AQAR – QUALITATIVE METRIC

2023 - 2024

Criterion 1 - Curricular Aspects

1.1.1 Curricula developed and implemented have relevance to the local, national, regional and global developmental needs which is reflected in Programme outcomes (POs), Programme specific outcomes (PSOs) and Course Outcomes (COs), of the Programmes offered by the Institution.

Name of the Programme: B.SC PHYSICS **Programme Code: UAPH**

Programme Outcomes:

PO1	Apply acquired scientific knowledge to solve complex issues.
PO2	Attain Analytical skills to solve complex cultural, societal and environmental issues
PO3	Employ latest and updated tools and technologies to analyse complex issues
PO4	Demonstrate Professional Ethics that foster Community, Nation and Environment Building Initiatives.

Programme Specific Outcomes:

PSO1	Acquire thorough knowledge of the basic concepts of the frontier areas of Physics comprising Mechanics, Properties of matter, Electromagnetism, Electronics, Thermodynamics, Modern Physics, optics, Medical Physics and Opto electronics.
PSO2	Understand and solve the physics problems in everyday life using the acquired basic knowledge.
PSO3	Develop skills to perform experiments based on the theoretical understanding
PSO4	Apply the knowledge acquired to analyse and design models in the versatile realm of physics.
PSO5	Equip with the essential foundations for higher education and research in physics.

Course Outcomes:

Course Code	Course Title	Nature of the Course (Local/ National/ Regional/Global)	Course Description	Course Outcomes
23P1CC1	Properties Of Matter and sound	National	The objective of this course is to understand the basic properties of matter and sound.	Students will be able to 1. Gain knowledge about elasticity and theory of bending of beams 2. Appreciate the different cases of pressure in liquid drop, spherical surface and soap bubble while learning about phenomena of surface tension and capillarity. 3.To Understand the concept of viscosity and appreciate the Method of Poiseuille for determining Coefficient of Viscosity 4. Comprehend the meaning of simple harmonic motion and its properties 5.To Understand the different methods of producing ultrasonic waves and its

				applications .
23P1CC2	Physics Practical I	National	The course provides hands on training to work with basic physics experiments.	Students will be able to Apply various physics concepts to understand properties of matter, set up experimentation to verify theories, quantify and analyse and correlate the results.
23P1GE2	Digital logic fundamentals	National	The course provides a conceptual based exposure to the fundamental principal and processes of significant topics of Digital Electronics which forms the basis for Computer Architecture.	The student will be able to To define the different types of number systems and explain the basic and universal logic circuits To simplify the logic expressions using Boolean laws and Kmap To describe the principles behind the data processing and arithmetic circuits To explain the working of basic flipflops and design master slave flipflops To understand the working of shift registers and counters Students will be able to describe D/A and A/D conversion techniques

23P1FC	Introductory Physics	National	Aim of this course is to enable the student to understand the basic physics concepts and serve as the foundation to complex concepts.	students will be able to: 1.Apply concept of vectors to understand concepts of Physics and solve problems 2. Appreciate different forces present in Nature while learning about phenomena related to these different forces. 3. Quantify energy in different process and relate momentum, velocity and energy 4. Differentiate different types of motions they would encounter in various courses and understand their basis 5. Relate various properties of matter with their behaviour and connect them with different physical parameters involved.
23P2CC3	Heat, Thermodynamics and Statistical Physics	National	The course provides a conceptual exposure to the fundamental principles of calorimetry, low temperature physics, thermodynamics, heat transfer, conduction and radiation, and significant topics of statistical	The student will be able to 1. comprehend the concept of calorimetry gaining knowledge on the determination of specific heat capacities of gases 2. To understand the first and second law of thermodynamics and its application on efficiency of heat engines 3. To describe the meaning of entropy and

			mechanics.	measure the change of entropy in adiabatic processes 4. To explore into the physics of heat transfer, conduction and radiation 5. To conceptualize the basics of statistical mechanics and compare and appreciate the three statistics
23P2CC4	Physics Practicals II	National	The course provides hands on training to work with basic physics experiments on Elasticity and heat and sound.	Students will be able to determine the properties of materials relevant to the theory learnt in core courses
21P2SE3	Physics of measuring instruments	National	This course describes the basic principles of thermodynamical and pressure measurements, aircraft instrumentation.	students will be able, 1.To Describe the qualitative aspects of thermodynamic quantities temperature and its measurement techniques. 2. Describe the qualitative aspects ofpressure , density and humidity and their measurement technique. 3. Explain a basic idea of aircraft instrumentation 4. list the factors affecting

				wind speed and gain insight on wind speed 5. Discuss the mechanical and electrical instruments comprising of temperature and transducers
19P3CC7	Electromagnetism	Global	This course imparts an exposure to electric field, electric potential energy, magnetic field, magnetic field of current, magnetic dipole moment, magnetization and Maxwell's electromagnetic waves	students will be able to Calculate electric field for a distribution of charges by applying method of calculus. students will be able to Evaluate electric field for problems involving symmetry by using Gauss's law students will be able to Estimate the magnetic field of a current using Biot Savarat law and Ampere's law students will be able to Describe the working of generators and motors based on Faraday's law of induction and Lenz law. Also, they will be able to classify magnetic materials based on magnetic dipole moments students will be able to Comprehend Maxwell's equations and generation of electromagnetic waves

19P3CC8	Solid State Physics	National	This course aims at giving an idea about crystal structure and various properties of solids like magnetic and dielectric behaviours. This course also deals with the super conductors and their applications	Students will be able to Define the different parameters of crystal system and explain the basic concepts. Students will be able to Describe the various magnetic behaviours of solids Students will be able to Explain the working of dielectric materials. Students will be able to Understand the basic concepts in super conductivity. Students will be able to Describe working and various applications of superconductors.
19P3CC9	Major Practicals-III	National	This laboratory course explores the basic principles of electricity and magnetism, basic elements of electric circuits through experiments	Students will be able to Understand and Analyse electric, magnetic and electromagnetic principles and laws through experiments
19P4CC10	Analog Electronics	National	The aim of this course is to provide a basic knowledge in semiconductor,	Students will be able to Acquire basic knowledge of PN junction diode, different rectifiers and filters Explain different transistor configuration

			transistor, amplifier, oscillator and digital electronics	and various biasing circuits Obtain the knowledge of transistor amplifier and analyse using DC and AC load line Elucidate the concept of feedback in amplifiers and design various types of oscillators Describe the parameters of OP-AMP and to design OP-AMP circuits
22P4CC11	Mathematical Physics	National	The course provides an introduction to fundamentals of Mathematical Physics required in scientific and technological applications. This paper includes modeling, solving and interpretation of scientific problem based on basic principles of Physics.This course has also tremendous applications in solving problems in diverse fields of sciences.	Students will be able to Analyze properties and determinants of matrix to solve problem Apply vector calculus to solve Physics Phenomena UtilizeFourier series to represent waves of different shapes Comprehend idea of modeling physics phenomen Analyse analytic function and to express trigonometric and hyperbolic functions.

19P4CC12	Major Practicals IV	National	This laboratory course explores the basic principles of electronics through experiments	Students will be able to Understand and electronics principles and laws through experiments
19P5CC13	Digital Electronics And Communication	National	This course is designed to impart depth knowledge on combinational logic circuits, flip-flops, registers and counters, digital-analog conversion, different modulation techniques of communication systems and satellite communications.	Students will be able to Demonstrate the knowledge in Combinational logic circuits and Flip-Flops and apply skills in solving problems and drawing Karnaugh Maps. Students will be able to Analyse the working of different types of registers and counters Students will be able to Explain the concepts involved in D/A Conversion and A/D Conversion, continuous A/D conversion and A/D techniques Students will be able to Explicate the different types of analog modulation techniques in communication systems. Students will be able to Communicate clearly the principles of digital modulation and Satellite communication
19P5CC14	Optics	National	This course aims at giving a detailed study of interference, diffraction,	Students will be able Gain knowledge on interference of light waves and understand K1 PSO1& PSO2 the interference in a wedge

			polarization, and spectroscopy	shaped film, Newton's rings and describe interference of light due to division of wave front, Students will be able to Explain Diffraction of light, Diffraction at an opaque disc and the construction and working of zone plate.. Students will be able to Insight of the Fraunhofer diffraction at a single slit and double slit, Resolving Power of Prism, Grating, telescope and Microscope. Students will be able to Deduce the concepts of Polarization, Brewster's and Malus law and explain production and analysis of polarized light. Students will be able to Insight of the Infrared spectroscopy, ultraviolet spectroscopy,quartz spectrograph, Raman Spectroscopy,Quantum theory of Raman effect, Nuclear magnetic resonance.

19P5CC15	Major Practicals V (Electronics)	National	This laboratory course explores the basic principles of electronics through experiments	Students will be able to understand physical laws using appropriate equipments through experiments
19P5CC16	Major Practicals VI (Non Electronics)	National	The lab course deals with Experiments of optics, thermal and electricity in Physics.	Students will be able to understand electrical, thermal and optical measurements like Refractive index of a liquid, Determination of wavelength of Fraunhofer lines using Grating,Determination of λ using Hartmann's Interpolation Formula,determination of μ by forming Newtens rings and characteristics of a thermistor.
19P6CC17	Thermodynamics And Statistical Mechanics	National	The aim of this course is to deal with thermodynamics, entropy and thermodynamic potentials. This course also deals with statistical thermodynamics and applications of statistics to gases.	Students will be able to Analyse the basics of thermodynamic systems and derive the internal energy equation as Pressure, Volume and Temperature as independent Explain the entropy and the second law of thermodynamics and deduce the Tds equations and discuss the properties of an ideal gas and Vander Waals gas Gain knowledge on thermodynamic

				potentials, Helmoltz and Gibbs functions and derive Maxwell's relations.. Distinguish Bose Einstein, Fermi-Dirac statistics, Maxwell-Boltzmann Statistics and study their distribution functions. Demonstrate and explain the application of quantum statistics
19P6CC18	Modern Physics	Global	This course is an informative and comprehensive course on modern physics encompassing the basic quantum mechanical properties of particles, nuclear models and special relativity	Students will be able to Describe the wave properties of particles Arrive at Schrodinger wave equations and apply it for accounting the behaviour of atoms, nuclei and particles on the basis of it. Explain the vector atom model and understand the role of spin in atomic phenomena Discuss the properties of atomic nuclei and interpret its behavior through detailed models like liquid drop and shell model Explain the concepts of relativity and explain the intimate relationships between

				space and time, mass and energy.
19P6CC19	Major Practicals VII (Electronics)	National	This laboratory course explores the basic principles of electronics through experiments	Students will be able to understand physical laws using appropriate equipments through experiments
19P6CC20	Major Practicals VIII (Non Electronics)	National	The lab course deals with Experiments of optics, thermal and electricity in Physics.	Students will be able to understand electrical, thermal and optical measurements like Refractive index of a liquid, Determination of groove spacing of CD,Determination of λ wavelength using biprism and calcite prism ,determination of thickness of the wire using Airwedge, numerical aperature of optical fiber, conversion of galvanometer into voltmeter etc.
23P1GEM1 / 21P3ACM1 / 23P1GEG1	Allied Physics - I	National	The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like Waves and	Students will be able Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with practical applications in medical field. Students will be able to Explain their

			Oscillations, Properties of matter, Heat and Thermodynamics, Electricity and Magnetism and Digital Electronics.	knowledge of understanding about materials and their behaviours and apply it to various situations in laboratory and real life. Connect droplet theory with Corona transmission. Students will be able to Comprehend basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of flow temperature physics in the background of growth of this technology. Students will be able to Articulate the knowledge about electric current resistance,capacitance in terms of potential electric field and electric correlatetheconnectionbetweenelectricfieldandmagneticfieldandanalyzethemmathematicallyverifycircuitsandapplytheconcepts to construct circuits and study them. Students will be able to Interpret the real life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and acquire elementary ideas of IC circuits.Acquire

				information about various Govt. programs/ institutions in this field.
21P1ACB1	Digital Principles And Applications	National	Aim of this course provides a conceptual based exposure to the fundamental principal and processes of significant topics of Digital Electronics which forms the basis for Computer Architecture.	students will be able to Define the different types of number systems and explain the basic and universal logic circuits students will be able to Simplify the logic expressions using Boolean laws and Kmap students will be able to describe the principles behind the data processing and arithmetic circuits students will be able to explain the working of basic flipflops and design master slave flipflops students will be able to Understand the working of shift registers and counters students will be able to describe D/A and A/D conversion techniques
23P1GEM2 / 21P3ACM2 / 23P1GEG2	Allied Physics Practicals I	National	This course enables the students to develop basic lab skills.	Students will be able to determine the properties of materials relevant to the theory learnt in core courses

23P2GEM3 / 21P4ACM3 / 23P2GEG3	Allied Physics- II	National	The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like Optics, Atomic physics, Nuclear Physics, Relativity and Gravitational waves and Semiconductor physics.	Students will be able to Explain the concepts of interference diffraction using principles of superposition of waves and rephrase the concept of polarization based on wave patterns Students will be able to explain the atom model and calculate the total energy of an atom and account for the spectral series of hydrogen atom. Students will be able to Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation. Appreciate interdisciplinary nature of science and in solar energy related applications. Students will be able to Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on delay rate half-life and mean-life.Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy, safety measures carried and get our Govt.agencies like DAE guiding the country

				in the nuclear field. Students will be able to To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice versa. Relate this with current research in this field and get an overview of research projects of National and International importance, like LIGO, ICTS, and opportunities available To Summarize the working of semiconductor devices like junction diode, Zener diode, transistors and practical devices we daily use like USB chargers and EV charging stations.
23P2GEM4 / 21P4ACM4 / 23P2GEG4	Allied Physics Practical II	National	This course enables the student to develop broad array of basic skills and tools of experimental physics	Students will be able to determine the properties of materials relevant to the theory learnt in core courses
19P6ME1	Microprocessor	Global	Aim of this course is to enable the student to understand microprocessor	Students will be able to Acquire knowledge of Microprocessor Architecture

			architecture and assembly language programming	Comprehend the instructions in assembly language program Describe the various operations and debugging Understand the programming techniques in microcontroller Explore the role of counters and time delay
19P6ME2	Medical Physics	Global	This course introduces physics of medical instruments used for diagnosis and therapy	Students will be able to Acquire knowledge of terminologies, modeling and measurements in medical physics. Also application of low frequency and high frequency electricity in medicine . Comprehend properties of light in medicine and to study various applications of light in medicine Describe the role of nuclear medicine techniques for diagnosis and therapy Understand the radiation protection in medicine Explore the role of computers in diagnosis,

				testing and therapy
19P6ME3	Opto Electronics	National	Aim of this course is to enable the student to understand the concepts in semiconducting materials and fiber optic systems which forms the basis for communication systems.	Students will be able to Define the different parameters of fiber optics system and explain the basic concepts. Solve the problems in various losses of fibers Understand the working of LED, semiconductor lasers and PN diode. Describe working and various parameters of photo detectors Understand the working and application of optical fiber sensors.
19P6ME4	Energy Physics	National	This course intends to give a comprehensive description of existing types of conventional energy sources and aims to give a potential notion to resolve the challenges	Students will be able to Distinguish the energy resources as conventional and nonconventional and describe each one of its types. Describe the physics behind harnessing solar radiation as renewable energy

			with regard to future supply and demand with the usage of various types of renewable energy sources like solar energy, geothermal energy , wind, biomass, tidal energy.	resource and its applications explain the basic concepts of geothermalenergy, magnetohydrodynamics and fuel cell. describe the energy conversion principles of wind , biomass and ocean tides and waves suggest energy options for developing countries based on energy conservation approach.
23P1SE1/ 23P2SE2	Physics In Everyday Life	National	Aim of this course is to enable the student to understand the physics concepts in day today life.	Students will be able to Discuss and illustrate the importance of paying attention to the basic units of physical quantities and the standards accepted for their measurement Describe the optical instruments and lasers Understand the basic concepts of physics in home appliances Explain the characteristics of Sound Under stand about the solar energy and its concepts

				Comprehend the attributes of Indian physicist and their contributions
19P3SB1	Biomechanics	National	This course aims to introduce the Biomechanical concepts and to give an idea about the anatomic pulleys and lever systems	Students will be able to acquire a skill to apply the laws of kinematics to biological systems. Students will be able to Identify the anatomical pulleys and lever systems Students will be able to Access the types of levers in our body Students will be able to Explain how the biological machines inside our body Students will be able to Discuss different kinds of activities, equilibrium and stability of the body using law of physics
22P4SB2	Solar Cell and its Applications	National	This course provides concept based exposure to solar cell technologies	Students will be able to Acquire a skill on various technologies of solar cell Acquire a knowledge on thin film technologies

				Gain knowledge about the Applications of PV cells Explain how to use solar in power plants Discuss about PV Solar Design
19P5SB3	Physics of Measuring Instruments	National	This course describes the basic principles of thermodynamical and pressure measurements, aircraft instrumentation.	Students will be able to Describe the qualitative aspects of thermodynamic quantities temperature and its measurement techniques. Describe the qualitative aspects ofpressure , density and humidity and their measurement technique. Explain a basic idea of aircraft instrumentation list the factors affecting wind speed and gain insight on wind speed measurement techniques Discuss the mechanical and electrical measurements comprising of temperature transducers, biosensors, chemical and optical sensors.

19P5SB4	Physics of medical instruments	National	This course emphasise the basic concepts and applications of Medical instruments which involves Keratometer, Opthalmoscope , electromyogram, ECG, EEG, Electroretinogram, Cardio vascular Instrumentation- Bio potential of heart, Pacemakers and Angiography	Students will be able to Explain the physics of some common lung disease and instrumentation of Sphygmomanometer Understand the application of sound in medicine and demonstrate the functioning of Stethoscope Study the application of Lasers in the field of medicine. Gain knowledge on the construction, working principle of instruments such as Ophthalmoscope &Keratometer Learn about the applications of the cardio vascular instrumentation and medical instrumentation utilising the principle of electricity within the body .
19P6SB5	Physics of Advanced Instrumentation	National	This course emphasis the basic principles and their measurement techniques of astronomical instruments such as optical telescope, Hubble space telescope,	Students will be able to Discusses the basic physics behind astronomical measurements and material characterization Explains the principles behind astronomical instruments and their main parts

			astronomical spectrograph, photoelectric photometry, spectrometry and also electron microscopes such as scanning electron microscopy, transmission electron microscopy and atomic force microscopy and X-ray diffraction measurements.	Explains the principles behind astronomical measurement techniques Describes the principles and working of electron microscopy Characterizes the structural properties of materials using X ray diffraction measurements
19P6SB6	Physics of Advanced Medical Instruments	National	This course emphasise the basic concepts and applications of Medical instruments which involves Radiography, X-Ray, Endoscopy, Computed Tomography , Magnetic Resonance Imaging , Linear Accelerator. Also provides the knowledge on Radiation protection in Diagnostic Radiology and Biomedical Computer	Students will be able to Understand the working principle of medical instruments used in X- ray, radiography and endoscopy Comprehend the Principle and application of Computed Tomography, Magnetic Resonance Imaging, Linear Accelerator in medicine Gain knowledge on the medical applications of Ultrasonography Acquire knowledge on applications of Nuclear Medicine such as Radio Therapy

			Applications.	and the key factors of Radiation protection Understand the biomedical Computer Applications.
19UGSLP1	Nanoscience and Nanotechnology	National	This course provides knowledge about nano scale, carbon nanotubes, nanobiology, nanosensors and nanomedicines.	Students will be able to Find suitable materials to prepare nanomaterials. Synthesis carbon nanotubes and apply them for various applications Describe Biological Imaging using Semiconductor naocrystals. Explain about nanosensors. Understand the nanoshells, nanopores and Tectodendrimers.
21UGSLP2	Amazing Universe And Indian Space Missions	Global	This course provides information about Astronomy and cosmology, Indian space research organization, ISRO's Rockets and Satellites and Saris	Students will be able to Understsand about Astronomy and cosmology . Explain the Clustered objects in the Universe. Describe the The Indian Space Research

				Organisation. Understant basics in rockets. Explain the Satellites and Saris
21UGIDPB1	Fundamentals & Programming of Microprocessor 8085	National	This course provides knowledge about microprocessor, its architecture, instruction set of 8085 and some Assembly language programming	Students will be able to Understand Evolution of Microprocessors and embedded Microprocessors. Explain the Microprocessor Architecture. Describe the various Instruction set of 8085. Write Assembly language programming. Write Programs using looping statements.
21UGIDPM1	Space Science	Global	This course emphasise about Cosmology, galaxy,sun,moon and eclipses	Students will be able to Understand Big Bang theory and cosmology. Describe the structure of galaxy. Explain basic features of the sun Explain the sidereal and synodic month and various phases of moon.

				Understand the eclipses, solarandlunar and conditions for the occurrences.
19UGVAP1	Digital Photography	National	This course teaches the most important functions and techniques of digital photography that will enable the students to take the perfect shot every time.	Students will be able to Understand the basic phenomena of photography. Students will be able to comprehend the basic parts of camera, its important control parameters and composition techniques of photography Students will be able to handle SLR camera and apply various composition techniques and shoot professional photographs Students will be able to understand the modern technique of photoshop and develop skills to manipulate, edit and enhance the real time photographs using photoshop. Students will be able to prepare their own digital ids and greeting cards with photoshop
19UGVACP1	Mobile Servicing	National	This course teaches the most important functions and techniques of Mobile servicing that will enable	Students will be able to Repair and diagnose the problem of all kinds of faults in Mobile Phone.

			the students to troubleshoot the faults in mobiles.	Understand handsets in Hardware as well Software and rectify the faults using tools and equipment . Known to uses various softwares in the mobile. Identify the business opportunities in this sector to run a Mobile Handset Repairing unit Describe various reparing techniques and apps in the mobile.