservation of energy, second law of thermodynamics, Energy flow diagram to the earth.Origin and time scale of fossilfuels, Conventional energy sources

2. Environmental Effects: Environmental degradation due to energy production and utilization, air and water pollution, depletion of ozone layer, global warming, biological damage due to environmental degradation. Effect of pollution due to thermal power station, nuclear power generation, hydroelectric powerstations on ecology and environment.

UNIT-II **12 Hrs**

3. Global Energy Scenario: Energy consumption in various sectors, projected energy consumption for thenext century, exponential increase in energy consumption, energy resources, coal, oil, natural gas, nuclear and hydroelectric power, impact of exponential rise in energy usage on global economy.

4. Indian Energy Scene: Energy resources available in India, urban and rural energy consumption, energy consumption pattern and its variation as a function of time, nuclear energy -promise and future, energy as a factor limiting growth, need for use of new and renewable energy sources.

UNIT-III **12 Hrs**

5.Solar energy: Solar energy, Spectral distribution of radiation, Flat plate collector, solar waterheating system, Applications, Solar cooker. Solar cell, Types of solar cells, Solar module and array, Components of PV system, Applications of solar PV systems.

6. Wind Energy: Introduction, Principle of wind energy conversion, Components of wind turbines, Operation and characteristics of a wind turbine, Advantages and disadvantages of windmills, Applications of wind energy.

UNIT-IV **12 Hrs**

7. Ocean Energy: Introduction, Principle of ocean thermal energy conversion, Tidal power generation,Tidal energy technologies, Energy from waves, Wave energy conversion, Wave energy technologies, advantages and disadvantages.

UNIT-V **12 Hrs**

8. Hydrogen Energy: History of hydrogen energy - Hydrogen production methods – Electrolysis of water,Hydrogen storage options – Compressed and liquefied gas tanks, Metal hydrides; Hydrogen safety - Problems of hydrogen transport and distribution - Uses of hydrogen as fuel.

References:

Solar Energy Principles, Thermal Collection &Storage, S.P.Sukhatme: Tata McGraw HillPub., New Delhi.

1. Non-Conventional Energy Sources, G.D.Rai, New Delhi.
2. Renewable Energy, power for a sustainable future, Godfrey Boyle, 2004,

3. The Generation of electricity by wind, E.W. Golding.
4. Hydrogen and Fuel Cells: A comprehensive guide, Rebecca Busby, Pennwell corporation(2005)
5. Hydrogen and Fuel Cells: Emerging Technologies and Applications, B.Sorensen, AcademicPress (2012).
6. Non-Conventional Energy Resources by B.H. Khan, Tata McGraw Hill Pub., 2009.
7. Fundamentals of Renewable Energy Resources byG.N.Tiwari, M.K.Ghosal, Narosa Pub.,2007.

		2018-19	

Semester –VI **No of Credits:2**

Cluster Elective Paper-VIII-B-2: Practical: Renewable Energy

Minimum of 5 experiments to be done and recorded **45 Hours**

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

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PHYSICS	**PHY TCL62**	**2017 -18** **2018-19**	**B.Sc .(PMC&PMCS)**

Semester –VI

No of Credits:3Cluster Elective Paper

VIII-B-3

Computational Methods and Programming

UNIT-I **10Hrs**

1(a). Fundamentals of C language: C character set-Identifiers and Keywords-Constants Variables - Datatypes-Declarations of variables-Declaration of storage class-Defining constants-Assignment statement.

1(b). Operators: Arithmetic operators- Relational operators-Logic operators- Operators - Increment anddecrement operators - Conditional operators.

UNIT-II **10Hrs**

2(a). Expressions and I/O Statements: Arithmetic expressions-Precedence of operators- Type converters inexpressions-Mathematical (Library) functions - Data input and output. The Get char and put char functions-Scanf-Printf simple programs.

2(b). Control statements: If -Else statements -Switch statements - The operators - GO TO While, Do -While, FOR statements - BREAK and CONTINUE statements.

UNIT-III **10Hrs**

3(a). Arrays: One dimensional and two dimensional arrays - Initialization - Type declaration - Inputtingand outputting of data for arrays - Programs of matrices addition, and Multiplication.

3(b). User defined functions: The form of C functions - Return values and their types – a function - Category of functions, Nesting of functions, Recursion, ANSI C Function declaration. Scope and life time ofvariables in functions.

UNIT-IV **10Hrs**

4(a). Linear and Non - Linear equations: Solution of Algebra and transcendental equations-Bisection, False position and Newton-Rhapson methods-Basic principles-
Formulae –Algorithms.

4(b). Simultaneous equations: Solutions of simultaneous linear equations-Guass and Gauss Seidel iterative methods- Basic principles-Formulae-Algorithms

UNIT-V **5Hrs**

5(a). Interpolations: Concept of linear interpolation-Finite differences-Newton'sLagrange's interpolation formulae-principles.

5(b). Numerical differentiation and integration: Numerical differentiation-algorithm for evaluation of first order derivatives using formulae based on Taylor's series -Numericalintegration Trapezoidal and simpson's 1/3 rule.

Reference books:

1. Introductory methods of Numerical Analysis: Sastry
2. Numerical Methods: Balaguruswamy
3. Programming in ANSI C (TMH) : Balaguruswamy
4. Programming with 'C'- Byron Gottafried, Tata Mc Graw Hill

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PHYSICS	**PHY PCL62**	**2017 -18** **2018-19**	**B.Sc .(PMC&PMCS)**

Semester –VI **No of**

Credits:2Cluster Elective PaperVIII-B-3

Practical: Computational Methods and Programming

Minimum of 6 experiments to be done and recorded **45 Hours**

1.Write a program that reads an alphabet from keyboard and display in the reverse order.2.Write a program to read and display multiplication of tables.

3. Write a program for converting centigrade to Fahrenheit temperature and Fahrenheittemperature centigrade.

4. Write a program to find the largest element in an array.

5. Write a program based on percentage calculation, the grade by entering the marks. (If percentage >60 I class, if percentage between 50&60 II class, if between 35&50III class, if percentage below 35 fail).

6. Write a program for generation of even numbers up to 100 using while, do-while and for loop.7.Write a program for generation of odd numbers up to 100 using while, do-while and for loop.

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(An autonomous college in the jurisdiction of Krishna University, Machilipatnam.)

PHYSICS	**PHYTELS63**	**2017 -18**	**B.Sc .(PMC&PMCS)**
		2018-19	

Paper–VII-(A)Elective(Electronics)

Semester –VI **No ofCredits:3**

Elective Paper –VII-(A):Analog and Digital Electronics

Unit-I **14 Hrs**

1. FET-Construction, Working, characteristics and uses; MOSFET-enhancement MOSFET, depletion MOSFET, construction and working , drain characteristics of MOSFET, applicationsof MOSFET

2. Photo electric devices: Structure and operation, characteristics, spectral response andapplication of LDR, LEDand LCD

Unit-II **10Hrs**

3. Operational Amplifiers: Characteristics of ideal and practical Op-Amp (IC 741), Basicdifferential amplifiers, Op-Amp supply voltage, IC identification, Internal blocks of
Op-Amp, its parameter off set voltages and currents, CMRR, slew rate, concept of virtualground.

Unit-III **10 Hrs**

4. Applications of Op-Amp: Op-Amp as voltage amplifier, Inverting amplifier, Non-inverting amplifier,voltage follower, summing amplifier, difference amplifier, comparator, integrator, differentiator.

Unit-IV **14 Hrs**

5. Data processing circuits: Multiplexers, De-multiplexers, encoders, decoders, Characteristicsfor Digital ICs -RTL, DTL, TTL, ECL CMOS (NAND & NOR Gates).

6. IC 555 Timer -Its pin diagram,internal architecture, Application as astablemultivibrator andmono stable multivibrator.

Unit-V **12 Hrs**

7. Sequential digital circuits:Flip-flops, RS, Clocked SR, JK, D, T, Master-Slave, Flip-flop,Conversion of Flip flops.

8. Code Converters: Design of code converter, BCD to 7 segment, binary/BCD to gray, gray tobinary/BCD ,design of counters using state machine.

Reference Books

1. Digital Electronics by G.K.Kharate Oxford University Press
2. Unified Electronics by Agarwal and Agarwal.
3. Op- Amp and Linear ICs by Ramakanth A Gayekwad, 4th edition PHI
4. Digital Principles and Applications by Malvino and Leach, TMH, 1996, 4th edition.
5. Digital Circuit design by Morris Mano,PHI
6. Switching Theory and Logic design by A.AnandKumar ,PHI
7. operations amplifier by SV Subramanyam.

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PHYSICS	**PHYPELS63**	**2017 -18** **2018-19**	**B.Sc .(PMC&PMCS)**

Elective Paper-VII

Practical: Analog and Digital Electronics

Semester –VI **No of Credits:2**

Minimum of 6 experiments to be done and recorded

1) Characteristics of FET
2) Characteristics of MOSFET
3) Characteristics of LDR
4) Characteristics of Op-

amp.(IC741) 5)Op-Amp as
amplifier/inverting amplifier
6) Op-Amp as integrator/differentiator
7) Op-Amp as summing amplifier/difference amplifier
8) IC 555 as astable multivibrator
9) IC 555 as monostable amplifier
10) Master slave flip-flop
11) JK flip-flop

SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.

(An autonomous college in the jurisdiction of Krishna University, Machilipatnam.)

PHYSICS	**PHYTCLS66**	**2017 -18**	**B.Sc .(PMC&PMCS)**
		2018-19	

Semester –VI Cluster Electives VIII-A

Paper – VIII-A-1: Introduction to Microprocessors and Microcontrollers

Semester –VI **No ofCredits:3**

Unit –I **10Hrs**

1. Introduction to microcontrollers:General purpose of computer systems,architecture of embedded system, classification, applications and purposes, challenges and designs, operational and nonoperational quality attributes, elemental description of embedded processors and micro controllers

Unit–II **10Hrs**

2. Microprocessors:Organisation of microprocessorbased system, 8085 microprocessor,its pin diagram and architecture, concept of data bus, and address bus, 8085 programming, instruction classification, stacks and its implementation, hardware and software interrupts.

Unit–III **15Hrs**

3. 8051 microcontroller:Introduction , block diagram, assembly language programming, programme counter, ROM memory, data types and directives, flag bits PSW register, jump, loopand call constructions

4. 8051 I/O Programming: Introduction to I/O port programming, pin out diagram, I/O port pin programming, bit manipulation, addressing modes, accessing memory, arithmetic and logic instructions.

Unit – IV **13 Hrs**

5. Timers:Programming of 8051 timers, counter programming, interrupts, externalhardware interrupts**,**serial communication interrupts, interrupt priority

6. Embedded system programming:Structure of programming, infinite loop, compiling, linking locating,down loading and debugging.

Unit –V **12Hrs**

7. Embedded system design and development:Embedded system development environment, file typegenerated after cross compilation, dissembler, decompiler, simulator, emulator and debugging.

8. Embedded product life cycle:Embedded product development life cycle, trends in embeddedindustry.

Reference Books

1) Embedded Systems.. Architecture,programming and design, R Kamal, 2008, TMH
2) The 8051 micro controller and embedded systems using Assembly and C, M.A.Mazidi,J.G.Mazidi and R.D.McKinlay, second Ed., 2007 pearson Education India
3) Introduction to embedded systems K.V. Shibu, 1st edition, 2009 McGraw Hill
4) Micro Controllers in practice, I Susnea and Mitescu,2005,springer

SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.

(An autonomous college in the jurisdiction of Krishna University, Machilipatnam.)

PHYSICS	**PHYPCLS66**	**2017 -18**	**B.Sc .(PMC&PMCS)**
		2018-19	

Elective Paper-VIII-A-1

Practical: Introduction to Microprocessors and MicrocontrollersSemester –VI

No ofCredits:2 **45 Hours**

Minimum of 6 experiments to be done and recorded

1. To find that the given numbers is prime or not.
2. To find the factorial of a number.

3. Write a program to make the two numbers equal by increasing the smallest number anddecreasing the largest number.
4. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter(8 bit) on LED's.
5. Program to glow first four LED then next four using TIMER application.
6. Program to rotate the contents of the accumulator first right and then left.
7. Program to run a countdown from 9-0 in the seven segment LED display.
8. To interface seven segment LED display with 8051 microcontroller and display 'HELP' in the sevensegment LED display.
9. To toggle '1234' as '1324' in the seven segment LED.
10. Interface stepper motor with 8051 and write a program to move the motor through a givenangle in clock wise or counter clockwise direction.
11. Application of embedded systems: Temperature measurement, some information on LCDdisplay, interfacing a keyboard.

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PHYSICS	**PHYTCLS67**	**2017 -18** **2018-19**	**B.Sc .(PMC&PMCS)**

Semester –VI No of Credits:3

Cluster Elective Paper –VIII-A-3 :Electronic Instrumentation

Unit – I 12Hrs

1. Basic of measurements:Instruments accuracy , precision , sensitivity , resolution range, errors in measurement, Multimeter , principles of measurement of dc voltage and dc currents, ac currentand resistance, specifications of multimeter and their significance.

Unit -11 10 Hrs

2. Electronic Voltmeter:Advantage over conventional multimeter for voltage measurement with respect toinput impedence and sensitivity, principles of voltage measurement (block diagram

only), specification of an electronic voltmeter/multimeter and their significance.

Unit– III **14 Hrs**

3. CRO :Block diagram of basic CRO, construction of CRT, electron gun, electrostatic focusing and acceleration(only explanation) , time base operation, synchronization, front panel controls, specifications of CRO and their significance.

Applications CRO: Measurement of voltage ,dc and ac frequency , time period, special features of dual trace, digital storage oscilloscope, block diagram and principle of working.

Unit – IV **12 Hrs**

4. Digital Multimeter:Block diagram,working, frequency and period measurement using universalcounter, frequency counter ,accuracy and resolution.
5. Digital instruments:Principle and working of digitalinstruments, characteristics of a digital meter,working principle of digital voltmeter.

Unit – V **12 Hrs**

6. Signal generators:Block diagram explanation, specifications of low frequency signal generators, pulse generator, function generator-working, Brief idea for testing, specifications. Distortionfactor meter, wave analysis.
7. Bridges:Block diagram, working of basic LCR bridge – specifications – block diagram and working.

Reference Books

1. A text book in electrical technology by B.L.Thereja (S.Chand&Co)
2. Digital circuits and systems by Venugopal 2011 (Tata Mcgraw Hill)
3. Digital Electronics by SubrathaGhoshal 2012 (Cengage Learning)

SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA - 10.

(An autonomous college in the jurisdiction of Krishna University, Machilipatnam.)

PHYSICS	**PHYPCLS67**	**2017 -18** **2018-19**	**B.Sc .(PMC&PMCS)**

Semester –VI **No of Credits:2** **45 Hours**

Elective Paper-VIII-A-3: Practical: Electronic Instrumentation

Minimum of 6 experiments to be done and recorded

1. Study the loading effect of a multimeter by measuring voltage across a low and high resistance.
2. Study the limitations of a multimeter for measuring high frequency voltage and currents.
3. Measurement of voltage, frequency, time period and phase angle using CRO.
4. Measurement of time period and frequency using universal counter/frequency counter.
5. Measurement of rise, fall and delay times using a CRO.
6. Measurement of distortion of a RF signal generator using distortion factor meter.
7. Measurement of R, L and C using a LCR bridge/ universal bridge.