الخطة الدراسية لقسم الفيزياء

المستوى الاول **المستوى الثانى**

الساعات	اسم المقرر	الرقم والرمز	الساعات	اسم المقرر	الرقم والرمز
٢	المدخل إلى الثقافة الإسلامية	١٠١ سلم	٣	مبادئ الاحصاء والاحتمال١	١٠١ احص
٣	مهارات الحاسب	١٣٠ تقن	٢	المهارات اللغوية	١٠١ عرب
٣	مقدمة في الرياضيات	٣٠ ريض١	٣	فيزياء عامة- ١	١٠١ فيز
٨	اللغة الانجليزية	١٣٠ نجل	٢	تطبيقات الحاسب	١٤٠ حاسب
			٣	مقدمة في الرياضيات	١٤٠ ريض
			٢	اللغة الانجليزية -٢	١٤١ نجم
١٦	المجموع		١٤	المجموع	

المستوى الثالث **المستوى الرابع**

الساعات	اسم المقرر	الرقم والرمز	الساعات	اسم المقرر	الرقم والرمز
٢	الاسلام وبناء المجتمع	١٠٢ سلم	٤	مقدمة في الكيمياء	١٠٢ كيم
٤	فيزياء عامة ٢	٢٠٢فيز	٢	التحرير العربي	١٠٣ عرب
٤	الكهرباء والمغناطيسية	٢٠٤ فيز	٣	مقدمة في الفيزياء الحديثة	٢٠٣ فيز
٤	حساب التفاضل	٢١٢ فيز	٣	مقدمة في الفيزياء الحديثة	٢٠٥ فيز
٢	لغة انجليزية علمية	٢٣٠ نجم	٢	جبر خطي	٢٤٨ ريض
٢	المعادلات التفاضلية	٢٣٩ ريض	١	مختبر بصريات	٢٩٤ فيز
١٨	المجموع		١٥	المجموع	

المستوى الخامس

الساعات	اسم المقرر	الرقم والرمز
٣	فيزياء رياضية (متغير مركب)	٣٠٣ فيز
٣	ميكانيكا تقليدية	٣٠٤ فيز
٢	اهتزازات وموجات	٣٢٢ فيز
٣	فيزياء حديثة	٣٣٢ فيز
٣	كهرومغناطيسية	٣٤٢ فيز
١	مختبر فيزياء موجية	٣٩٢ فيز
١	مختبر كهرومغناطيسية	٣٩٦ فيز
١٦		المجموع

المستوى السادس

الساعات	اسم المقرر	الرقم والرمز
٢	النظام الاقتصادي في الاسلام	١٠٣ سلم
٣	ميكانيكا احصائية	٣٠٥
٣	ميكانيكا الكم	٣٥٧
٢	فيزياء نووية	٣٨٤
٢	مختبر فيزياء نووية	٣٩٤
٢	مختبر فيزياء حديثة	٣٩٥
١٤	المجموع	

المستوى السابع

الساعات	اسم المقرر	الرقم والرمز
٣	فيزياء الحالة الصلبة	٤٣٤ فيز
٢	مشروع تخرج ١	٤٨٨ فيز
٢	مختبر فيزياء الحالة الصلبة	٤٩٦ فيز
٧		المجموع

المستوى الثامن

الساعات	اسم المقرر	الرقم والرمز
٢	اسس النظام السياسي في الاسلام	١٠٤ سلم
٢	مشروع تخرج ٢	٤٩٩ فيز
٤	المجموع	

وصف المقرارت خطة قسم الفيزياء

General Physics 1 – Phys 101 – 4(3+1+2):
Physics of measurement – Motion in one dimension- Vectors- Motion in two dimensions- The laws of motion – Circular motion and other applications of Newton`s laws – Energy of a system – Conservation of energy – Linear momentum and collisions – Rotation of rigid object about a fixed axis.

Introduction to Waves and Light – Phys 205 – 3(2+2+0):
Oscillatory motion – Wave motion – Sound waves – Superposition and standing waves – The nature of light and principles of ray optics – Image formation – Wave optics – Diffraction patterns and polarization.

General Physics 2 – Phys 202 – 4(3+1+2):
Angular momentum – Static equilibrium and elasticity – Universal gravitation – Fluid mechanics – Temperature – The first law of thermodynamics – Kinetic theory of gases – Heat engines, entropy and the second law of thermodynamics.

Electricity and Magnetism – Phys 204 – 4(3+1+2):
Electric fields – Gauss`s law – Electric potential – Capacitance and dielectrics – Current and resistance – Direct current circuits – Magnetic fields – Source of magnetic fields – Faraday`s law – Inductance and alternating current circuits – Electromagnetic waves.

Introduction to Modern Physics – Phys 203 – 3(3+2+0):
Relativity – Introduction to quantum optics – Quantum mechanics – Atomic physics – Molecules and solids – Nuclear structure – Applications of nuclear physics – Particle physics and cosmology.

Electromagnetism – Phys 342 – 3(3+0+0):
Potential gradient and its applications – Electric displacement, polarization, susceptibility and dielectric strength – Vector operation, electric and magnetic field in materials, magnetic potential vector – Electrostatic and magnetic energy – Maxwell`s equation in different form and Lorentz transformation – Plane waves in insulators, conductors and plasma – Reflection and refraction at plane boundaries – Guided waves and dipole radiation.

Modern Physics – Phys 332 – 3(3+0+0):
Background of quantum physics - Wave particle duality – Heisenberg uncertainty principle – Zeeman effect – Formulation of Schrodinger wave equation in one dimension and operators method – Bound states in square wells – Harmonic oscillators – Transmission through barriers.

Quantum Mechanics – Phys 357 – 3(3+1+0):
Formalism of quantum mechanics – Operator approach to the harmonic oscillator – Quantum mechanics in three dimension – Hydrogen atom and angular momentum – Time independent perturbation theory – Fine structure of hydrogen spectra – Spin and Fermi golden rule – Identical particles, two level systems – The variational principle and ground state of helium atom – Introduction to Dirac equation.

Classical Mechanics – Phys 304 – 3(3+1+0):
Non inertial frames of reference – Calculus of variation – Newtonian dynamics of particles and systems of particle – Gravity and the central force problem – Dynamics of a rigid body – Lorentz transformation and relativistic dynamics – Lagrangian mechanics – Coupled oscillations and normal modes – Hamiltonian and Lagragian dynamics.

Waves and Vibrations – Phys 322 – 2(2+0+0):
Wave motion, traveling and standing waves – Transverse, longitudinal waves and simple harmonic motion – Superposition of waves and sound waves – Damped vibration, forced vibration and resonance – Interference of waves and beats – Dispersion of waves and Fourier theorem.

Statistical Mechanics – Phys 305 – 3(3+0+0):

Fundamental postulates of statistical mechanics – Entropy, Microcanonical, canonical and grand canonical ensembles – Fermi Dirac statistics – Bose Einstein statistics – Boltzmann statistics and Boltzmann velocity distribution – Application to specific heat of solids, classical and quantum gases, electrons in metals – Plank`s law of radiation – Bose Einstein condensation.

Solid State Physics – Phys 434 – 3(3+0+0):
Ionic bonding, covalent bonding, van der Wall bonding, hydrogen bonding and energy spectra of molecules, rotational and molecular spectra of molecules – bonding in solids, free electron theory of metals and band theory of solids – Electrical conduction in metals, insulators and semiconductors, semiconductor devices and superconductivity – Crystal lattices and structure, crystal defects, Fourier analysis of periodic structure – X-ray diffraction and Brioullin zone, lattice vibration and phonons – Thermal properties of solids, Einstein and Debye model of heat capacity, phonon density of states – Fermi surface, energy levels, energy gap calculation, electrical transport theory and Hall effect – Magnetic properties of solids.

Nuclear Physics – Phys 382 – 2(2+0+0):
Properties of nucleus – Nuclear binding energy – Different types of nuclear models and radioactivity – The decay process and natural radioactivity – Nuclear reactions, nuclear fusion, fission and nuclear reactors – Nuclear magnetic resonance and magnetic resonance imaging – Radiation damage, radiation detectors – Uses of radiation.

Renewable Energy – Phys 371 – 2(2+0+0):
Introduction to renewable energy fundamentals and its applications – Origin of renewable energy sources – Utilization of passive solar energy – Solar thermal power plant – Photovoltaic power generation – Wind power generation – Utilization of ambient air and shallow geothermal energy.

Electronics – Phys 436 – 3(2+0+2):
Metal, insulator, and semiconductor, P and N materials, pn junction diode and its characteristics and application – field effect transistor, applications and characteristics – Operational amplifier theory, characteristics and applications – Oscillators, power supply and voltage regulators design and applications – Introduction to Boolean algebra, logic gates, flip flops and shift registers – Principles of integrated circuits and applications.

Mathematical Physics 1 – Phys 303 – 3(3+0+0):
Complex variables, Cauchy-Reimann conditions - Sturn-Liouville theory, Legendre, Bessel and other special functions – Fourier series, separation of variables, Green`s function – Methods of solving systems of linear equations – Matrices definitions and operations – Cramer`s rule, two and three dimensional vector space, eigen value and eigen vector problem – Residue theorem and contour integral.

Mathematical Physics 2 – Phys 406 – 3(3+1+0):
Taylor and Laurent expansion – Fourier and Laplace transformation with application – Introduction to probability and statistics – Differential and integral equations and solutions to Laplace`s equations – Dirac delta function, multivalued complex functions – Contravarient and covariant tensors – Introduction to group theory – Special functions, gamma, Bessel, and Legendre functions.

Laser Physics - Phys 437 – 3(2+2+0):
Introduction to laser operation – Absorption, emission, and dispersion of light – Multimode and pulsed lasing – Laser resonator and Gaussian beam – Propagation of laser radiation – Coherence and atom field interaction – Different types of lasers and their applications.

Atomic and Molecular Physics – Phys 438 – 3(2+2+0):
Spin-Orbit interaction in hydrogen atoms – Pauli exclusion principle – Electron configuration in many electron atoms – Hund`s rule – Interaction of many electrons with magnetic fields and Zeeman effect – Electronic , vibrational and rotational energy levels of a diatomic molecules – Spectroscopic techniques, optical spectroscopy, infrared spectroscopy, and Raman spectroscopy – Magnetic resonance – Excitation source and data acquisition systems.

Biophysics – Phys 361 – 2(2+0+0):
Biomechanics – Fluid properties and flow of fluids – Flow of heat in biological systems and its medical applications – Hearing and applications of sound in medicine – Function of DNA and proteins radiation oncology (treatment of cancer by ionizing radiation) – X-rays diffraction and diagnostic radiology (diagnostic imaging with x-rays, ultrasound and nuclear magnetic resonance: NMR) - Nuclear medicine (diagnosis using radioisotopes) – Health physics (radiation hazards and radiation protection) – Physiological biophysics.

Molecular and Cellular Biophysics – Phys 462 – 3(2+2+0):
Cell structure and molecular composition – Intermolecular interactions and hydration – Protein structure, and function – Cytoskeletal filaments – DNA structure, packing and chromosomes – Rate equations and biological dynamics (e.g. cytoskeletal polymerization) – Self-assembly; cell membranes; action potentials and biological electricity – Molecular motors – Cell motility.

Radiation Bio-Physics – Phys 463 – 3(2+2+0):
The effect of radiation of various kinds on cells and tissues – Mechanisms of damage, repair theories, genetic effects, dose response relationships – Cancer radiotherapy (x-rays, electrons, neutrons, protons, negative Pi mesons) – Other types of cancer therapies used in conjunction with radiotherapy (e.g. hyperthermia) – Late effects of radiation – Carcinogenesis; risk vs. benefit – Applications.

Physics of Medical Imaging – Phys 464 – 3(2+2+0):
Introduction to imaging concepts in medicine – Nuclear medicine – Computed tomography – Magnetic resonance imaging – Ultrasound and optical imaging – Physics principles and applications with emphasis on the former.

Solar Thermal Energy – Phys 477 – 3(2+2+0):
Introduction to solar thermal energy and its uses – Importance and modes of energy storage – Sensible heat storage – Sensible heat storage – Latent heat or phase change thermal energy storage – Long term solar thermal energy – Solar thermal energy storage in building materials – Characteristics of solar radiation and its relation to solar thermal energy conversion.

Solar Photovoltaic Energy – Phys 473 – 3(2+2+0):
Introduction to solar photovoltaic energy – Physics of solar cells – Silicon solar cells materials and characterization – Thin film solar cells and its application – Solar cell and solar module – PV system and its application – Environmental impacts by PV system – Efficient and performance by PV system – Installation of PV system – Future prospect of PV system.

Wind Energy – Phys 474 – 3(2+2+0):
Introduction to wind energy – Wind energy origin and local effects – Physics of wind energy – Components of wind energy converter – Design consideration – Operation and control of wind energy converter – cost of wind turbines – Future of wind energy.

Nuclear Energy – Phys 478 – 3(2+2+0):
Energy concept and history of nuclear energy – Radioactivity and biological effect of radiation – nuclear fission and fusion – Particle accelerator – Isotope separation – Radiation detection – Breeder reactor and fusion reactor – Useful radiation effect – Reactor safety and security – Radiation protection and waste disposal.

Lab of General Physics 1 – Phys 101 – 1(0+0+2):
Determination of acceleration due to gravity using simple pendulum - Verification of Hooke`s law - Determination of velocity of sound – Verification of Newtonian mechanics using rail track – Determination of surface tension of liquid – Measurement of free fall acceleration – Demonstration of kinetic energy and potential energy using simple pendulum – Determination of density of solid – Force table – Projectile.

Lab of General Physics 2 – Phys 202 – 1(0+0+2):
Measurement of change of angular momentum with the change of moment of inertia – Determination of heat conduction in Joule`s experiment using calorimeter – Measurement of specific heat of solids and liquids – Determination of viscosity of viscous liquid – Absorption of heat radiation – Verification of Boyele`s law and Newton`s law of cooling – Determination of Young`s modulus of a metallic wire – Determining the melting and the solidification temperature – Thermal expansion – Latent heat of vaporization.

Optics Lab – Phys 294 – 1(0+0+2):
Verification of inverse square law for light vradiation and determination of the absorption coefficient of light in glass using photocell – Diffraction grating experiment for the determination of wavelength of light – Studying Malu`s law of polarization of light – Determination of refractive index of different glass prisms as a function of wavelength – Determination of thickness of thin metallic wire using laser – Determination of focal length and power of convex lens and concave lens – Specific rotation measurements using polarometer – Interference and diffraction of light experiments – Abby`s interferometer – Newton`s rings.

Lab of Electricity and Magnetism – Phys 204 – 1(0+0+2):
Measurement of unknown resistance using meter bridge - Charging, discharging characteristics of capacitor – Shadow galvanometer uses to test the change of electric field due to magnetic field – Comparison of magnetic moments of two magnets – Determination of magnetic field of a magnet – Determination of dielectric constant using RCL resonant circuit – Determination of unknown resistance using Wheatstone bridge – Determination of unknown resistance using oscilloscope – Deflection of electron beams in an electric field .

Lab of Modern Physics – Phys 395 – 2(0+0+4):
Determination of Plank`s constant using the photoelectric effect – Frank-Hertz experiment with mercury recording with oscilloscope, the XY recorder or point by point – X-rays experiment – Diffraction of electrons to determine its wave length – Normal Zeeman effect to measure the Zeeman split of the red cadmium line as a function of the magnetic field – Magneto-Optic Faraday effect experiment – The Balmer series of hydrogen to determine Rydberg constant – Electro optic Kerr effect – Microwave experiment – Fabry-Perot interferometer.

Lab of Electromagnetism – Phys 396 – 1(0+0+1):
Determination of the ratio e/m for electrons by using Thompson CRT – Determination of dielectric constant using resonance in RCL circuits – Full wave rectification – Determination of magnetic field intensity using search coil – Investigation of mutual inductance of the voltage transformer – Study the curve of the magnetic hysteresis loop for a complete cycle – Study of the magnetic field induction using varying currents and varying distances for the coil – Study of the variation of magnetic field in different location of the solenoid using varying currents and varying turn numbers – Study of the magnetic field due to circular coil using varying currents.

Wave Lab – Phys 392 – 1(0+0+2):
Determination of the velocity of sound using Echo-Sounder – Determination of a distance using echo sounder – Determination of the wave length of light using Fresnel bi-prism and Lloyd`s mirror – Determination the frequency of unknown tuning fork using forced vibration – Michelson interferometer experiment for the determination of the wavelength of monochromatic light – measurement of the frequency of sound due to superposition of two waves – Young`s double-slit experiment for the determination of wave length of monochromatic light – Newton`s ring experiment for the determination of wavelength of monochromatic light – Black body radiation (Stefan-Boltzmann law , Inverse square law) – Determination of the absorption coefficient and verifying inverse square law using photo cell.

Lab of Solid State Physics – Phys 496 – 2(0+0+4):
X-ray diffraction for crystal structure investigation – Dielectric constant measurement – Hall effect – Magnetic susceptibility measurement – Magnetic resonance – Solar cell characteristics – Energy gap measurement for semiconductor – Nobel metal resistance measurement and resistivity – Optical absorption of solids with defects – Seebeck effect.

Lab of Nuclear Physics – Phys 394 – 2(0+0+4):
Measurement of radioactivity using Geiger Muller counter – Absorption of nuclear radiation – Poisson distribution – Gamma ray spectroscopy – Beta ray spectroscopy – Alpha ray spectroscopy – Study of neutron diffusion – Alpha particle scattering spectra – Compton scattering – Rutherford scattering – Nuclear magnetic resonance.

Lab of Electronics – Phys 436 – 1(0+0+2):
P-N junction – Half and full wave rectifier – Design of power supply – Logic gates – Characteristic curve of Zener diode – Transistor characteristics – Characteristics of common emitter amplifier – Voltage-shunt feed back – Current series feed back – Forward feed back and design stable multivibrator.

Philosophy and History of Physics – Phys 210 – 2(2+0+0):
Physics today and in the pre-modern era and the 16th and 17th century scientific revolution – Transition from classical to quantum physics and development of quantum mechanics – Philosophical aspects of physics and development of quantum mechanics – Phylosophical aspects of physics e.g. (law of gravitation, Coulomb`s law, Plank`s law) – Laser and laser application – Sensors and nanomaterial.

Benefits and Hazards of Nuclear Radiation – Phys 283 – 2(2+0+0):
Introduction to nuclear radiation – Danger from medical uses of radiation and working in nuclear power plants – How nuclear radiation cause cancer and other damage to our bodies – Uses of nuclear radiation for the treatment of cancer and other diseases – Hazards of nuclear radiation.

Solar Energy in Saudi Arabia – Phys 476 – 2(2+0+0):
Solar energy as an example of renewable energy – Different methods of utilization of solar energy – Production of solar power using solar photovoltaic module consists of many solar cells – Solar desalination project using solar energy towards purification of water – International co-operation with Saudi Arabia in solar energy field.

Graduation Project – Phys 488 – 2(2+0+0):
Student should have a case study in his specialized topic and at the end he will write an essay in an English language. There are no specific guidelines concerning the length of an essay but not to exceed 60 pages, but students are reminded that an accurate and concise essay usually indicates a better understanding of the topic. The organization of the essay should follow that of a typical research paper.

Description of Math 239, Math 212, Math 248 from Department of Mathematics
Differential Equation – Math 239 – 2(2+1+0):
Cartesian, cylindrical and spherical coordinate systems. Functions of two and three variables, limits and continuity, partial derivatives, the chain rule, extreme of functions of two variables. Definition of first order differential equations (separable- homogeneous- exact- linear). Solution of higher order linear differential equation with constant coefficients and variable coefficients. Linear systems of differential equation. Solution with polynomial coefficients using the series method.

Linear Algebra – Phys 248 – 2(2+1+0):
Matrices: matrix operations, inverse of a matrix, solving systems of linear equations. Determinants: definition and properties, cofactor expansion and applications. Vectors in RII, RIII scalar and cross products, lines and planes. The vector space Rn, subspaces, linear independence, basis and dimensions, orthogonality, rank of matrix. Eigen values and eigenvectors, diagonalization of a matrix.

Introduction to Integral Calculus – Math 212 – 4(3+2+0):
Definition of definite integral by using Reimann sum, properties of definite integral, mean value theory of integration and differentiation. Definition of non-definite integral, method of integration by substitution. Logarithmic and power functions, hyperbolic functions and their inverse. Method of integration: by parts, by trigonometric functions, square complete, rational functions integration, approximate method of definite integral, calculations of area, rotation of value bodies, length of curves, polar coordinates, graphic of some polar coordinate curves. Sequences, infinite series, Taylor and Maclaurin series, the binomial series.