VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Ibrahimbagh, Hyderabad-31

DEPARTMENT OF PHYSICS

B.E Syllabus for **CSE** and **IT** Branches w.e.f 2021-2022

SEMICONDUCTOR PHYSICS AND OPTOELECTRONIC DEVICES

L : T : P	Credits	CIE		SEE		Course Code
		Marks	Exam Duration	Marks	Exam Duration	
3 :0 : 0	03	40	90 min	60	03 hours	U21BS110PH
CIE	Assignments (03)		Quizzes (03)	Internal Exams (02)		Total CIE Marks
Ave. Marks	05		05	30		40

CO code	Course Objectives	Course Outcomes	Highest BTL
BS110PH.1	Demonstrate the use of crystal structure in device applications.	Classify crystals based on their structure and apply effects of defects on manipulation of properties of solids.	3
BS110PH.2	Appreciate the merits of quantum mechanics over classical mechanics.	Apply Schrodinger wave equation to quantum mechanical systems and obtain eigen values.	4
BS110PH.3	Explain classification of solids based on band theory of solids.	Illustrate types of semiconductors along with energy band diagrams.	2
BS110PH.4	Describe working of optoelectronic devices	Categorize optoelectronic devices and explain their device structure	2
BS110PH.5	Distinguish types of optical fibers and list loses optical fibers	Summarize merits and demerits of optical fibers and interpret losses in optical fibers.	2

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	3	2	-	-	-	-	-	-	-	1	-	1	1
CO2	2	2	-	-	-	-	-	-	-	1	-	1	1
CO3	3	2	-	-	-	-	-	-	-	1	-	2	1
CO4	2	1	1	-	-	-	-	-	-	1	-	2	1
CO5	3	1	-	-	-	-	-	-	-	1	-	1	1

UNIT-I: FUNDAMENTALS OF CRYSTALLOGRAPHY (10 hours)

Introduction-Space lattice, Basis, primitive and non-primitive unit cells, Bravais lattices and crystal systems, Miller Indices, expression for inter planar spacing (d_{hkl}), X-ray diffraction: Bragg's law, powder x- ray diffraction, crystalline, polycrystalline and amorphous materials, Diamond Structure, Point Defects, expression for concentration of Schottky and Frankel defects.

UNIT-II: INTRODUCTION TO QUANTUM MECHANICS AND SOLID STATE PHYSICS (12 hours)

Quantum Mechanics: Wave-particle duality, de Broglie Hypothesis, uncertainty principle, wave function and its significance, bra and ket vector notation, Schrodinger time dependent and independent wave equations, basics of quantum mechanical operators, Eigen values and Eigen functions of infinite square-well potential (particle in a box).

HEAD
Department of Physics
University College of Science
Osmania University,
Hyderabad 500 007, T.S.

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad - 500007

Solid State Physics: Band theory, Kronig-Penny model-introduction to origin of band gap, E-k diagram, effective mass, energy bands in solids and classification of materials as conductors, semiconductors, and insulators.

UNIT-III: SEMICONDUCTOR PHYSICS (10 hours)

Intrinsic semiconductors, extrinsic semiconductors-doping, acceptor and donor impurities, Fermi energy level, density of states, expression for intrinsic and extrinsic carrier concentration (equilibrium carrier statistics), conductivity of intrinsic and extrinsic semiconductor, law of mass action, variation of Fermi level with doping and temperature, Direct and indirect band gap semiconductors, non- radiative and radiative recombination in semiconductors, Hall effect and its applications, energy band diagram of an unbiased PN junction.

UNIT-IV: OPTOELECTRONIC DEVICES (14 hours)

Light Emitting Diode (LED): Electro-luminescence, differences between homo and hetero junction LEDs, construction and working of homo junction LED, characteristics of LED, quantum efficiency of LED, advantages and applications of LED.

Lasers: induced absorption, spontaneous and stimulated emissions, characteristics of lasers, meta-stable states, population inversion, pumping, components of laser, types of lasers, construction and working of Ruby laser, He-Ne laser, semiconductor laser, advantages, and applications of lasers.

Photodetectors: Principle of a photodetector, construction and working of a photo-detectors:- photo-diode and PIN diode, applications of photo-detectors.

Solar Cell: Photovoltaic effect, construction and working of solar cell, V-I characteristics of solar cell, conversion efficiency, fill factor, generations of solar cells, applications of solar cells.

UNIT-V: FIBER OPTICS (08 hours)

Introduction, total internal reflection, propagation of light in optical fibre, numerical aperture, acceptance angle, types of optical fibres, evanescent field, light sources for optical fibers, various signal losses in optical fibers: Attenuation-Absorption, Scattering, bending, alignment losses, Signal distortion: intermodal and intra model dispersions, block diagram of optical communication system, advantages and application of optical fibers.

Learning Resources:

1. Charles Kittel, Introduction to Solid State Physics, 7th Edition, John Wiley & Sons, 2008.
2. Arthur Beiser, Shobhit Mahajan and S Rai Choudhury, Concepts of Modern Physics, Tata McGraw 6th Edition Tata McGraw,2009.
3. Donald A Neamen, Semiconductor Physics and Devices, , 3rd Edition, Tata McGraw 2008.
4. S.O. Kasap, Optoelectronic and Photonics: Principles and Practices, Pearson, 2012
5. Gerd Keiser, Optical Fiber Communications, 4th edition, Tata McGraw, 2010
6. M.N. Avadhanulu and P.G. Kshirsagar and TVS Arun, Murthy A Textbook Engineering Physics, 11th Edition, S. Chand, 2018.
7. R. Murugeshan and K Sivaprasath, Modern Physics, S. Chand, 18th Edition, 2019.
8. M.R Shenoy, NPTEL MOOCS course, Semiconductor opto-electronics. 2020

HEAD
Department of Physics
University College of Science
Osmania University,
Hyderabad-500 007, T.S.

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad - 500007
T.S.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Ibrahimbagh, Hyderabad-31

DEPARTMENT OF PHYSICS

B.E Syllabus for **Civil Engineering** Branch w.e.f 2021-22

APPLIED PHYSICS

L : T : P	Credits	CIE		SEE		Course Code
		Marks	Exam Duration	Marks	Exam Duration	
3 :0 : 0	03	40	90 min	60	03 hours	U21BS120PH
CIE	Assignments (03)		Quizzes (03)		Internal Exams (02)	Total CIE Marks
Ave. Marks	05		05		30	40

CO code	Course Objectives	Course Outcomes	Highest BTL
BS120PH.1	Explain mathematical formulations of waves and oscillations.	Interpret behavior of mechanical oscillators with and without damping effects	2
BS120PH.2	State principles of interference, diffraction and polarization of light.	Outline the principles of wave optics and their applications	1
BS120PH.3	Comprehend lasing action and relate use of lasers in optical fiber communications.	Compare different types of lasers and use of light sources in optical fiber communication	3
BS120PH.4	Describe good acoustics required for a hall.	Explain production of ultrasonics and summarize good building acoustics	2
BS120PH.5	Interpret the advantages of using sensors in civil engineering.	List various sensors used in structural health monitoring	3

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	3	3	-	-	-	-	-	-	-	1	-	1	1
CO2	3	2	-	-	-	-	-	-	-	1	-	1	1
CO3	2	2	-	-	-	-	-	-	-	1	-	1	1
CO4	3	2	-	-	-	-	-	-	-	1	-	1	1
CO5	2	1	1	-	-	-	-	-	-	1	-	1	1

UNIT-I: OSCILLATIONS (10 hours)

Definition of SHM, equation of motion and it solution to simple harmonic oscillator, energy of simple harmonic oscillator, equation of motion and it solution to damped harmonic oscillator, logarithmic decrement, energy of damped oscillator, relaxation time, equation of motion and it solution to forced harmonic oscillator, Resonance, Q-factor, sharpness, electromechanical analogy.

UNIT-II: WAVE OPTICS (10 hours)

Interference: superposition principle, coherence, conditions for interference, interference due to thin parallel film, Newton's rings, and its applications.

Diffraction: Phenomenon of diffraction of light, differences between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction due to a single slit- diffraction due to N- slits (plane transmission grating)-Rayleigh criterion for limit of resolution, resolving power.

Polarization: Polarization of light, types of polarized light, Brewster law, Malus law, double refraction, construction and working of Nicol's Prism, action of Polarizer and analyzer, Quarter wave and Half wave plates.

Department of Physics
University College of Science
Osmania University
Hyderabad - 500 007, T.S.

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad - 500007
T.S.

Head, Dept. of Physics
Vasavi College of Engineering
Ibrahim Bagh, Hyderabad-31

UNIT-III: LASERS AND OPTICAL FIBRES (10 hours)

Lasers: induced absorption, spontaneous and stimulated emissions, Properties of laser light, population inversion, meta-stable states, pumping mechanisms, components of laser, construction and working of Ruby laser, He-Ne laser, and CO_2 lasers, advantages and applications of lasers.

Optical Fibers: Introduction, total internal reflection, propagation of light in optical fibre, numerical aperture, acceptance angle, types of optical fibres, evanescent field, light sources for optical fibers, various signal losses in optical fibers: Attenuation-Absorption, Scattering, bending, alignment losses, Signal distortion: intermodal and intra model losses. Block diagram of optical communication system, advantages and application of optical fibers.

UNIT-IV: ACOUSTICS (10 hours)

Architectural Acoustics: sound, classification of sound: musical sounds and noise, Characteristics of musical sound-pitch, loudness, timbre, sound intensity, sound pressure levels, phon, Sone, reverberation time, Sabine's formula, sound absorbent materials, absorption coefficient, conditions for good acoustics of a building-acoustic quieting: effects and remedies

Ultrasonics: properties of ultrasonics, types of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics by piezoelectric, Kundt's tube, flame test, thermal detector, applications of ultrasonics: SONAR, cavitation (cleaning), drilling, sonogram

UNIT-V: SENSORS FOR STRUCTURAL HEALTH MONITORING (10 hours)

Introduction to Structural Health Monitoring (SHM), Types of sensors, Vibrating Wire Traducers, Fiber Optic Sensors, Accelerometer, Linear Variable Differential Transformer (LVDT), Load Cells, Strain Gauges in Structural Health Monitoring, Inclinometer (Slope Indicator), Tiltmeter, Acoustic Emission Sensor, Temperature Sensors

Learning Resources:

1. J Walker, D., Halliday and R Resnick, Principles of Physics, 10th edition, Wiley, 2016,
2. Jewett and Serway, Physics for Scientists and Engineering, 7th edition, 2012.
3. A. P. French, Vibration's and Waves, CRC Press, 2003
4. M.N. Avadhanulu and P.G. Kshirsagar and TVS Arun Murthy A Text Book Engineering Physics, 11th Edition, S. Chand, 2018.
5. Senior, Optical Fiber Communications: Principles and Practice, 3rd Edition, Pearson, 2010
6. Gerd Keiser, Optical Fiber Communications, 4th edition, Tata McGraw, 2010

HEAD
Department of Physics
University College of Science
Osmania University,
Hyderabad - 500 007, T.S.

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad. - 500007
T.S.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Ibrahimbagh, Hyderabad-31

DEPARTMENT OF PHYSICS

B.E Syllabus for **ECE** and **EEE** Branches w.e.f 2021-22

QUANTUM MECHANICS AND MATERIAL SCIENCE

L : T : P	Credits	CIE		SEE		Course Code
		Marks	Exam Duration	Marks	Exam Duration	
3 : 0 : 0	03	40	90 min	60	03 hours	U21BS210PH
CIE	Assignments (03)		Quizzes (03)		Internal Exams (02)	Total CIE Marks
Ave. Marks	05		05		30	40

CO code	Course Objectives	Course Outcomes	Highest BTL
BS210PH.1	Demonstrate the use of crystal structure in device applications.	Classify crystals based on their structure and their appropriate uses	3
BS210PH.2	Appreciate the advantages of quantum mechanics over classical mechanics.	Apply Schrodinger wave equations to quantum mechanical systems.	3
BS210PH.3	Explain classification of solids based on band theory of solids.	Distinguish materials based on band theory of solids and explain energy band structure of semiconductors.	2
BS210PH.4	Distinguish types and uses of lasers and optical fibers	Compare different types of lasers and illustrate use of light sources in optical fibres.	2
BS210PH.5	Choose appropriate dielectric, magnetic and superconducting materials for required applications	Select various dielectric, magnetic and super conducting materials for specific applications in engineering.	3

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	3	3	-	-	-	-	-	-	-	1	-	1	1
CO2	2	2	-	-	-	-	-	-	-	1	-	1	1
CO3	3	2	-	-	-	-	-	-	-	1	-	1	1
CO4	3	1	-	-	-	-	-	-	-	1	-	1	1
CO5	2	1	1	-	-	-	-	-	-	1	-	1	1

UNIT-I: FUNDAMENTALS OF CRYSTAL STRUCTURE (12 hours)

Introduction-Space lattice, Basis, Unit cell, Bravais lattices and crystal systems, X-ray diffraction, Bragg's law, powder x- ray diffraction-derivation of lattice parameters for cubic crystals, crystalline, polycrystalline and amorphous materials, Miller Indices, inter-planar spacing. Defects in crystals: point defects, expression for concentration of Schottky and Frankel defects, NaCl, Diamond and ZnS crystal structure.

UNIT-II: INTRODUCTION TO QUANTUM MECHANICS (10 hours)

Inadequacy of classical mechanics, Wave-particle duality, de Broglie waves, Davisson and Germer's experiment, G.P. Thomson experiment, wave packet, uncertainty principle, wave function and its physical significance, bra and ket notation, basics of quantum mechanical operators, Time-dependent and time-independent Schrodinger equations, Eigen values and eigen functions of a particle in infinite square-well potential, potential barrier: tunneling effect.

HEAD
Department of Physics
University College of Science
Osmania University
Hyderabad - 500 007. T.S

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad - 500007
T.S.

Head, Dept. of Physics
Vasavi College of Engineering
Ibrahimbagh, Hyderabad-31

UNIT-III: BAND THEORY OF SOLIDS (8 hours)

Classical free electron Drude theory and its limitations, Somerfield theory, Fermi-Dirac Statistical distribution, Density of states, Kronig-Penney model- introduction to origin of band gaps in solids, E-k diagram, formation of energy bands, Classification of solids based on energy bands as metals, semiconductors, and insulators, intrinsic and extrinsic semiconductors, expression for carrier concentration in intrinsic and extrinsic semiconductors, conductivity of intrinsic and extrinsic semiconductors, law of mass action, variation of Fermi energy level with temperature and doping concentration.

UNIT-IV: LASERS AND OPTICAL FIBRES (10 hours)

Lasers: induced absorption, spontaneous and stimulated emissions, Einstein's A and B coefficients; characteristics of lasers, population inversion, meta-stable states, pumping mechanisms, components of laser, Properties of laser beam, construction and working of Ruby laser, He-Ne (gas Laser) and semiconductor laser, advantages and applications of lasers.

Optical Fibres: Introduction, total internal reflection, propagation of light in optical fibre, numerical aperture, acceptance angle, types of optical fibres, evanescent field, light sources for optical fibers, various signal losses in optical fibers: Attenuation-Absorption, Scattering, bending, alignment losses, Signal distortion: intermodal and intra model losses. Block diagram of optical communication system, advantages and application of optical fibers.

UNIT-V: MATERIALS SCIENCE (12 hours)

Dielectric Materials: Polar and non-polar dielectrics, types of dielectric polarizations, Expressions for electronic polarizability and ionic polarizability, Frequency and temperature dependence of dielectric polarizations, applications of dielectric materials.

Magnetic Materials: Origin of magnetism, classification of various magnetic materials, Ferro, antiferro and ferri-magnetic materials, Weiss molecular field theory of ferromagnetism- magnetic domains- hysteresis curve-Soft and hard magnetic Materials, fundamentals of Ferrites and their applications.

Superconductivity: Superconductor, General properties of super conductors – Meissner effect- Type I and Type II superconductors-fundamentals of BCS Theory - Josephson's Junction- d.c and a.c Josephson's effects–SQUIDS- Applications of superconductors

Learning Resources:

1. Charles Kittel, Introduction to Solid State Physics, 7th Edition, John Wiley & Sons, 2008.
2. S O Pillai, Solid State Physics, 8th edition, New Age International Publishers, 2018
3. R. Murugeshan and K Sivaprasath, Modern Physics, 18th Edition, S. Chand & Co, 2016
4. M.N. Avadhanulu and P.G. Kshirsagar and TVS Arun Murthy A Text Book Engineering Physics, 11th Edition, S. Chand, 2018.
5. S.O. Kasap, Optoelectronic and Photonics: Principles and Practices, Pearson, 2012
6. Arthur Beiser, Shobhit Mahajan and S Rai Choudhury, Concepts of Modern Physics, 6th Edition Tata McGraw, 2009.
7. Senior, Optical Fiber Communications: Principles and Practice, 3rd edition, Pearson, 2010
8. NPTEL MOOCS, Introduction to Solid State Physics, Satyajit Banerjee

HEAD
Department of Physics
University College of Science
Osmania University
Hyderabad - 500 007, T.S

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad 500007

Head, Dept. of Physics
Vasavi College of Engineering
Ibrahim Bagh, Hyderabad-31

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Ibrahimbagh, Hyderabad-31

DEPARTMENT OF PHYSICS

B.E Syllabus for **Mechanical Engineering** Branch w.e.f 2021-22
ENGINEERING PHYSICS

L : T : P	Credits	CIE		SEE		Course Code
		Marks	Exam Duration	Marks	Exam Duration	
3 :0 : 0	03	40	90 min	60	03 hours	U21BS220PH
CIE	Assignments (03)		Quizzes (03)		Internal Exams(02)	Total CIE Marks
Ave. Marks	05		05		30	40

CO code	Course Objectives	Course Outcomes	Highest BTL
BS220PH.1	Explain mathematical formulations of waves and oscillations	Interpret behavior of mechanical oscillators with and without damping	2
BS220PH.2	State principles of interference, diffraction and polarization of light	Outline the principles of wave optics and their applications	1
BS220PH.3	Comprehend lasing action and relate use of lasers in optical fiber communications.	Compare different types of lasers and illustrate use of light sources in optical fiber communication	3
BS220PH.4	Describe good acoustics required for a hall	Explain production of ultrasonics and summarize good building acoustics	2
BS220PH.5	Summarize the principles of liquefaction of gasses	Describe liquefaction of gases and their significant applications	2

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	3	3	-	-	-	-	-	-	-	1	-	1	1
CO2	3	3	-	-	-	-	-	-	-	1	-	1	1
CO3	2	2	-	-	-	-	-	-	-	1	-	1	1
CO4	3	2	-	-	-	-	-	-	-	1	-	1	1
CO5	2	2	-	-	-	-	-	-	-	1	-	1	1

UNIT-I: OSCILLATIONS (10 hours)

Definition of SHM, equation of motion and it solution to simple harmonic oscillator, energy of simple harmonic oscillator, equation of motion and it solution to damped harmonic oscillator, logarithmic decrement, energy of damped oscillator, relaxation time, equation of motion and it solution to forced harmonic oscillator, Resonance, Q-factor, sharpness, electromechanical analogy.

UNIT-II: WAVE OPTICS (10 hours)

Interference: superposition principle, coherence, conditions for interference, interference due to thin parallel film, Newton's rings, and its applications.

Diffraction: Phenomenon of diffraction of light, differences between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction due to a single slit- diffraction due to N-slits (plane transmission grating)-Rayleigh criterion for limit of resolution, resolving power.

Polarization: Polarization of light, types of polarized light, Brewster law, Malus law, double refraction, construction and working of Nicol's Prism, action of Polarizer and analyzer, Quarter wave and Half wave plates.

HEAD
Department of Physics
University College of Science
Osmania University
Hyderabad-500 007 T.S

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad - 500007
T.S.

UNIT-III: LASERS AND OPTICAL FIBRES (10 hours)

Lasers: induced absorption, spontaneous and stimulated emissions, Properties of laser light, population inversion, meta-stable states, pumping mechanisms, components of laser, construction and working of Ruby laser, He-Ne laser, and CO_2 lasers, advantages and applications of lasers.

Optical Fibers: Introduction, total internal reflection, propagation of light in optical fibre, numerical aperture, acceptance angle, types of optical fibres, evanescent field, light sources for optical fibers, various signal losses in optical fibers: Attenuation-Absorption, Scattering, bending, alignment losses, Signal distortion: intermodal and intra model losses. Block diagram of optical communication system, advantages and application of optical fibers.

UNIT-IV: ACOUSTICS (10 hours)

Acoustics: sound, classification of sound: musical sounds and noise, Characteristics of musical sound-pitch, loudness, timbre, sound intensity, sound pressure levels, phon, Sone, reverberation time, Sabine's formula, sound absorbent materials, absorption coefficient, conditions for good acoustics of a building-acoustic quieting: effects and remedies

Ultrasonics: properties of ultrasonics, types of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics by piezoelectric, Kundt's tube, flame test, thermal detector, applications of ultrasonics: SONAR, cavitation (cleaning), drilling, sonogram

UNIT-V: LOW TEMPERATURE PHYSICS (10 hours)

Introduction to low temperature Physics- Porous plug experiment: Joule Thomson effect, Theory of porous plug experiment- J-K effect for a Van der Waal's gas, J-K effect for real gas, Inversion temperature, Boyle temperature, critical temperature and relationship between them. Regenerative cooling and cascade process, Liquefaction of air by Linde Process, Liquefaction of helium, Properties of cryogenic helium, adiabatic demagnetization, Applications of cryogenic liquids.

Learning Resources:

1. J Walker, D., Halliday and R Resnick, Principles of Physics, 10th edition, Wiley, 2016,
2. Jewett and Serway, Physics for Scientists and Engineering, 7th edition, 2012.
3. A. P. French, Vibration's and Waves, CRC Press, 2003
4. M.N. Avadhanulu and P.G. Kshirsagar and TVS Arun Murthy, A Textbook Engineering Physics, 11th Edition, S. Chand, 2018.
5. Senior, Optical Fiber Communications: Principles and Practice, 3e: Pearson, 2010
6. B.K. Pandey, S. Chaturvedi, Engineering Physics, Cengage Learning, 2012

HEAD
Department of Physics
University College of Science
Osmania University,
Hyderabad - 500 007. T.S.

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad - 500007
T.S.

Head Dept. of Physics
Vasavi College of Engineering
Ibrahim Bagh, Hyderabad

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Ibrahimbagh, Hyderabad-31

DEPARTMENT OF PHYSICS

B.E Syllabus for **CSE and IT Branches** w.e.f academic year 2021-2022

SEMICONDUCTOR OPTOELECTRONICS LAB

L : T : P	Credits	CIE Marks	SEE Marks	Semester	Course Code
0 : 0 : 2	01	30	50	I	U21BS111PH

Course Objectives	Course Outcomes	BTL
	The students acquire the ability to	
• to study and discuss the characteristics of a given device	1. Conduct experiment independently and in team to record the measurements.	2
• to identify probable errors and take in the readings and known possible precautions	2. Outline the precautions required to be taken for each experiments	1
• to compare the experimental and theoretical values and draw possible conclusions.	3. Compare the experimental results with standard values and estimate errors.	2
• To interpret the results from the graphs drawn using experimental values.	4. Draw graphs and interpret the results with respect to graphical and theoretical values	2
• To write the record independently with appropriate results.	5. Write the summary of the experiment and draw appropriate conclusions	1

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	2	-	-	1	1	-	-	-	1	-	-	1	1
CO2	3	-	-	-	-	-	-	-	-	-	-	1	1
CO3	2	2	-	1	1	-	-	1	-	-	-	1	1
CO4	3	-	-	-	1	-	-	-	-	-	-	1	1
CO5	2	-	-	-	-	-	-	1	-	1	-	1	1

1. Study I-V characteristics of P-N Junction diode
2. Study I-V characteristics of Zener Diode
3. Determination of wavelength of Semiconductor lasers.
4. Calculation of numerical aperture, acceptance angle and power loss due to bending of an optical fibre.
5. Study of I-V characteristics of LED
6. Study of I-V characteristics of solar cell and to calculate fill factor and efficiency
7. Study I-V Characteristics of Photodiode at different intensities
8. Determination of Planck's constant using Photocell
9. Determination of Hall's coefficient- Hall's effect
10. Study of resonance in LCR series and to find resonant frequency & Q- factor
11. Study of resonance in LCR parallel and to find resonant frequency & Q- factor
12. Helmholtz coil –calculation of magnetic field along the axis of solenoid
13. Determination of energy gap of a given semiconductor by four probe method
14. Estimation of Thermistor constants
15. Determination of e/m of electron by Thomson's method

Each student should perform at least 12 (Twelve) experiments.

HEAD
Department of Physics
University College of Science
Osmania University
Hyderabad - 500 007, T.S.

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad - 500007
T.S.

Head, Dept. of Physics
Vasavi College of Engineering
Ibrahimbagh, Hyderabad-31

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Ibrahimbagh, Hyderabad-31

DEPARTMENT OF PHYSICS

B.E Syllabus for **ECE and EEE Branches** w.e.f academic year 2021-2022

ENGINEERING PHYSICS LAB

L : T : P	Credits	CIE Marks	SEE Marks	Semester	Course Code
0 : 0 : 2	01	30	50	II	U21BS211PH

Course Objectives	Course Outcomes	BTL
	The students acquire the ability to	
• to study and discuss the characteristics of a given device • to identify probable errors and take in the readings and known possible precautions • to compare the experimental and theoretical values and draw possible conclusions. • To interpret the results from the graphs drawn using experimental values. • To write the record independently with appropriate results.	1. Conduct experiment independently and in team to record the measurements. 2. Outline the precautions required to be taken for each experiments 3. Compare the experimental results with standard values and estimate errors. 4. Draw graphs and interpret the results with respect to graphical and theoretical values 5. Write the summary of the experiment and draw appropriate conclusions	2 1 2 2 1

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	2	-	-	1	1	-	-	-	1	-	-	1	1
CO2	3	-	-	-	-	-	-	-	-	-	-	1	1
CO3	2	2	-	1	1	-	-	1	-	-	-	1	1
CO4	3	-	-	-	1	-	-	-	-	-	-	1	1
CO5	2	-	-	-	-	-	-	1	-	1	-	1	1

1. Determination of wavelength of He-Ne lasers.
2. Determination of radius of curvature of a given Plano-convex lens by forming Newton's Rings.
3. Calculation of numerical aperture, acceptance angle and power loss due to bending of an optical fibre.
4. Study of I-V characteristics of P-N Junction diode
5. Study of I-V characteristics of LED
6. Determination of energy gap of a given semiconductor by four probe method
7. Study of I-V characteristics of solar cell and to calculate fill factor and efficiency
8. Determination of Hall's coefficient using Hall's effect
9. Determination of e/m of an electron by Thomson's method
10. Study of resonance in LCR series circuit and to find resonant frequency & Q- factor
11. Study of resonance in LCR Parallel circuit and to find resonant frequency & Q- factor
12. Estimation of Thermistor constants
13. determination of Seebeck coefficient
14. Helmholtz coil –calculation of magnetic field along the axis of a solenoid
15. B-H curve-estimation of Hysteresis loss of a ferromagnetic sample

Each student should perform at least 12 (Twelve) experiments.

HEAD
Department of Physics
University College of Science
Osmania University
Hyderabad - 500007 T.S.

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad - 500007
T.S.

Head, Dept. of Physics
Vasavi College of Engineering
Ibrahim Bagh, Hyderabad-31

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Ibrahimbagh, Hyderabad-31
DEPARTMENT OF PHYSICS

B.E Syllabus for **Civil and Mechanical Branches** w.e.f academic year 2021-2022

APPLIED PHYSICS LAB

L : T : P	Credits	CIE Marks	SEE Marks	SEE Duration	Course Code
0 : 0 : 2	01	30	50	3 hours	U21BS011PH

Course Objectives	Course Outcomes	BTL
	The students acquire the ability to	
• to study and discuss the characteristics of a given device	1. Conduct experiment independently and in team to record the measurements.	2
• to identify probable errors and take in the readings and known possible precautions	2. Outline the precautions required to be taken for each experiments	1
• to compare the experimental and theoretical values and draw possible conclusions.	3. Compare the experimental results with standard values and estimate errors.	2
• To interpret the results from the graphs drawn using experimental values.	4. Draw graphs and interpret the results with respect to graphical and theoretical values	2
• To write the record independently with appropriate results.	5. Write the summary of the experiment and draw appropriate conclusions	1

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	2	-	-	1	1	-	-	-	1	-	-	1	1
CO2	3	-	-	-	-	-	-	-	-	-	-	1	1
CO3	2	2	-	1	1	-	-	1	-	-	-	1	1
CO4	3	-	-	-	1	-	-	-	-	-	-	1	1
CO5	2	-	-	-	-	-	-	1	-	1	-	1	1

1. Determination of moment of inertia of a Fly Wheel
2. Estimation of errors in the time period and determination of 'g' using Simple pendulum
3. Torsional Pendulum to calculate rigidity modulus of material of a wire.
4. Determination of frequency of electrically maintained Tuning fork- Melde's experiment
5. Determination of radius of gyration and acceleration due to gravity using Compound Pendulum.
6. Determination of wavelength of Semiconductor lasers.
7. Determination of radius of curvature of a Plano-convex lens by forming Newton's Rings.
8. Determination of wavelength under normal incidence method using diffraction grating
9. Determination of specific rotation of an optically active solution by polarimeter
10. Calculation of numerical aperture, acceptance angle and power loss due to bending of an optical fibre.
11. Study of I-V characteristics of P-N Junction diode
12. Estimation of Thermistor constants
13. Study of I-V characteristics of solar cell and to calculate fill factor and efficiency
14. Gyroscope- study of gyroscopic effects.
15. Determination of wavelength of a light source by Michelson interferometer

Each student should perform at least 12 (Twelve) experiments.

HEAD
Department of Physics
University College of Science
Osmania University
Hyderabad - 500 007. T.S.

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad - 500007
T.S.

Vasavi College of Engineering
Ibrahim Bagh, Hyderabad-31

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF PHYSICS
Open elective Course
SMART MATERIALS AND APPLICATIONS

L : T : P	Credits	CIE		SEE		Course Code
		Marks	Exam Duration	Marks	Exam Duration	
02 :0 :0	02	40	90 min	60	3hours	U21OE310PH
CIE	Assignments (02)		Quizzes (02)	Internal Exams(02)		Total CIE Marks
Ave. Marks	05		05	30		40

Course Objectives	Course Outcomes	BTL
The student will be able to	**the student should at least be able:**	
1. grasp the concepts of peizo and ferro electric materials	1. summarize various properties and applications of peizo and ferro electric materials	2
2. Learn fundamentals of pyro and thermo electric materials	2. apply fundamental principles of pyro and thermo electricity in relevant fields of engineering	3
3. gain knowledge on shape memory alloys	3. Explain types of shape memory alloys and their properties and applications	3
4. acquire fundamental knowledge on chromic materials	4. Outline the importance of chromic materials in engineering fields.	2

UNIT I: PIEZO AND FERRO MATERIALS (8 hours)

Piezo electric effect and inverse piezoelectric effect, Piezo electric materials, Structure of Quartz crystal, Piezoelectric oscillator, Magnetostriction, Magnetostriction oscillator, piezo-electric sensors, applications of Piezo-electric materials.

Characteristics and properties of ferro-electric materials, Structure of Barium Titanate, Curie-Weiss law, applications of Ferro electric materials

UNIT II: PYRO AND THERMO-ELECTRIC MATERIALS (6 hours)

Pyroelectricity: pyro electric effect, pyro electric materials, pyro-electric sensors.

Thermoelectricity: thermoelectric effect, Seebeck effect, Peltier effect, thermocouple and laws of thermocouples, Principle and working of thermoelectric generator and Thermoelectric cooler, applications of thermoelectric materials

UNIT III: SHAPE MEMORY MATERIALS (8 hours)

Introduction to shape memory alloys (SMA)- Shape Memory Effect (SME) different phases of Shape memory alloys, Austenite, Martensite, Properties and characteristics of engineering SMAs, Super elasticity, one and two way shape memory effects, Properties of Ni-Ti shape memory alloy, Cu-based shape memory alloys, biomedical Materials and their applications, Advantages, disadvantages of SMAs, Applications of SMAs.

UNIT-IV: (6 hours)

Electro-chromaticity, Electro-chromic materials, Electro-chromic sensors and devices.
Photo-chromaticity, Photo-chromic materials, Photo-chromic sensors and devices.
Thermo-chromaticity, thermo-chromic materials, thermo-chromic sensors and devices.
Smart fluids: Magneto-rheological and Electro-rheological fluids.

Learning Resources:

1. K. Otsuka and C M Wayman, Shape memory materials, Cambridge university press, 1998.
2. T W Duerig, K N Melton, D Stockel, C M Wayman, Engineering aspects of shape memory alloys, Butterworth-Heinemann, 1990
3. A.K. Sawhney, A Course in Electronic Measurements and Instrumentation, Dhanpat Rai & Sons, 2015
4. D. Patranabis, Sensors and Transducers, PHI Learning Pvt. Ltd., 2013

Department of Physics
University College of Science
Osmania University,
Hyderabad-500007, T.S.

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad - 500007
T.S.

Head, Dept. of Physics
Vasavi College of Engineering
Ibrahim Bagh, Hyderabad-31

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF PHYSICS

Open elective Course
THIN FILM TECHNOLOGY AND APPLICATIONS

L : T : P	Credits	CIE		SEE		Course Code
		Marks	Exam Duration	Marks	Exam Duration	
03 :0 :0	03	40	90 min	60	3hours	U21OE510PH
CIE	Assignments (03)		Quizzes (03)		Internal Exams(02)	Total CIE Marks
Ave. Marks	05		05		30	40

Course Objectives	Course Outcomes	BTL
Students are able to	***The students acquire the ability to***	
1. Learn the fundamental atomistic mechanisms.	1. State fundamental definitions of thin film technology	1
2. Narrate thin film deposition techniques	2. Describe thin film deposition techniques	
3. Acquire knowledge on thin film devices	3. Illustrate thin film devices and their use	2
4. Appreciate applications of thin films	4. Apply thin films coatings for a variety industrial applications	3 3

UNIT-I: THIN FILM GROWTH

Classification of films- formation of thin films- Condensation and nucleation, growth and coalescence of islands, -nucleation theories: capillarity and atomistic models, sticking coefficient, adhesion, substrate effect, film thickness effect.

UNIT-II: DEPOSITION TECHNIQUES

Thin film deposition techniques- simple thermal evaporation- Chemical vapor deposition technique- Advantages and disadvantages of Chemical Vapor deposition (CVD), physical vapour deposition electron beam evaporation- RF sputtering, flash evaporation, Laser ablation- spin coating- molecular beam epitaxy (MBE), Spin coating, Film thickness measurement-ellipsometry, quartz crystal oscillator techniques, structure and microstructure of thin films.

UNIT-III: THIN FILM MATERIAL CHARACTERIZATION TECHNIQUES

Characterization techniques: X-Ray Diffraction (XRD), working principles of Scanning Electron Microscopy (SEM), working of Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM).

UNIT-IV: PROPERTIES OF THIN FILMS

Electrical conduction in continuous and discontinuous metallic thin films. Transport and optical properties of metallic, semiconducting and dielectric films.

UNIT-V: THIN FILM DEVICES AND APPLICATIONS

Anti-reflection coatings, fabrication of thin film resistor, capacitor, diode, gas sensors and temperature sensors. Thin film solar cells, Quantum well and Quantum dot solar cells. Application of thin films in different areas such as electronics, medical, defense, sports, automobiles, applications of thin films in various fields etc.

Learning resources:

1. Kasturi Chopra Thin Film Device Applications, Mac Graw Hill, New York, 2012
2. A. Goswami, thin film fundamentals, New age international, 2006

HEAD
Department of Physics
University College of Science
Osmania University
Hyderabad - 500 007, T.S

CHAIRMAN
Board of Studies in Physics
Osmania University
Hyderabad - 500007
T.S.

Head, Dept. of Physics
Vasavi College of Engineering
Ibrahim Bagh, Hyderabad-31