	VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS) Ibrahimbagh, Hyderabad-500 031, Telangana State **DEPARTMENT OF PHYSICS**

SYLLABUS OF ENGINEERING PHYSICS
UNDER CBCS W.E.F ACADEMIC YEAR 2017-2018

B.E I-SEMESTER (COMMON TO ALL BRANCHES)

Syllabus Reference Code: ***BS120PH***	Duration of SEE Exam: 3 Hrs	SEE: 60 Marks
Instruction:2+1 Hours per week	Credits: 2	CIE: 40 Marks

Course objectives	***Course outcomes***
Students will be able to learn	***At the end of the course students will be able to***
• Mathematical formulations for mechanical systems like oscillators. • Fundamental principles of optics in engineering fields. • The construction of optical fibres and losses in optical fibres. • Working of various laser systems • Engineering applications of a.c fundamentals and EM theory.	• Deduce solutions under different conditions of mechanical oscillators. • Appreciate the principles of interference, diffraction, polarization in engineering and technology. • Summarise various merits, demerits and applications of optical fibres. • Ascertain appropriate laser systems for practical usage. • Apply electrical and electromagnetic principles in various applications.

UNIT-I: FUNDAMENTALS OF VIBRATIONS: (8 HOURS)

- Free, Damped and Forced Harmonic Oscillators: Equation of motion, their solutions and special case such as under damping, over damping and critical damping.

- Logarithmic decrement, Relaxation time, amplitude and velocity resonance, sharpness, bandwidth, Q-factor.

- Superposition of simple harmonic vibrations of same frequency, Lissajous figures.

UNIT-II: PHYSICAL OPTICS (10Hours)

- Interference in thin films, Newton's rings (reflected light), measurement of wavelength of a light source using Newton's rings, anti-reflecting coatings.

- Diffraction due to a single slit, double slit and diffraction grating (Qualitative), dispersive and resolving powers of diffraction grating.

- Polarization of light, double Refraction, Nicol's prism, wave plates, optical activity, Laurent's half shade polarimeter, determination specific rotation.

UNIT – III: INTRODUCTION TO FIBRE OPTICS (7 Hours)

- Fibre construction**,** Propagation of light through an optical fiber, Acceptance angle, Numerical aperture, Types of optical fibers: Step index, GRIN fibers, SMF and MMF fibers.

- Losses in optical fiber: absorption losses, evanescent field, bending losses, signal distortion. Merits and demerits of optical fiber, applications of optical fiber.

UNIT-IV–LASERS (08 Hours)

- Characteristics of Lasers, induced absorption, spontaneous and stimulated emission of radiation - Einstein Coefficients A and B, meta stable state, pumping, Population inversion.

- Solid state lasers: Ruby laser, Nd-YAG laser. Gas Laser: Helium-Neon Laser, Applications of lasers in engineering (industrial, medical and communication), LIDAR, Holography (Basic principles, advantages and applications).

UNIT– V: AC CIRCUITS AND EM THEORY (9 Hours)

- **AC CIRCUITS:** Basic Definitions of RMS and average values of A.C voltage, reactance and impendence, power factor, A.C through pure resistor, capacitor and inductor, AC through RC, RL and CL circuits with phasor diagrams, Series and parallel LCR resonance circuits, band width, sharpness, electromechanical analogy.

- **ELECTROMAGNETIC THEORY*:*** Conduction and displacement current, Maxwell's equations in integral and differential forms, electromagnetic wave equations in free space and conducting medium, transverse nature of EM waves and Poynting vector, skin depth.

Suggested books:

1. Avadhanulu M. N. and. Kshirsagar P. G, Textbook of Engineering Physics, 5th Edition (2014), S. Chand & Co. Pvt. Ltd, New Delhi
2. David Halliday, Robert Resnick and Walker, Principles of Physics Extended, 10th Ed (2014) Wiley Eastern limited, Jefferson City, USA.

Reference Books:

3. Jewett Serway, Physics for scientists and engineers, 8th edition (2009), Cengage learning Publication, Boston, USA.
4. John M Senior, Optical Fiber Communication: Principles and Practice, 3rd Ed (2009), Pearson Education Limited, London
5. Neeraj Mehta, Applied Physics for Engineers, (2011), Prentice-Hall of India Pvt.Ltd, New Delhi
6. Gupta S.L and Sanjeev Gupta, Modern Engineering Physics, 1st Ed (2011), Dhanpat Rai publications, New Delhi
7. Sanjay D Jain and Girish H Sahasrabudhe, Engineering Physics (2012) University Press, Hydeabad

Online Resources:

8. www.nptel.ac.in
9. http://ocw.mit.edu/courses/physics
10. http://oyc.yale.edu/physics

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SYLLABUS OF ENGINEERING PHYSICS LAB
UNDER CBCS W.E.F ACADEMIC YEAR 2017-2018

B.E I-SEMESTER (COMMON TO ALL BRANCHES)

Reference Code: ***BS111PH***	Duration of SEE:3 Hrs	SEE: 50 Marks
Instruction:2 Hours per week	Credits: 1	CIE : 30 Marks

1. Estimation of errors using Gaussian distribution in Torsional Pendulum and to calculate the probable error and rigidity modulus.
2. Plot of B-H curve of a ferromagnetic specimen and to find Coercivity (H_c), Remanence (B_r) and Hysteresis loss
3. Determination of moment of inertia 'I 'of a flywheel about its axis of rotation.
4. Determination of radius of curvature of a given Plano-convex lens by forming Newton's Rings.
5. Determination of wavelength of spectral lines of Mercury light source using diffraction grating under normal incidence.
6. Determination of wavelength of given semiconductor laser using diffraction.
7. Calculation of numerical aperture, acceptance angle and power loss due to bending of an optical fiber & to study power loss.
8. Study of V-I characteristics of P-N Junction and Zener diode
9. Study of resonance in LCR series & parallel circuits and to find resonant frequency & Q-factor.
10. Determine the specific rotatory power of sugar solutions of different concentration by Lorent half shade polarimeter.
11. Study of V-I characteristics of solar cell & to calculate fill factor, efficiency & series resistance.
12. Determination of energy gap of a given semiconductor.

Optional Experiments:

1. Verification of Malus law
2. Calculation of Seebeck Coefficient by thermoelectric power.
3. Study of Thermistor characteristics
4. Cathode Ray Oscilloscope: Measurement of frequency, amplitude and phase

**** Students should perform a minimum of 10 experiments***

Suggested Books:

1. Worshnop B.L. and Flint H.T. Advanced Practical Physics, KPH
2. Gupta S. L and Kumar. V Practical Physics, Pragati Prakashan
3. Chauhan & Singh, Advanced Practical Physics Vol.I & II, Pragati Prakashan.

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SYLLABUS OF APPLIED PHYSICS
UNDER CBCS W.E.F ACADEMIC YEAR 2017-2018
***B.E II-Semester* (Common to all branches)**

Syllabus Reference Code: ***BS220 PH***	Duration of SEE: 3 Hrs	SEE:60 Marks
Instruction:2+1 Hours per week	Credits: 2	CIE Marks: 40

Course objectives	***Course outcomes***
Students will be able to learn • Fundamentals of wave mechanics and relativistic mechanics. • the crystal structure and crystal defects • electrical conduction theories of solids • properties of dielectric materials • characteristics of ferromagnets and superconductors	***At the end of the course students will be able to*** • Analyse various quantum mechanical systems. • Differentiate materials based on their structure and properties. • Classify solids and their applications • Distinguish different dielectric materials • Compare various magnetic materials and superconductors.

UNIT- I: CRYSTALLOGRAPHY (8 Hours)

- **Crystal Systems**: Introduction-Space lattice, Basis, Unit cell, Bravais lattices and crystal systems, Miller Indices, X-ray diffraction, Bragg's law, powder x-diffraction method

- **Defects in crystals**: Point Defects - Schottky and Frankel defects, concentration of Schottky and Frankel defects in a crystal. Property-(point) defect dependence in a crystal.

UNIT-II: Quantum and Relativistic Mechanics (10 Hours)

- Concept of de-Broglie wave - wavelength of matter waves of particles - Concept of wave function - Schrödinger time dependent and time independent wave equations- Applications: particle in an Infinite Square well (particle in a box) potential. Quantum tunneling: Potential barrier (qualitative treatment)

- Frames of references-inertial and non-inertial frames, postulates of special theory of relativity. Galilean and Lorentz transformations, length contraction, time dilation, Relativistic velocity addition, relativistic mass, mass-energy equivalence.

UNIT- III: BAND THEORY OF SEMICONDUCTORS (6 Hours)

- Free electron theory: features, merits and demerits, salient features of Kronig-Penny model -Classification of solids as conductors, insulators and semiconductors based on band theory, Fermi energy. Carrier concentration in intrinsic semiconductors and its conductivity, Hall effect.

- Principle, working and construction of Solar cell, LED and photo diode

UNIT-IV: DIELECTRIC MATERIALS (9 Hours)

- Polar and non-polar dielectrics, types of dielectric polarizations, Expression for electronic and ionic polarizabilities, Frequency and temperature dependence of dielectric polarizations, phase transitions and structure of $BaTio_3$.

- dielectric loss, Dielectric breakdown, internal filed in solids, Lorentz field, Clausius-Mossotti equation.

UNIT-V: MAGNETIC MATERIALS AND SUPERCONDUCTORS (9 Hours)

- Ferro, antiferro and ferri-magnetic materials, Weiss molecular field theory of ferromagnetism- magnetic domains- hysteresis curve-Soft and hard magnetic Materials-Ferrites fundamentals

- General properties of super conductors – Meissner effect. Type I and Type II superconductors - BCS Theory (in brief) - Josephson's Junction –SQUIDS- Applications of superconductors

Suggested Books:

1. Avadhanulu M. N. and. Kshirsagar P.G, Textbook of Engineering Physics, 5th Edition (2014), S.Chand & Co. Pvt. Ltd, New Delhi
2. Gupta S.L and Sanjeev Gupta A text book of Engineering Physics, Revised Ed, (2014) Dhanpath Rai Pub. New Delhi
3. David Halliday, Robert Resnick and Walker, Principles of Physics Extended, 10th Ed (2014) Wiley Eastern limited, Jefferson City, USA.

Reference Books:

4. Kittel .C, Introduction to Solid State Physics, 8th Ed (2005), Wiley Eastern, New Jersey, USA
5. Pillai. S.O., Solid State Physics, 7th Ed (2015), New Age International publishers, New Delhi
6. Robert Resnick, Introduction to special Relativity (2005) John Wiley, New Delhi
7. Neeraj Mehta, Applied Physics for Engineers, (2011), Prentice-Hall of India Pvt.Ltd, New Delhi

Online resources:

8. http://ocw.mit.edu/courses/physics
9. http://oyc.yale.edu/physics
10. www.nptel.ac.in

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OPEN ELECTIVE (ONE CREDIT)
UNDER CBCS W.E.F ACADEMIC YEAR 2017-2018

1. FUNDAMENTALS OF CRYOGENICS

Syllabus Reference Code: ***OE300PH***	Duration of SEE: 2 Hrs	SEE: 30 Marks
Instruction:1 Hours per week	Credits: 1	CIE: 20 Marks

Course objectives	***Course outcomes***
Students will be able to learn • Fundamentals of cryogenics	***At the end of the course students will be able to*** • Enumerate properties and production of cryogenic fluids.

UNIT-I:

Properties of cryogenic fluids: oxygen, nitrogen, helium and hydrogen, Joule Thomson effect, Porous plug experiment. Properties of Materials at Cryogenic Temperature

UNIT-II:

Production of low temperatures: Gas-Liquefaction and Refrigeration Systems, adiabatic demagnetization, cascade process, practical applications of low temperatures, super fluidity and its applications. Cryocoolers, Cryogenic Insulations

Suggested Books:

1. Mathur D.S., Heat and thermodynamics (2008) S. Chand & Co, New Delhi
2. Mamata Mukhopadhyay, Fundamentals of Cryogenic Engineering (2010), Prentice Hall of India, New Delhi

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2. DISPLAY DEVICES

Syllabus Reference Code: ***OE310PH***	Duration of SEE: 2 Hrs	SEE: 30 Marks
Instruction:1 Hours per week	Credits: 1	CIE Marks: 20 Marks

Course objectives	***Course outcomes***
Students will be able to learn • Basics of luminescence and display devices	***At the end of the course students will be able to*** • List out different types of luminescence mechanisms and display devices

UNIT-I:

Introduction to Luminescence, fluorescence, phosphorescence, principle and classification, luminescence mechanisms for various types and its applications.

UNIT-II:

Classification of display devices, working of Liquid crystal displays, comparison of LED and LCD, dynamic scattering display, OLEDS and their applications.

SUGGESTED BOOKS:

1. McKeever S. W. S., Thermo-luminescence of Solids (1988) Cambridge University Press, Cambridge
2. Adrian Kita, Luminescent Materials and Applications (2012) John Willey & Sons, Singapore

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OEPN ELECTIVE (ONE CREDIT)
UNDER CBCS W.E.F ACADEMIC YEAR 2017-2018

3. INTRODUCTION TO NON- DESTRUCTIVE TESTING

Syllabus Reference Code: ***OE320PH***	Duration of SEE: 2 Hrs	SEE: 30 Marks
Instruction:1 Hours per week	Credits: 1	CIE Marks: 20 Marks

Course objectives	***Course outcomes***
Students will be able to learn	***At the end of the course students will be able to***
• Basics of acoustics and non-destructive testing	• Differentiate various methods of non-destructive testing.

UNIT-I:

- Ultrasonic waves and their properties, Production of ultrasonics by Piezo-electric and magnetostriction methods, Detection of ultrasonics, Acoustic grating: ultrasonic velocity measurement, cavitation, Applications: ultrasonic cleaning, Echo cardiogram (ECG), ultrasonic imaging.

UNIT-II:

- Introduction to non- destructive testing (NDT)- objectives of NDT- advantages- types of defects-methods of NDT: Visual inspection, liquid penetration testing, acoustic detection: pulse echo method, ultrasonic inspection methods, Radiography: x-ray and gamma ray, Electromagnetic: eddy current testing, Acoustic Emission, Ultrasonic Testing (UT)

Suggested Books:

1. Avadhanulu M. N. and. Kshirsagar P.G, Textbook of Engineering Physics, 5th Edition (2014), S.Chand & Co. Pvt. Ltd, New Delhi

Reference Books:

1. B.K. Pandey and S. Chaturvedi, Engineering Physics 1st Ed (2012), Cengage learning, Delhi
2. R K Gaur and S L Gupta, Engineering Physics, 8th Edition (2001) Dhanpat Rai and Sons, Delhi

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OEPN ELECTIVE (ONE CREDIT)
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4. FUNDAMENTALS OF VACUUM TECHNOLOGY

Syllabus Reference Code: ***OE330PH***	Duration of SEE: 2 Hrs	SEE: 30 Marks
Instruction:1 Hours per week	Credits: 1	CIE Marks:20 Marks

Course objectives	***Course outcomes***
Students will be able to learn	***At the end of the course students will be able to***
• Fundamentals of vacuum technology	• Enumerate various methods production of vacuum.

UNIT-I:

Definition of vacuum, units of vacuum Vacuum ranges, evaporation theory- rate of evaporation, Hertz- Knudsen equation, types of evaporation, adsorption, desorption, Production of Vacuum, vacuum measurement, Vacuum pumps: pumping speed, throughput, Rotary oil pump, multi stage rotary pumps, diffusion pump, cryo-pump. Vacuum applications in various areas of engineering.

UNIT-II:

Measurement of vacuum, Vacuum gauges: thermocouple gauge, Pirani gauge, ionization gauge, Penning gauge, leak detection, Leak detection methods

Suggested Books:

1. Avadhanulu M. N. and. Kshirsagar P.G, Textbook of Engineering Physics, 5th Edition (2014), S.Chand & Co. Pvt. Ltd, New Delhi

Reference Books:

2. Rao V.V. Gosh T.B., Chopra K.L, Vacuum Science and Technology (2008) Allied Publishers, New Delhi.
3. John F. O'HanlonA User's Guide to Vacuum Technology (2006), John Willey &sons, United States.

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OPEN ELECTIVE (TWO CREDITS)
CBCS W.E.F ACADEMIC YEAR 2017-2018

1. SMART MATERIALS AND APPLICATION

Syllabus Reference Code: ***OE340PH***	Duration of SEE: 3 Hrs	SEE: 70 Marks
Instruction:2 Hours per week	Credits: 2	CIE Marks: 30 Marks

Course objectives	*Course outcomes*
Students will be able to learn	***At the end of the course students will be able to***
• Essentials of smart materials • Different types of smart materials	• Identify various smart materials based on properties. • Usage of smart materials in daily applications

UNIT I:
Introduction to functional materials, ferroelectricity, piezo electricity, pyroelectricity, Magnetostriction. Properties of smart materials such as piezo electric, magneto-strictive, electro-strictive, thermos-responsive, electrochromic materials, photochromic materials, thermos-chromic materials, thermoelectric materials, smart gels, electro-rheological (ER) and Magnetorheological MR fluids

UNIT II:
Introduction to metal alloys, classification of metal alloys as ferrous and non-ferrous alloys. Properties and applications of ferrous and non-ferrous alloys.

Introduction to shape memory alloys (SMA)- advantages and disadvantages of SMAs- Austenite, martensite, shape memory effect and types of shape memory effects- temperature transformation

UNIT III:
Properties and characteristics of engineering SMAs - Ni-Ti shape memory alloy, Cu-based shape memory alloys: Cu-Zn-Al, Cu-Al-Ni, ferromagnetic shape memory alloys Applications of SMAs.

Suggested Books:

1. K. Otsuka and C. M. Wayman, Shape memory Alloys, (1999) Cambridge University Press, Cambridge, UK.
2. Dimitris C. Lagoudas Shape Memory Alloys: Modeling and Engineering Applications, (2013) Springer, Springer, Taxas, USA.
3. Vijay K. Varadan, K. J. Vinoy, S. Gopalakrishnan, Smart Material Systems and MEMS, (2006), John Wiley & Sons

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OPEN ELECTIVE (TWO CREDIT)
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2. FUNDAMENTALS OF THIN FILM TECHNOLOGY

Syllabus Reference Code: ***OE350PH***	Duration of SEE: 3 Hrs	SEE: 70 Marks
Instruction:2 Hours per week	Credits: 2	CIE Marks: 30 Marks

Course objectives	*Course outcomes*
Students will be able to learn	***At the end of the course students will be able to***
• Fundamentals of thin film technology • Properties and preparation mechanisms	• List out various thin film preparation techniques • Narrate properties and measurement of thin films

UNIT-I:

Classification of films- nucleation and growth- nucleation theories: capillarity and atomistic models, substrate effect, film thickness effect.

UNIT-II:

Thin film deposition techniques- simple thermal evaporation-electron beam evaporation-sputtering (d.c and a.c), flash evaporation, Laser ablation- spin coating- molecular beam epitaxy Film thickness measurement-ellipsometry, Fizeu (Tolonsky) technique, quartz crystal oscillator techniques.

UNIT-III:

Electrical conduction in metallic films- Continuous and discontinuous films, electrical, optical and dielectric properties of thin films- fabrication of thin film resistor, capacitor, diode, anti-reflection coatings, gas sensors and temperature sensors.

Suggested books:

1. Kasturi Chopra Thin Film Device Applications (2012) Mac Graw Hill, New York
2. Goswami. A., Thin film fundamentals, 1st Ed (Reprint) (2006) New Age International, New Delhi
3. Chopra K.L., Thin film phenomenon (1990) Mac Graw Hill, New York

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OPEN ELECTIVE (TWO CREDIT)
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3. QUANTUM MECHANICS FOR ENGINEERS

Syllabus Reference Code: ***OE360PH***	Duration of SEE: 3 Hrs	SEE: 70 Marks
Instruction:2 Hours per week	Credits: 2	CIE Marks: 30 Marks

Course objectives	*Course outcomes*
Students will be able to learn	***At the end of the course students will be able to***
• Fundamentals of perturbation theories • basics of quantum computing	• Write wave functions for particles moving under various potentials • Appreciate applications of quantum mechanics in computing

UNIT I:

Inadequacy of classical mechanics-photoelectric effect, Compton effect, Probability density and probability current, equation of continuity; Wave function as a vector, quantum mechanical operators; bra-ket notation, Eigenvalues, Eigen functions, expectation values-Harmonic oscillator, energy levels and wave functions, Hydrogen atom model (qualitative) quantum picture of the LC-circuit, Esaki tunnel diode.

UNIT II:

Basic ideas of perturbation theory, time independent and time dependent perturbations; WKB approximation- symmetric and antisymmetric wave functions, statistics of electrons and photons.

UNIT-III:

Quantum Computation: Idea of qubit, examples of single qubit logic gates- Classical bits, Qubit as a two-level system, EPR paradox.

Suggested Books:

1. Avadhanulu M. N. and. Kshirsagar P.G, Textbook of Engineering Physics, 5th Edition (2014), S.Chand & Co. Pvt. Ltd, New Delhi

2. Leon van Dommelen, Fundamental Quantum Mechanics for Engineers, (2012)

Reference Books:

3. David K Ferry, Quantum Mechanics: An Introduction for Device Physicists and Electrical Engineers, Second Edition (2001), Institute of Physics Publishing, Bristol
4. Paul Sanghera, Quantum Physics for Scientists and Technologists (2011) John Wiley and Sons Ltd, Hoboken, United States
5. David J.Griffiths, .Introduction to Quantum Mechanics, 2nd Edition (2014), Pearson Education Ltd, USA.