2021-2022

21PHP01	CLASSICAL MECHANICS	SEMESTER	LEVEL
CO1	recall important terms such as Constraints, Degree of Freedom, Phase Space, angular Momentum and Poissons bracket	1	K1
CO2	illustrate D'Alembert's principle, Hamilton's Canonical Equation of Motion, Poisson Brackets, Principle of Least Action, Equivalent One body problem, Euler's theorem, Euler's angles, Kepler's Problem - Shapes of orbits		K2
CO3	apply Lagrange's and Hamilton's equation of motion in Linear Harmonic Oscillator, Simple Pendulum, Isotropic Oscillator, HJ method in Harmonic Oscillator		K3
CO4	analyze Inertial/Non inertial frames, Stable and Unstable Equilibrium, The motion of a Symmetric Top under the action of Gravity, Equation of motion in Poisson Bracket form		K4
CO5	evaluate the Hamilton's Variational principle, Canonical Transformations, Generating Function and different forms, Principle Axis of Transformation, Moments and Products of Inertia		K5
CO6	Formulate Effects of Coriolis force on moving bodies.		K6

21PHP02	MATHEMATICAL PHYSICS	SEMESTER	LEVEL
CO 1	identify the basic definitions of differential Equations, Polynomials, Functions, Complex Variable and Groups	1	K 1
CO 2	summarize the Legendre's Polynomials and Functions, Orthogonality, Functions of a Complex Variable, Vector Space, Basis, Inner Product, Fourier Series, Laplace Transform, Multiplication table, Subgroups, cosets and classes, Schur's lemma, rotation groups		K 2
CO 3	perform the Special function and complex variables in various theorems and relations		K 3
CO 4	classify the functions and variables, vector space and groups		K 4
CO 5	relate the Legendre Polynomial and their derivatives		K 5
CO 6	Make Fourier Series and Laplace Transform for different problems and create character table of C2v and C3v by using groups		K 6

21PHP03	QUANTUM MECHANICS-I	SEMESTER	LEVEL
CO1	recall the limitations of Classical Physics, wave packets, wave functions, Schrödinger equation, operators and eigen values in quantum mechanical systems	1	K1
CO2	explain matrix formalisms in quantum mechanics, Schrödinger equation of motion, approximation methods and commutation relations.		K2
CO3	apply Schrödinger equation and approximation methods to solve quantum mechanical systems and to find eigen values of the systems		K3
CO4	Correlate the various approximation methods, equation of motions in Schrodinger, Heisenberg and Interaction pictures		K4
CO5	Validate the matrix representation of angular momentum operators, addition of angular momentum and Clebsch-Gordon co-efficients		K5
CO6	formulate wave functions and operators in matrix form.		K6
21PHP04	**NUMERICAL METHODS & MATLAB PROGRAMMING**	**SEMESTER**	LEVEL
CO1	remember the Differential equation by using various Numerical methods and MATLAB basics,	1	K1
CO2	explain Newton Raphson Method, Guass elimination Method, Rungekutta method, SimPOn's rule , Trapezoidal rule, Gauss Quadrature , MATLAB fundamentals, in programming and Graphics		K2
CO3	apply various numerical methods and MATLAB Help and Demos , Control flow statements, MATLAB fundamentals, programs and Graphics with 2D and 3D plots.		K3

CO4	correlate Different Techniques in Numerical methods like Giraffe's root square methods and MATLAB programs for various loops MATLAB Built-In Functions		K4
CO5	validate the different methods in Numerical Methods and fundamentals in Basic MATLAB programming and interpretation of 2D and 3D Graphics in MATLAB		K5
CO6	Adapt numerical Methods in many mathematical fields and MATLAB programming in many computerize world,		K6
21PHP05A	**ESSENTIALS OF NANOSCIENCE**	**SEMESTER**	LEVEL
CO1	recall the basic concepts of Nano science, Nanotechnology and Nanoscale, Introduction to polymers	1	K1
CO2	explain the Nano material and its structure, properties, importance and applications.		K2
CO3	apply the fabrication methods to synthesis the new nano particles		K3
CO4	infer the chemical interactions, quantum confinement and emission characteristics of semi-conductor nano crystals		K4
CO5	verify the nanoparticles dimension and justify quantum dot , core shell nano particles and carbon nano tubes		K5
CO6	create the nano particles and nano materials in the field of agriculture and medical, other field to solve the recent problems		K6

21PHP06	**QUANTUM MECHANICS - II**	**SEMESTER**	LEVEL
CO1	recite the definitions of scattering amplitude and identical particles	2	K1
CO2	interpret the scattering process in quantum mechanical system and the application of approximation methods to atomic structure		K2
CO3	apply symmetric and anti symmetric wave functions in central field approximation and apply approximation methods to find scattering amplitude and scattering cross section		K3
CO4	justify probability and current densities and negative energy states from relativistic wave equations		K4
CO5	quantize classical and quantum mechanical equations of motions.		K5
CO6	construct symmetric and anti symmetric wave functions		K6
21PHP07	**ADVANCED ELECTRONICS**	**SEMESTER**	LEVEL
CO1	recall the logic gates, basic types of transistors, counters ,shift registers and flip-flops	2	K1
CO2	elucidate to make integrated circuits, JFET,MOSFET,SCR, optoelectronic devices by chronologically order		K2
CO3	examine basic laws of Boolean algebra, De-Margan's theorem and types of flip- flops, A/D converter, D/A converter		K3
CO4	analyze the results of integrated circuits and non-linear analog system		K4
CO5	verify the opto electronic devices such as photo register, photo diode, photo transistor and field effect transistors.		K5

CO6	create a new design of synchronous counters by using of flip- flop, karnaugh map		K6
22PHP08	**Introduction to Scientific Research & Solar Energy Research**	**SEMESTER**	LEVEL
CO1	Describe the concept of research, defining and formulating the research problem	2	K1
CO2	Narrate the significance of report writing		K2
CO3	Seek different applying technique behind solar cell and creates innovative ideas.		K3
CO4	Explore the causes and relationship between IPR and ethics of research		K4
CO5	Create new innovation on the basis of Solar energy and its applications		K5
CO6	Incorporate the creative ideas in solar energy research proposals		K6
21PHP09	**ADVANCED PHYSICS PRACTICAL-I**	**SEMESTER**	LEVEL
CO1	identify the basic concepts of experiments related to theories in Modern Physics recognize various commands and formulae in MATLAB	1 & 2	K1
CO2	illustrate the working principles of various experimental setups		K2
CO3	use different experimental setup to study various physical properties of solids and liquids apply the formulae to calculate the output values for various experiments implement the procedures of solving physical problems to write and process the MATLAB programs		K3

CO4	compare and contrast the various methods of determination of various physical constants and values correlate the relations between theoretical values and experimental observations		K4
CO5	observe the output values of the physical process using required experimental setups assess rectify the errors if any in the execution of MATLAB programs		K5
CO6	design the desired circuit to carry out the required experiment and justify the observed values rewrite the MATLAB program based on the requirements of the specific problem		K6

21PHP10	GENERAL ELECTRONICS PRACTICAL - I	SEMESTER	LEVEL
CO1	demonstrate and explain basic electrical and electronic components and different types of circuits recognize various commands and formulae in MATLAB	1 & 2	K1
CO2	interpret the working principles of the electronic circuits express the applications of diodes, OP-AMP, BJT, SCR, FET and UJT		K2
CO3	use CRO and AFO to analyze and study various waveforms and its amplitude and frequency controls apply the circuit equations to calculate the output values for various electronic circuits relate the electronic circuit analysis to write and process the MATLAB program.		K3
CO4	compare and contrast the various circuits for the specific application correlate the relations between theoretical values and experimental observations construct various electronic circuits using diodes, OP-AMP, BJT, SCR, FET and UJT		K4
CO5	measure the output values of the constructed circuits using required tools assess rectify the errors if any in the execution of MATLAB programs		K5
CO6	design the desired circuit based on the parameters and properties of the various electronic components rewrite the MATLAB program based on the requirements of the specific problem		K6

21PHP11A	ASTRONOMY & ASTROPHYSICS	SEMESTER	LEVEL
CO1	outline the history of astronomy, stars, galaxies, components of the Sun and stellar evolution	2	K1
CO2	explain the concepts in highlights of Einstein's special and general theory of relativity, fusion reaction mechanism, classification of galaxies and stages of stars		K2
CO3	classify concepts of astronomy, calculating the distance between stars, components of the Sun, galactic astronomy and stages of stars		K3
CO4	categorize the classification of galaxies and stars		K4
CO5	evaluate the science behind observation of universe		K5
CO6	elaborate the hypothesis behind the geo and helio centric theories, calculating the distance between the stars and its composition, types of galaxies and to formulate the lives and death of stars		K6
21PHP11B	**EXPERIMENTAL TECHNIQUES**	**SEMESTER**	LEVEL
CO1	recall the errors in measurements, transducers, Amplifiers, Electronic Measuring Instruments and Wave Analyzers	2	K1
CO2	explain the types of transducer, the working of Amplifiers, Electronic Measuring Instruments and Wave Analyzers		K2
CO3	apply the different types of transducers, amplifiers, electronic Measuring Instruments		K3
CO4	analyze the applications of various electronic measuring instruments		K4
CO5	evaluate appropriate methods for analyzing electronic waves and Conditioning of signals		K5
CO6	design amplifiers, filters, Electronic Measuring Instruments and Wave Analyzers		K6

21AEP01	**CYBER SECURITY**	SEMESTER	LEVEL
CO1	Recall the basic concepts of information security and its types	2	K1
CO2	Gain knowledge on cyber space issues and cyber security measures		K2
CO3	Identify various risks and threats in cyber space		K3
CO4	Apply security measures to prevent ourselves from threats in social media		K4
CO5	Compare various social media, security issues and measures		
CO6	Propose a secured cyber platform for people to connect each other for their social and professional concerns		K5
21PHP12	**ATOMIC AND MOLECULAR SPECTROSCOPY**	SEMESTER	LEVEL
CO1	outline the Atomic Spectra and Study the microwave spectra	3	K1
CO2	explain the concepts in Atomic and Molecular Spectroscopy		K2
CO3	apply the concepts to understand the properties of molecules		K3
CO4	analyze the properties of atoms and molecules using different types of Spectroscopy		K4
CO5	choose appropriate spectroscopy to analyze atoms and molecules		K5

21PHP13	**NUCLEAR & PARTICLE PHYSICS**	**SEMESTER**	LEVEL
CO1	recall the properties of nucleus, radioactive decay, fusion, fission reaction mechanism and elementary particles	3	K1
CO2	explain the concepts of nuclear theories, decay process of particles, nuclear models, fusion reactors and nuclear models		K2
CO3	classify the concepts of nuclear composition, forms of interactions inside the nucleus and models of a nucleus		K3
CO4	Analyse the classification of nuclear composition, nuclear force, properties of radioactive decays, selection rules, magic numbers, thermal reactors and for particle physics		K4
CO5	evaluate the nuclear properties, decay process, nuclear reaction mechanisms and basic conservation laws		K5
CO6	elaborate the hypothesis behind particle physics, forms of interactions and radioactive decay, nuclear energy levels and nuclear models		K6
21PHP14	**ELECTROMAGNETIC FIELD THEORY**	**SEMESTER**	LEVEL
CO1	recap the basics of electrostatics, magnetostatics and Maxwell's equation	3	K1
CO2	recognize the principles behind electrostatics in macroscopic media and Electromagnetic potentials		K2

CO3	apply different formulae in the field of electrostatics, magneto statics and relativistic electrodynamics		K3
CO4	infer innovative ideas in the field of electromagnetic theory		K4
CO5	examine the effectiveness of different laws in electromagnetic problems with the help of electrodynamic potentials		K5
CO6	Originate new theories and innovations based on electromagnetic field theory		K6
21PHP15	**INSTITUTIONAL TRAINING**	**SEMESTER**	LEVEL
CO1	Identify the problems & solutions related to Institutional Training, Article ship Training.	3	K1
CO2	Explain the principles involved in concerned Mini projects & Summarize the processes in various Industries.		K2
CO3	Solve the problems in concerned project works &also Produce excellent project report for both Institutional Training & Mini projects.		K3
CO4	Examine different types of problems,principles,Experimental techniques& applications of concerned project works.		K4
CO5	Design new machines, principles & applications for future generations& evaluate different issues related to Science & Technology.		K5
CO6	Invent new technology and use it in variour application		K6

	ENVIRONMENTAL PHYSICS	SEMESTER	LEVEL
CO1	recall the basic terms involved in Environmental Pollution and Pollution Control Techniques	2	K1
CO2	outline the basic Principles involved in Pollution Control Techniques & Conservation of renewable &non renewable energy resources		K2
CO3	apply Pollution Control Techniques to reduce pollution		K3
CO4	Analyse the different types of Pollution		K4
CO5	evaluate control measures for different types of pollution		K5
CO6	create new techniques to control Pollution		K6
22PHP16A	**BIOMEDICAL INSTRUMENTATION**	**SEMESTER**	LEVEL
CO1	recall ultrasonic resonance, Magnetic intensity, brain ,the central nervous system,Transducer, and Doppler Ultrasound.	3 & 4	K1
CO2	discuss electroencephalogram, ENT and ophthalmic instruments, Magnetic Resonance and Imaging		K2
CO3	apply the components of a typical laser system in ophthalmology.		K3
CO4	analyze the Recording of ECG waves, opthamology , ultrasound technology, magnetic resonance phenomena , magnetic relaxation and MRI parameters.		K4
CO5	evaluate the techniques behind ultrasonography, ultrasound scanning, retinoscopy and Keratometer.		K5
CO6	modifythe characteristics of the normal ECG and transducer design.		K6

22PHP16B	THIN FILM PHYSICS AND CRYSTAL GROWTH	SEMESTER	LEVEL
CO1	recall the nature of thin films, deposition and Growth Process of crystals	3	K1
CO2	explain the concepts of different Deposition techniques, stages of film growth and various characterization Techniques of crystals		K2
CO3	apply the required deposition technique of thin films and growth technique of crystals		K3
CO4	analyze the thickness of the film and the growth and structure of a crystal,		K4
CO5	evaluate the defects and impurities in films and crystals, deposition parameters and grain size of thin films, Growth Techniques of crystal		K5
CO6	Prepare a thin film, grow a crystal		K6
21PEP01	**LASER AND ITS APPLICATIONS (SELF – STUDY)**	**SEMESTER**	LEVEL
CO1	recall the basic terms involved in the lasers	3	K1
CO2	Explain the fundamental properties and conditions of different lasers		K2
CO3	apply the laser applications in material processing		K3
CO4	Analyze the different types of surface treatments, laser deposition of thin film, integrated circuit fabrication		K4
CO5	Evaluate the needed method for the preparation of thin film.		K5
CO6	Create a new technique for sample fabrications		K6

21PHP17	CONDENSED MATTER PHYSICS	SEMESTER	LEVEL
CO1	remember the Crystal, lattice, Reciprocal lattice, Defects, Hall effect, Semiconductors, Superconductor and magnetic materials.	4	K1
CO2	Describe the concept of Reciprocal, various defects and different types of materials.		K2
CO3	calculate the reciprocal value of BCC and FCC thermal conductivity of metals by suitable methods.		K3
CO4	analyze various various theories in Semiconductor, Dielectric, Superconductor and magnetic materials		K4
CO5	classify the defects and dislocations in crystals and identify the defects by various methods.		K5
CO6	create new types of semiconductor, Superconductor and magnetic materials		K6
21PHP18	**THERMODYNAMICS AND STATISTICAL MECHANICS**	**SEMESTER**	LEVEL
CO1	recall the laws and principles in Thermodynamics and Statistical Mechanics	4	K1
CO2	explain the link between statistics and thermodynamics, classical and quantum statistics and its applications		K2
CO3	apply principles to explain Black body radiation, Gibbs paradox and Phase transition		K3
CO4	categorize different type of statistics based on application		K4
CO5	select appropriate statistics for the distribution of particles		K5
CO6	predict the proper statistics to explain various phenomena in Thermodynamics		K6

21PHP19	ELECTRONIC COMMUNICATION SYSTEMS	SEMESTER	LEVEL
CO1	recall the propagation and properties of light, Antennas, Signals and Optical fibre	4	K1
CO2	discuss the types of Antenna, the microwave generators, Radar Systems, Types of Modulation		K2
CO3	apply Light propagation in Sky ,Ground Wave Propagation and Ionosphere, Radar in Radar Systems, Signals in Modulation, Interpret the application of optical fibres		K3
CO4	analyze the Working of Directional High frequency Antennas, Klystron, Magnetron, Travelling Wave Tubes, MASER, and Optical Fibre Propagation		K4
CO5	evaluate the Grounded Antenna, Ungrounded λ/2 Antenna, and Mathematical representation of FM, Step and Graded Index Fibres, Fibre Losses and Dispersion		K5
CO6	predict the rule for reducing Noise and Signal Loss in Antenna transmission		K6

21PHP20	ADVANCED PHYSICS PRACTICAL-II	SEMESTER	LEVEL
CO1	remember the formulae and properties for different experiments	3 & 4	K1
CO2	be aware of principles and characteristics of various experiments		K2
CO3	seek different applying conditions and procedure in each experiment		K3
CO4	explore the causes for each experiments and relationship between different formulae		K4
CO5	assess and compare the effectiveness of each experiment		K5
CO6	develop new innovation on the basis of existing experiment		K6
21PHP21	**GENERAL ELECTRONICS PRACTICAL-II**	**SEMESTER**	LEVEL
CO1	recall the working principle of Operational Amplifier, IC 555 and microprocessor	4	K1
CO2	elucidate the functioning of circuits constructed using operational amplifier and IC 555		K2
CO3	perform analog to digital conversion and digital to analog conversion using operational amplifier perform interfacing for waveform generator, stepper motor, 7 segment LED display Hex keyboard musical tone generator using microprocessor		K3
CO4	analyze the mathematical operations performed by circuits constructed using operational amplifier		K4
CO5	determine the frequency of astablemultivibrator and output voltage in simultaneous adder and subtractor execute programs using microprocessor		K5
CO6	construct the circuits to perform mathematical operations, measurement of temperature and light intensity using operational amplifier		K6

21PHP22	**PROJECT WORK & VIVA VOCE**	**SEMESTER**	LEVEL
CO1	remember the facts about concerned project and its availability in environment	4	K1
CO2	be aware of principles that are interconnected to their individual project like material science, thin films, solar cells		K2
CO3	seek different applying technique and create innovative ideas on basis of project studies		K3
CO4	explore the causes and reason behind applied techniques of the project		K4
CO5	evaluate the results made from the project and analyse the usage of project in daily life		K5
CO6	develop further more innovations in the existing project based on innovative ideas		K6