

<b>Brief course description- Course Plan Development and Updating Procedures\ Physics Department</b>	<b>QF01/0409-3.0E</b>
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Faculty	Science & IT	Academic Department	Physics	Number of the course plan (2021-2022)
Number of Major requirement courses	<b>29</b>	Date of plan approval		
Course number	Credit hours	Title of the course		Prerequisite-co-requisite
<b>0150111</b>	<b>3</b>	<b>General Physics(1)</b>		<b>None</b>
Measurements and units, vectors, motion in one dimension, equations of motion, motion in two and three dimensions, newton's laws in motion, work and energy, energy conservation, linear momentum, collisions, angular motion, torque, inertia of moment, momentum, and elasticity.				
Course number	Credit hours	Title of the course		Prerequisite-co-requisite
<b>0150121</b>	<b>3</b>	<b>General Physics(2)</b>		<b>0150111</b>
Coulombs law, potential and electric field, gauss law, capacitors, electric current, ohm's law, electrical power, kirchhoff's law, magnetic field, faraday's law, and induced electromotive force.				
Course number	Credit hours	Title of the course		Prerequisite-co-requisite
<b>0150101</b>	<b>1</b>	<b>General Physics Lab (1)</b>		<b>0150111</b>
Significant figures, measurements and errors, vectors, motion in one dimension, projectile motion, newton's laws, friction forces, energy conservation, linear momentum, collisions, angular motion, elasticity.				
Course number	Credit hours	Title of the course		Prerequisite-co-requisite
<b>0150102</b>	<b>1</b>	<b>General Physics Lab (2)</b>		<b>0150121</b>
Potential and electric field, capacitors, electric conductivity, resistance depending on temperature, electrical power, kirchhoff's law, magnetic field, faraday's law, and induced electromotive force.				
Course number	Credit hours	Title of the course		Prerequisite-co-requisite
<b>0150231</b>	<b>3</b>	<b>Modern Physics</b>		<b>0150121</b>
General and special relativity, black body radiation, plank laws, x-ray, introduction to quantum physics, introduction to atomic physics, hydrogen atom, nuclear and particle physics.				
Course number	Credit hours	Title of the course		Prerequisite-co-requisite
<b>0150251</b>	<b>3</b>	<b>Mathematical Physics(1)</b>		<b>0150121</b>
Vector calculus, partial differential, integral equations, complex numbers, matrices and determinants, Fourier series, special functions in mathematical physics.				
Course number	Credit hours	Title of the course		Prerequisite-co-requisite
<b>0150252</b>	<b>3</b>	<b>Mathematical Physics(2)</b>		<b>0150151</b>
Series solution of differential equations, separation variables, Laplace equation, spherical coordinates, Legendre polynomial, Bessel equation, wave equation, integral transformations, Dirac and greens function, function of complex numbers and residue theorem, special functions, gamma and beta functions.				
Course number	Credit hours	Title of the course		Prerequisite-co-requisite
<b>0150211</b>	<b>3</b>	<b>Optics</b>		<b>0150121</b>
Reflection and refraction, lenses, wave-light theory, light interference, light diffraction, polarization, leaser.				
Course number	Credit hours	Title of the course		Prerequisite-co-requisite
<b>0150253</b>	<b>3</b>	<b>Computational Physics</b>		<b>0150121</b>
Program language (C, C++, Fortran or, Python), numerical methods to solve problems in physics. It includes root finding, systems of equations, integration, differentiation,				

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boundary-value problems, and Monte Carlo methods.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0150221</b>	<b>3</b>	<b>Electronics</b>	<b>0150121</b>
AC Circuits, semiconductor and p-n junction diodes, junction transistors, transistors in dc circuits, transistors in ac circuits (voltage amplifiers), Frequency effect, Operational Amplifiers.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0150301</b>	<b>1</b>	<b>Electronics Lab</b>	<b>0150221</b>
.AC circuits, The Diode, Diode rectifier circuits, Zener Diode, Transistor Emitter Biasing, Transistor Voltage Divider Biasing, The Common Emitter Amplifier, Inverting Op-Amp Circuit.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0150302</b>	<b>1</b>	<b>Optics Lab</b>	<b>0150211</b>
Reflection and refraction, light diffraction, polarization, newton's rings, fresnel mirrors, Balmer series.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0150321</b>	<b>3</b>	<b>Electromagnetic(1)</b>	<b>0150121</b>
Coulombs law, electric field, Gausses law, electrostatic energy, and potential theory, magnetic field, magnetic force, Amperes law, vector potential, multipole expansion of the vector field.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0150322</b>	<b>3</b>	<b>Electromagnetic(2)</b>	<b>0150321</b>
The Lorentz force and Maxwell's equations as a complete system and energy and impulse in the electromagnetic field. The Coulomb integrals for the electrostatic and magnetostatic fields and Biot-Savarts law. Brief treatment on electromagnetic waves, desperation, electric dipole radiation, Validity of electromagnetism in particular concerning line radiation.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0150311</b>	<b>3</b>	<b>Classical Mechanics (1)</b>	<b>0150251</b>
Newton Mechanics. Motion in one, two, and three dimensions, Motion of a system of particles. Motion of rigid bodies. Moving coordinate systems, gravitation.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0150341</b>	<b>3</b>	<b>Thermodynamic</b>	<b>0150231</b>
Basics concepts like heat, temperature, inner energy. Thermodynamic variables and equations of state, exact and partial differentials. First, second and third law thermodynamics. Classical kinetic theory of gases, temperature, velocity and Maxwell's velocity distribution. The ideal gas law and other simple equations of state for gases and other physical systems. Macroscopic definition of and Boltzmann's equation for entropy. Thermodynamics potentials. Maxwell's and other thermodynamic relations.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0150312</b>	<b>3</b>	<b>Classical Mechanics (2)</b>	<b>0150311</b>
Coordinate transformation, Lagrangian equations, Hamiltonion Equations, Rotational Motion of Rigid Bodies, Small Vibrations,			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0150331</b>	<b>3</b>	<b>Quantum Mechanics(1)</b>	<b>0150251</b>
Limitations of classical physics. Uncertainty principles. Operators, hermit and linear operators, Schrödinger equation. Simple harmonic motion. Perturbation Theory. Hydrogen atom.			

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Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0150332</b>	<b>3</b>	<b>Quantum Mechanics(2)</b>	<b>0150331</b>
.Effect of magnetic field. Matrix representation. Angular momentum. Time dependent perturbation theory. Hydrogen and helium atom. Quantum physics in nuclear physics. Approximation methods. Zeeman effect .			
<b>0150461</b>	<b>3</b>	<b>Solid State Physics</b>	<b>0150251</b>
Crystal Structure. The reciprocal lattice. Reciprocal lattice. X-ray diffraction. Crystal binding. The Drude theory of metals. Nearly free electron model. Semiconductor crystal.			
<b>0150431</b>	<b>3</b>	<b>Nuclear Physics 1</b>	<b>0150251</b>
Nuclear forces, deuteron, nuclear models, scattering, radio-activity, alpha, beta, and gamma decay, nuclear reaction, fission and fusion. Nuclear accelerators and reactors.			
<b>0150401</b>	<b>1</b>	<b>Advanced Physics Lab</b>	<b>Dept. Approval</b>
Black body radiation, specific charge, electrons diffraction, Frank hertz, photo-electric effect, Hall effect, Zemman effect, thermionic emission, solar cells.			
<b>0150441</b>	<b>3</b>	<b>Statistical Mechanics</b>	<b>None</b>
Distribution functions, statistical mechanics theorems, Gibbs, Boltzmann, Fermi and Bose distributions, energy fluctuation, entropy, paramagnetic.			
<b>0150462</b>	<b>3</b>	<b>Material Physics</b>	<b>0150341</b>
Crystal Structure. Crystal binding. Mechanical properties of metals. Electrical, thermal, optical, and magnetic properties of materials. Magnetic materials. Macroscopic and microscopic.			
<b>0150314</b>	<b>3</b>	<b>Astrophysics</b>	<b>0150341</b>
Nature of stars. Big bang theory. Mater and radiation. Ideal gas. Photonic gas. Ionized hydrogen. Balck halls. Fission and fusion.			
<b>0150421</b>	<b>3</b>	<b>semiconductors</b>	<b>0150361</b>
Introduction to semiconductors. PN junction. Transistor and amplifier. Integrated circuits. Amplifier and amplification theory. Digital electronics.			
<b>0150471</b>	<b>1</b>	<b>Research Seminar in Physics</b>	<b>Dept. Approval</b>
Introducing students to the methods of writing a scientific report by submitting a report at the end of the semester on a specific scientific topic.			
<b>0150413</b>	<b>3</b>	<b>Waves and Vibrations</b>	<b>None</b>
Simple harmonic motion, simple oscillations, types of oscillations, decaying, longitudinal and electromagnetic waves.			
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0150411	3	Laser Physics	0150374
Introduction to laser science. Properties of laser. Types of laser. Photons radiation. Nuclear models and reactions. cross section of nuclear reaction. Energy levels. Nuclear forces. Mesons theory. Introduction to elementary particles.			

Approved by department council		Date of approval	
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