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1	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PYHS 100	General Science	3	0	3	-

Objectives of the Course:

This course aims to prepare the students for the studying the pre-courses in English language with concentrating onto the basic concepts of the natural sciences. It also target to present a general review on the other scientific field and their applications in different areas.

Course Description:

Motion and Equilibrium, Newton's Laws of Motion. Momentum and Energy. The Atom and the Periodic Table, Water flow. A brief Introduction to Physics, Chemistry and Biology and their Applications. Introduction to Geology and Marine Sciences.

Main text Book:

- **University Physics with Modern Physics with Mastering Physics (11th Edition)**, by H.D.Young and R.A.Freedman. **Publisher:** Addison Wesley; 11 edition (August 8, 2003).

Subsidiary Books:

Earth: An Introduction to Physical Geology (8th Edition),by Edward J. Tarbuck and Frederick K Lutgens and Dennis Tasa **, Publisher:** Prentice Hall; 8 edition (March 14, 2004).

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Lab.	Credit	
PHYS 110	General Physics I	3	0	3	-

Objectives of the Course:

The course provides a general introduction to the fundamental concepts of mechanics.

Course Description:

Physical quantities and dimensional analysis, vectors, motion in one dimension, motion in a plane, Newton's laws, friction, work and energy, impulse, momentum, collisions, and rotational motion.

Main text Book:

Fundamentals of Physics Extended, 8th Edition

David Halliday, University of Pittsburgh
Robert Resnick, Rensselaer Polytechnic Institute
Jearl Walker, Cleveland State University

Subsidiary Books:

1. **Physics for Scientists and Engineers**, by Raymond A. Serway **Publisher:** Brooks/Cole Publishing Company; 5th edition (October 30, 1999).
2. **Sears and Zemansky's University Physics: With Modern Physics**, by Hugh D. Young and Francis Weston Sears, **Publisher:** Addison-Wesley **Publication Date:** 1991.
3. **Physics, Volume 1, 5th Edition** , by David Halliday, Univ. of Pittsburgh ,Robert Resnick, Rensselaer Polytechnic Institute and Kenneth S.Krane ,Oregon State Univ.©2002.

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3	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 200	Safety Awareness	1	0	1	-

Objectives of the Course:

Safety Awareness: Safety is critical in laboratories. Therefore, safety education in laboratories must be a part of the physics curriculum. Discussion of the hazards involved in specific experiments should prepare all students for their course work. As the students work in the labs, they should develop a high degree of safety awareness and understand safety procedures and processes, and should also learn to handle laboratory equipment properly.

This is an intensive course designed to teach the fundamentals of safety in the laboratories of the Physics Department to the students taking lab courses. The course emphasizes the need for a safe working environment.

Course Description:

Students should know what to do when emergencies occur, including escape routes, emergency phone numbers, and location and use of emergency equipment (e.g., alarms, eyewashes, showers, fire extinguishers, spill kits). The course will cover broadly the major topics given below. The major safety topics that the students in the physics labs should understand are:

1. Student responsibilities.
2. General safety precautions in the laboratories.
3. Working with electricity.

4. What is dangerous about electricity?

5. High voltage safety & electronics equipment considerations.
6. Compressed gas cylinders.
7. General precautions when using lasers.
8. Radiation safety: x-radiation and nuclear radiation.
9. What to do if an injury incident occurs.
10. First aid.

Main text Book:

1. CRC Handbook of Laboratory Safety. Fifth Edition. Editor. A. Keith Furr.

2. Handbook of Laboratory Health and Safety. Second Edition.

Editors: R. Scott Stricoff and Douglas B Walter. Weiley Inter Science.

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Pr.	Credit	
PHYS 203	General Physics III	3	1	4	-

Objectives of the Course:
A continuing presentation of additional concepts of physics by studying oscillations, waves and the principles of thermodynamics.

Course Description:
Oscillations, fluid mechanics, Elasticity, wave motion, Acoustic Phenomena, Temperature, quantity of heat, thermal Expansion, Heat transfer, Thermal of matter, Reflection, Refraction, Images from planes and spherical mirrors and surfaces.

Main text Book:

Fundamentals of Physics Extended, 8th Edition
David Halliday, University of Pittsburgh
Robert Resnick, Rensselaer Polytechnic Institute
Jearl Walker, Cleveland State University

Subsidiary Books:

1. Physics for Scientists and Engineers, by Raymond A. Serway
Publisher: Brooks/Cole Publishing Company; 5th edition (October 30, 1999).

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	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	phys 281	**Physics lab.**	**0**	**1**	**1**	**-**

- **Course Objectives:**

- **Course Description:**

Registration- safety & regulations- friction- free fall- force table- Newton‘s law- projectile motion- air track- rotational motion- simple pendulum- hook’s law

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Lab.	Credit	
PHYS 202	General Physics II	3	1	4	PHYS 101, MATH 101

Objectives of the Course:

A continuation of presenting more concepts of physics by studying electricity and magnetism.

Course Description:

Charge and electric force , electric field , Gauss' law , electric potential , capacitance , current and resistance , DC circuits , magnetic force , magnetic field , induction and inductance , magnetism of matter and Maxwell's equations.

Main text Book:

Fundamentals of Physics Extended, 8th Edition

David Halliday, University of Pittsburgh
Robert Resnick, Rensselaer Polytechnic Institute
Jearl Walker, Cleveland State University

Subsidiary Books:

1. **Physics for Scientists and Engineers**, by Raymond A. Serway **Publisher:** Brooks/Cole Publishing Company; 5th edition (October 30, 1999)**.**
2. **Sears and Zemansky's University Physics: With Modern Physics**, by Hugh D. Young and Francis Weston Sears, **Publisher:** Addison-Wesley **Publication Date:** 1991.

3. **Physics, Volume 1, 5th Edition** , by David Halliday, Univ. of Pittsburgh ,Robert Resnick, Rensselaer Polytechnic Institute and Kenneth S.Krane ,Oregon State Univ.©2002.

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Pr.	Credit	
PHYS 204	Marine Physics	3	3	4	PHYS 101, MATH 101

Objectives of the course:

This course aims to teach the fundamental physical concepts of electricity and magnetism which be needed by marine students.

Course Description:

Fluid statics and fluid dynamics, transverse and longitudinal waves, coulomb's law, electric fields and electric potential, capacitors and capacitance, ohm's law, electric circuits, magnetostatics and magnetic inductance, alternating fields and alternating currents, optical interference and diffraction, electrical properties of materials, temperature.

Main text books:

Fundamental of Physics by Halliday, Resnick & Walker 2001 John Wiley & Sons.

Subsidiary books:

1- Physics for scientist and engineers with modern physics by Serway (1997), Saunders college publisher.
2- University Physics by Sears, Zemansky, and Young (1995) .
3- Physics by Halliday, Resnick & Krane (1992) John Wiley & Sons.

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Pr.	Credit	
PHYS 221	Thermodynamics	3	0	3	PHYS 203, MATH 202

Objectives of the Course:
This course aims at teaching the principles of heat and thermodynamics and their applications.

Course Description:
Basic principles of thermodynamics, First law of thermodynamics, Specific heat for ideal gases, Carnet's cycle, Entropy and equilibrium, Chemical potential, Maxwell's equations, Properties of pure materials, Change of Phase, ClausiusClay Peron equation, Vapor pressure, Kinetic theory of gases, Principle of eguipartition of energy, Specific heat capacity of solids.

Main text Book:
Thermodynamics, kinetic theory and statistical thermodynamics by F.W.Sears and G. L Salinger , John Wiley, 1975.

Subsidiary Books:
Fundamentals of Classical thermodynamics by Wylen and Sonntag , 1976.

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Pr.	Credit	
PHYS 241	Modern Physics I	3	0	3	PHYS 202, MATH 202

Objectives of the Course:
This course is intended to give the student a short comprehensive introduction of the special theory of relativity and an introduction to the atomic theory of matter and charge.

Course Description:
The special theory of relativity, hypothesis, Galilean and Lorentz transformation. Relativistic dynamics, photoelectric effect, Black body radiation, the Compton effect, Photon, DeBoglie's hypothesis, Uncertainty principles, wave packet basics properties of atoms, Thomson model, the Rutherford model, Bohr's model the Frank-Hertz experiment, the correspond principle, Wilson-Sommerfeld theory, Sommerfeld relativistic theory.

Main text Book:
Modern Physics by K.S. Krane (1995), Wiley, John & Sons, Inc.

Subsidiary Books:
1. Concepts of modern physics by A. Beiser, sixth edition (2002), McGrawHill Com.
2. Modern Physics for Scientists and Engineers by J. Taylor, C. Zafiratos and M. Dubson, Second Edition (2003).

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Pr.	Credit	
PHYS 251	Mathematical Physics I	4	0	4	MATH 202

Objectives of the Course:
The objective of the course is to provide the undergraduate students necessary mathematical pre-requisites to study core physics courses. **Course Description:** Vector analysis, gradient, divergence, curl; Gauss' and Stokes' theorems; orthogonal curvilinear coordinates. Elements of complex algebra, De Moivre's theorem. Matrix, determinant and their important algebraic properties. Ordinary differential equations of the first and second order with constant and variable coefficients.

Main Text Books:
Introduction to Mathematical Physics, by Charlie Harper; Prentice-Hall, (1976).

Subsidiary Books:
1-Introduction to Mathematical Physics: Methods and Concepts: by Chun Wa Wong (1991).

2-Mathematical Methods for Physicists, by G.B. Arfken, and H.J. Weber;Academic Press (1995).

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Pr.	Credit	
PHYS 252	Classical Mechanics I	3	0	3	PHYS 110, MATH 202

Objectives of the Course:
A continuation of the principles of classical mechanics introduced in the elementary course of physics with some expansion and the introduction of new concepts such as general motion of a particle in three dimensions, the celestial mechanics, and the non inertial reference system to enable the student to tackle more complex systems and to prepare him for the concept of modern physics.

Course Description:
Fundamental concepts of vectors, Newtonian mechanics, rectilinear motion of a particle, the harmonic oscillator, general motion of a particle in three dimensions, noninertial-reference systems, central forces and celestial mechanics.

Main text Book:
Fowles, Grant R., and George L. Cassiday. *Analytical mechanics*. Saunders college, 1999.

Subsidiary Books:
1- Introduction to classical mechanics by A.P. Arya, (1997) prentice-Hall. 2- Classical Dynamics of Particles and Systems by S. Thornton and J. Marion, Brooks Cole; 5^{th} edition (2003).

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10	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 311	Optics	3	-	3	PHYS 241

Objectives of the course:
The course provides an extensive discussion of optical phenomenon such as interference, diffraction and polarization.

Course Description:
Wave motion, electromagnetic theory, the superposition of waves, polarization, diffraction, interference and the basic of coherence theory.

Main text books:
Optics by E. Hecht (2001).

Subsidiary books:
1- Optics by M.V. Klein (1981).
2- Modem optics by: R. Guenthes (1986).

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11	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 312	Electronic Circuits I	3	-	3	PHYS 202, MATH 202

Objectives of the course:
To provide the basic information for BSc students in order to understand and analyze DC & AC electric circuits.

Course Description:
Study of Electric current starting from Ohm's law and their applications in Electric, circuits, including the study of current & voltage AC & DC source. The laws of Kirchhoff and methods of solving DC circuits, Elements of A.C circuits and their components (Capacitance & inductors), Representing voltage & currents through the concept of phasors, Methods to solve AC & DC circuits using Thevnin and Norton methods, Diodes & rectification of AC voltages, Smoothing circuits, power supplies, Transistors, biasing and circuit configurations and transistor with small signal model.

Main text books:
Fundamentals of Electronics Circuits (with CD-ROH), By Charles Alexander, Hathew Sadika, McGraw Hill (2003)

Subsidiary books:

1- Basic electronics, solid state, by B.L. Theraja (1997).
2- A text book of electronics by L.S.Kakani et.al (1991). 3- Electrical circuit analysis by Taberad Sigals (1980).

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Pr.	Credit	
PHYS 331	Electricity and Magnetism I	3	0	3	PHYS 202, PHYS 251

Objectives of the Course:
The objective of this course is to give the student an introduction to the subject of electromagnetic fields emphasizing the fundamental concepts.

Course Description:
Vector analysis, Electrostatics, work and energy, Special techniques in calculating potential (Laplace's equation, the method of images), Electromagnetic fields in mater (Polarization, electric displacement, linear dielectrics).

Main text Book:
Introduction to Electrodynamics by D. J. Griffiths, 3rd edition (1998). PrenticsHall, Inc.

Subsidiary Books:
1- Fundamentals of electromagnetic theory by: Reitz, Milford and Christy (1979).
2- Electromagnetic concepts and applications (Second edition) By: S.V. Marshall and A.A . Skitek (1987). Prentice-Hall, Inc.

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13	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 332	Electricity and Magnetism II	3	-	3	PHYS 331

Objectives of the course:
The course aims at teaching the principles of current electricity electromagnetism and electromagnetic radiation.

Course Description:
Static magnetism in matter, Electromagnetic induction, Faraday's law, Maxwell's equations, Electromagnetic waves. Their propagation in conducting and nonconducting media, Dispersion, emission of electromagnetic radiations from dipoles and point charges.

Main text books:
Introduction to Electrodynamics by D. J. Griffiths, 3rd edition (1998). Prentics-Hall, Inc.

Subsidiary books:
1- Electromagnetic concepts and applications 2nd edition by S.V. Marshall and A.A . Skitek (1987). Prentice-Hall, Inc.
2- Basic electromagnetic fields by Herbert P. Neff, J. R. (1981) Harper and row. Publisher, Inc.
3- Fundamentals of electromagnetic theory by: Reitz, Milford and Christy (1979).

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14	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 342	Modern Physics II	3	-	3	PHYS (241, 251, 252)

Objectives of the course:
The course is intended to convert the student from the classical (Newtonian) sense to the modern (Quantum) sense of Physics. It will teach quantum physics fundamentals and other main features of modern physics.

Course Description:
The Schrödinger equation and its applications, the hydrogen atom in quantum physics, quantum numbers, angular momentum, intrinsic spin, energy levels and spectroscopy, Zeeman effect; fine structure, the Pauli's exclusion principle, the periodic table, properties of elements, x-ray, optical spectra, the band theory in solids, electrons in metals, superconductivity, semiconductors. Nuclear structure and Radioactivity.

Main text books:
Modern Physics by K.S. Krane (1995), Wiley, John & Sons, Inc.

Subsidiary books:
1- Concepts of modern physics by A. Beiser, sixth edition (2002), McGraw-Hill Com.
2- Modern Physics for Scientists and Engineers by J. Taylor, C. Zafiratos and M. Dubson, 2nd edition, 2003.

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15	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 343	Special Relativity	2	-	2	PHYS 241

Objectives of the course:
Introduce the basic ideas and concepts of the special relativity to the student.

Course Description:
Revision of the relativistic ideas discussed in PHYS 241. Physics before relativity and the Newtonian relativity. Relativistic kinematics: Einstein's postulates of the relativity and their consequences. The four-dimensional space and the space-time invariant interval. Relativistic dynamics: Energy, momentum, and conservation of energy and momentum. Relativistic collisions and Compton effect. A gentle introduction to general relativity.

Main text books:
1- Special relativity, from Einstein to strings. Patricia M. Schwarz and John H. Schwarz, Cambridge university press. 2004.
2- Space time physics, 2nd edition, Edwin F. Taylor, John Archibald Wheeler.

Subsidiary books:
1- Introduction to special relativity, by Robert Resnick., John Wiley and sons, 1968. 2- Special relativity, by A. P. French, Van Nostrand Reinhold (UK) Co. Ltd, (19681984).
3- Introduction to relativity, by John B. Kogut., A Harcourt Science and technology company, (2001).

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Pr.	Credit	
PHYS 352	Mathematical Physics II	4	0	4	PHYS 251

Objectives of the Course:
The objective of the course is to provide the undergraduate students necessary mathematical pre-requisites to study core physics courses.

Course Description:
Special functions of mathematical physics, Hermite polynomial, Legendre and associated Legendre polynomials, Laguerre and associated Laguerre polynomials, Bessel and spherical Bessel functions and their important properties. Fourier series, Fourier and Laplace transforms and their simple applications. Elements of probability theory, random variables, expectation values, probability distributions. Elements of group theory

Main text Book:
Introduction to Mathematical Physics, by Charlie Harper; Prentice-Hall, (1976).

Subsidiary Books:
1-Introduction to Mathematical Physics: Methods and Concepts: by Chun Wa Wong (1991).

2-Mathematical Methods for Physicists, by G.B. Arfken, and H.J. Weber;Academic Press (1995).

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Pr.	Credit	
PHYS 353	Classical Mechanics II	3	0	3	PHYS 252

Objectives of the Course:
This course is a continuation for PHYS252 course. More advanced topics are introduced in classical mechanics.

Course Description:
System of particles, angular momentum, lab and center of mass coordinate systems, mechanics of rigid bodies, the physical pendulum, laminar motion, collision of rigid bodies, motion of rigid bodies in three dimensions, Euler's equations, gyroscopic motion, motion of a top, gyrocompass, inertia tensor, Lagrangian mechanics, generalized coordinates, Hamilton's variational principle, Hamiltonian equation, dynamics of oscillating systems, normal coordinates, coupled harmonic motion, continuous system and the wave equation.

Main text Book:
Analytical mechanics by G.R. Fowles and G. Cassiday, 7th edition (2004) Brooks Cole publishing.

Subsidiary Books:

1- Introduction to classical mechanics by A.P. Arya (1997) prentice-Hall. 2- Classical Dynamics of Particles and Systems by S. Thornton and J. Marion, Brooks Cole, 5th edition (2003).

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Course No.	Course Title	No. of Units			Pre-requisites
		Th.	Pr.	Credit	
PHYS 354	Quantum Mechanics I	3	0	3	PHYS (342, 353)

Objectives of the Course:
This introductory course in quantum mechanics covers the basics of quantum mechanics and its applications.

Course Description:
Topics covered include the basic ideas of wave function, probability density, The operators in quantum mechanics, The Schrödinger equation and its applications in one, two and three dimensions such as free particle, step potential, barrier potentials, particle in a box and the harmonic oscillator, solution of the Schrödinger equation for the hydrogen like atom, the concepts of orbital angular momentum and spin angular momentum. The spin orbit interaction.

Main text Book:
Introductory quantum mechanics by R. Liboff, 4th edition (2002), Addison-Wesely.

Subsidiary Books:
Quantum Mechanics, by Sara M. McMurry (1993), Addison - Wesely.

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19	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 381	Modern Physics Lab.	-	3	1	PHYS 342

Objectives of the course:
Special topics in applied physics will be presented in this course to keep the student aware about the new researches done in applied physics.

Course Description:
The experiments and applications of this laboratory are described very closely in accordance to the topics of PHYS 241 and PHYS 342.

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20	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 382	Electronic Circuits Lab.	-	3	1	PHYS 312

Objectives of the course:
Special topics in applied physics will be presented in this course to keep the student aware of the new researches being done in applied physics.

Course Description:
The experiments and applications of this laboratory are described very closely in accordance to the topics of PHYS 312.

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21	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 383	Optics Lab.	-	3	1	PHYS 311

Objectives of the course:
This laboratory is related very closely to the topics of Physical optics taught in PHYS 311. Its purpose is to give the students experimental background about interference, diffraction and polarization where in some cases laser sources will also be used.

Course Description:
The experiments and applications in this laboratory are described very closely in accordance with the topics of PHYS 311.

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22	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 390	Training I	-	6	2	Approval of the Department

Objectives of the course:
This course tends to train the student in conducting research work and provides him an opportunity for the acquisition of skill through practical work.

Course Description:
The course includes on the physical applications in industry, the dealing with the devices, the practical life and the typical dealing with it, in addition to the specialized training in the sides which include the factories and which the student can apply what he learn in the university.

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23	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 392	Special Topics	2	-	2	Approval of the Department

Objectives of the course:
The purpose of this course is to teach areas that are not covered by the other physics courses in the department and how find the suitable references.

Course Description:
This course can be of a theoretical or experimental nature. The course content must be approved by the department's board every time a new subject is offered.

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24	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 393	Computer Application in Physics	1	3	2	PHYS (251, 342)

Objectives of the course:
The course aims to train the students in using computers to solve special problems from different physics areas such as quantum mechanics, electromagnetism, statistical physics, classical mechanics,….. etc.

Course Description:
Using the latest programming languages which will include, statements, functions, loops, roots, integration, solving differential equations, matrices, set of simultaneous equations and graphics. In addition to a very carefully selected set of problems in mathematical physics and numerical analysis requiring the application of programming languages in solving these problems.

Main text books:

There are several books which meet the multiple nature of this cours.

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25	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 412	Laser Physics	2	-	2	PHYS (311, 354)

Objectives of the course:

To study the physical principles of laser and its different types, also to study the characteristics of laser beam and its applications.

Course Description:

Spontaneous and stimulated emissions, The idea of lasers- theory of lasers, Properties of lasers, Resonators and modes. Divergence and coherence of laser beam, Modification of lasers, Classification of lasers, some applications of laser beam.

Main text books:
Lasers by Bela A. Lengyel (1971).

Subsidiary books:
1- Safety With Lasers and Optical Sources by D. Sliney an M. Walbrasht (1987).
2- Optoelectronics - An introduction by J. Wilson and J.B. Hawakes (1983). 3- Laser Communication Systems by William K. Psatt (1978).

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26	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 413	Electronic Circuits II	1	3	2	PHYS (312, 352)

Objectives of the course:
To study the basic elements of the electronic circuits (Analogue and digitals).

Course Description:
Introduction to various types of modern transistors used in integrated circuits such as JFETS and MOSFETS. Applications of analogue transistor circuits. Voltage amplifiers , Oscillators, Operational amplifiers. Digital circuits such as Logic gates and digital counters.

Main text books:

Electronic Devices, Thomas, L. Floyd, 5th edition, Prentice Hall Inc. (1999).

Subsidiary books:

1- Electronics circuits and devices by R.J. Smith (1980).
2- Electronics devices and circuits by A. Mottersheed (1978).
3- A text book of electronics by S.L.Kakani etal (1991).
4- Electrical circuit analysis by Taberad Sigalls (1980).

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27	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 414	Microwaves	2	3	3	PHYS 312, PHYS 332

Objectives of the course:
To provide the fourth level BSc. students the basic information of the transmission lines and waveguide transmission.

Course Description:

This course provides an introduction to microwaves commencing with the definition and general properties of transmission lines. This study will investigate the microwave signals i.e. frequency, wavelength, velocity etc and will cover the following topics: Transmission lines, electromagnetic fields, waveguide transmission, rectangular and circular waveguide. Oscillators and measurements.

Main text books:
Microwaves: An introduction to microwave theory and techniques by B. Fuller (1979).

Subsidiary books:
Microwaves Theory and Applications by S.F. Adam (1969).

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28	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 455	Quantum Mechanics II	3	-	3	PHYS 354

Objectives of the course:
A continuation of PHYS 354 to completely cover the basics of quantum mechanics and its applications.

Course Description:

Topics covered include Methods of approximate solutions of the Schrödinger equation including the perturbation methods, variational methods and WKB method. Identical particles , The multi-electron atoms and the Zeeman effect.

Main text books:
Introductory Quantum Mechanics, by Liboff, 4th edition (2002) - Addison Wesley.

Subsidiary books:
Quantum Mechanics , by Sara M. McMurry (1993), Addison - Wesely.

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29	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 456	Statistical Mechanics	3	-	3	PHYS (221, 354)

Objectives of the course:
To introduce the statistical concepts in physics. It has been suggested to study basic laws of statistical physics and to apply them to a wide range of problems.

Course Description:

Review of the three thermodynamics laws , Introduction to statistical physics (a particle in a box, energy levels, microstates, macrostates, entropy). Statistical thermodynamics (distribution of energy between systems in equilibrium, equilibrium of a system in a heat bath, the partition function). The heat capacity of solids , black body radiation (the partition function of photons, properties of black body radiation). The perfect classical gas (the partition function of the gas, the Maxwell velocity distribution). The perfect quintal gas (the partition function of Bosons and Fermions, the Fermi-Dirac and Bose-Einstein distribution).

Main text books:
Introduction to statistical physics by R. Rosser (1983).

Subsidiary books:
1- Statistical physics by: F. Mandl, John and sons (1988) reprinted 2002.
2- Fundamentals of statistical thermodynamics by F. Reif, Mcgraw Hill, (1985).

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30	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 461	Nuclear Physics	3	-	3	PHYS 354

Objectives of the course:
The objective of the course is to give the students a good understanding of the basic concepts of nuclear physics.

Course Description:

General properties of the nucleus, nuclear stability, stability line and the table of nuclei. Binding energy, separation energy. The liquid drop model. Nuclear decay law, half life, mean life -time and radioactivity. Decay schemes. Production of radioactive materials. Alpha decay, Beta decay, Gamma decay, nuclear structure models, nuclear reactions and safety applications.

Main text books:

The Physics of nuclei and Particle, Richard Dunlap, Thomson- Brooks/cole (2004)

Subsidiary books:

1- Elements of nuclear physics W. Burcham Longman (1979). 2- Introductory Nuclear Physics H.S. Krane (1987).

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Department of Physics

31	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 462	Nuclear Radiation and Detectors	2	-	2	PHYS 461

Objectives of the course:

To familiarize the students with the practical side of nuclear physics that will help them to work in radiation detection and protection fields.

Course Description:
Radiation sources(standard sources and radiation machines), interaction of radiation with matter and the biological effects of radiation, counters and detectors(solid, liquid, gaseous), pulse processing and analysis, particle identification methods, nuclear energy and safety applications.

Main text books:
1- Radiation detection and measurement by G.Knoll, John – Wiley. 2-
Nuclear electronics by P.W. Nicholson, John – Wiley.

Subsidiary books:
1- Introduction to nuclear radiation detectors by P.N.Cooper, Cambridge university press.
2- Techniques for nuclear and physics experiments (A how – to approach), by W.R.Leo, Springer - Verlag.

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32	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 463	Nuclear Models	2	-	2	PHYS 461

Objectives of the course:
The objective of this course is to present some important nuclear models which help to improve the student's nuclear base.

Course Description:

Nuclear two-body problem, nuclear force, Fermi gas model, nuclear shell model, the deformed shell model the collective model, vibrational and rotational models.

Main text books:

1- Introduction to Nuclear Physics H. Enge (1999).
2- Introductory Nuclear Physics H.S. Krane (1987).

Subsidiary books:

Elements of Nuclaer Physics W.E. Meyerhof (1967).

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33	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 471	Solid State Physics	3	-	3	PHYS 354

Objectives of the course:

The objective of this course is to give the student an introduction to the field of solid state physics emphasizing the fundamental concepts.

Course Description:
Topics usually covered are crystal structure, crystal diffraction, crystal binding , lattice vibration , thermal properties , free electron theory and energy bands.

Main text books:
Introduction to solid slats physics by: C. Kittel (1995), John Wiley & Sons Inc.

Subsidiary books:
1- The solid state by Rosenberg (1983) Oxford press.
2- Solid state Physics by Omar,(1975).
3- Solid State Physics by Dekker (1981).

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34	Course No.	Course Title	No. of Units	Pre-requisites

			Th.	Pr.	Credit	
	PHYS 472	Semiconductor Physics	2	-	2	PHYS 312, PHYS 471

Objectives of the course:
To introduce the basics of semiconductor materials both in bulk and in thin film forms.

Course Description:
This course which will be an introduction to the Physics of semiconductors and is designed to give the students an understanding of the technology and applications of semiconductor devices. It will cover the following topics: Energy bands, carrier concentration, carrier transport phenomena, p-n junction, bipolar and other devices.

Main text books:
Introduction to Solid State Physics by: C.Kittel (1995). Wilesy, John & Sons Inc.

Subsidiary books:
Physics of Semiconductor Devices by: S. M. Sze. (1978).

35	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 484	Nuclear Physics Lab.	-	3	1	PHYS 461

Objectives of the course:

This laboratory is related very closely to the topics of nuclear physics taught in PHYS 461. Its purpose is to give the students experimental background about radiation, sources, detection, protection, signal processing, data acquisition and analysis.

Course Description:

The experiments and applications of this laboratory are described very closely in accordance to the topics of PHYS 461.

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36	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 485	Solid State Physics Lab.	-	3	1	PHYS 471

Objectives of the course:
This laboratory is related very closely to the topics of solid state and semiconductor physics taught in PHYS 471. Its purpose is to give the students experimental background about crystal structure, x-ray diffractometry, electrical conduction in metals and semiconductors, photocoductance and photovoltaic devices.

Course Description:
The experiments and applications in this laboratory are described very closely in accordance to the topics of PHYS 471.

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37	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 490	Training II	-	6	2	Approval of the Department

Objectives of the course:
This course tends to train the student in conducting a research work and provide him an opportunity for the acquisition of skills by practical work.

Course Description:
Initiating the work plan - preparing the planned experiment. Making measurements and data analysis writing a final report.

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38	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	PHYS 493	Physics Education Training	-	-	2	Approval of the Department

Objectives of the course:
This is a very important course for physics senior students where they are trained to give physics lessons in front of some department faculty members. This makes the students more prepared for teaching positions.

Course Description:
The physics topics covered by the students are in different subjects suitable for middle and high schools and in general subjects. The students will receive some educational and scientific directions.

Main text books:

Some international or local references chosen in the physics fields.