General Mathematics I 3 Cr. T

The set R of real numbers, Relation of order in R, Principle of Mathematical Induction, Complex numbers; Analysis: Functions: Odd, Even and Periodic Functions Hyperbola functions and their graphs; Co-ordinate geometry: Conic sections in rectangular coordinates, parabola, ellipse and hyperbola; Parametric equations: Plane polar co-ordinates, polar curves.

Physics I 3 Cr. T

A study of the basic concepts of physics using only elementary algebra, geometry, and trigonometry. Topics include vector algebra, motion, gravity, work, energy, momentum, angular momentum, conservation laws, thermodynamics, and vibrations and waves.

Anatomy 2 Cr. T

An Introduction to the human body, the skeletal system, the axial skeleton and ribs, the appendicular skeleton, joints, the muscular system, thorax, abdomen, upper limb, lower limb.

Physiology 3 Cr. T

Cell physiology, nervous system, muscles, cardiovascular systems, respiratory system, digestive system, urinary system, endocrine system. Pre-requisite: Human Anatomy

Physiology Laboratory 1 Cr. P

The practical experiments of Physiology course in Laboratory.

Physics II 3 Cr. T

A continuation of Physics I, treating electrostatics, magnetism, circuits, optics, relativity, atomic structure, the nucleus and fundamental particles.

Physics I Laboratory 1 Cr. P

Laboratory experiments designed to complement Physics I. Basic concepts of measurement, mechanics, heat and electrical circuits.

General Mathematics II 3 Cr. T

Determinants and their properties, Applications to systems of linear equations, Homogeneous systems, Eigen values and Eigen vectors; Convergence of series of real numbers, Tests of convergence, Series of functions and power series; convergence of power series; The Definite Integral; Definition: The Riemann Sum; Techniques of integration including advanced methods of substitution, partial fractions, by parts and reduction formulae, Applications; Improper Integrals; Convergence; Partial Differentiation, total derivations.

Biostatistics & Probabilities 3 Cr. T

Fundamentals of probability, conditional probability, Bayes rule, random variables, functions of random variables, expectation and high-order moments, Markov chains, hypothesis testing and also the use of statistics in Health systems.

Principles & Fundamentals of Computer & Network 2 Cr. T

Introduction and Layered Architecture, Introduction to Physical Layer, Data Link Layer, MAC Sub- layer, Network Layer and Routing, Transport Layer Concepts, Introduction to Application Layer, Definition, Synchronization, IC Interfacing, Memory system design and High Speed DRAMs, Parallel and Serial Communication and ports, Universal Serial Bus (USB), ISA Extension Bus, PCI Extension Bus, Design.

Differential Equations 3 Cr. T

Analysis of engineering problems formulated in terms of partial differential equations. Solutions of these mathematical models by means of analytical and numerical methods.

Engineering mathematics 3 Cr. T

Engineering applications of mathematical methods. Topics include ordinary differential equations, linear algebra, calculus, Fourier analysis, Laplace transform and partial differential equations.

Medical Physics 3 Cr. T

Introduction to medical physics: production and measurement of x-rays and charged particles for nuclear medicine, interaction of radiation with biological materials, radiation dosimetry, radiation safety, physics of medical imaging, magnetic resonance imaging.

Methodology & Medical Information Systems 2 Cr. T

The course gives an overview of scientific and industrial development trends within the areas of Biomedical engineering design. Scientific working methods, research and engineering ethics and research methodologies are treated both on a general level and on the level of specific research domains. Focus is on how research may be used for the benefit of industry and society by promoting innovation.

Biophysics 2 Cr. T
The course integrates physics, biology, physical experimental methods and biochemistry. The basic biological concepts are introduced: the cell, biological structures and principles of physics in biology. Basic biochemistry/physics, explaining function and structure of biological molecules, membranes and whole cells are briefly reviewed. Fundamental molecular biophysics: peptides, macromolecules, proteins, protein dynamics, biopolymers, DNA and nucleic acids. The intra- and inter-atomic forces between biomolecules and their biological relevance. Energy. Cell mechanics, movement, nerve cells and signals are briefly overviewed and discussed. Biological membranes and ion channels. Practical applications in several fields as well as prospective of biomaterials and micro/Nano technology are discussed. An introduction to modern experimental methods in biophysics (NMR, fluorescence, confocal microscopy and laser spectroscopy, SPM and AFM) will be given.

Electric Circuits I 3 Cr. T
Network graph-Kirchhoff's laws-Linear and nonlinear components-Dependent and independent sources- nodal and mesh analysis-Analysis of resistor circuits-Norton's and Thevenin's theorems -Equivalent resistance- Superposition theorem-Operational amplifier-Capacitor and inductor- RC, RL and RLC circuits- Step response- Impulse response-Transient and steady-state responses-Linear time-invariant circuits-Convolution integral- Sinusoidal steady-state analysis Frequency response-Three-Phase circuits.

Public health 1 Cr. T
Introduces and investigates the history, issues, function and context of public health, community health and health systems.

Signals and Systems Analysis 3 Cr. T
Primary definitions of systems and signal, various kinds of systems, introduction to modeling of various physical systems, analysis of linear and time independent

(continuous and discrete) systems, impulse response, convolution integral, Fourier analysis, energy density, spectrum and power sampling theorem, system analysis by Laplace transform, signal flow graphs, system analysis in state space (continuous and discrete), Z transform, discrete systems analysis by the Z transform.

Preliminaries of Biomedical Engineering 3 Cr. T
History of biomedical engineering, disciplines of biomedical engineering, role of biomedical engineers in health care sector, challenges and future directions in biomedical engineering, moral and ethical issues in biomedical engineering, visits to hospitals, student seminars Pre-.

Electronics I 3 Cr. T
N and P type semiconductors, current and voltage equations, diode equivalent circuit, diode circuit, half-wave and full-wave rectifiers, clipping circuits, clamping circuits, multipliers, transistors and their biasing, operating points for various transistor circuit configurations, low frequency and small signal equivalent circuits of transistors, single stage transistor amplifier, transistors in switching circuits, Multi – stage amplifiers.

Electromagnetism 3 Cr. T
Vector analysis, Coulomb's and Gauss' laws, electric potential, Laplace's and Poisson's equations, electrostatic fields in material media, electrostatic energy, electric current, Biot Savart's law, magnetic potentials, Faraday's law, magneto static fields in material media, magneto static energy, magnetic circuits, displacement current, Maxwell`s Equations.

Electric Circuits II 3 Cr. T
Coupling components and coupled circuits, nodal and mesh analysis, loop and cut-set analysis, natural frequencies, system function and frequency response of LIT Networks, state equations Analysis, network
analysis in frequency domain, network theorems (Reciprocity, Thevenin, Norton, substitution, superposition,
Telegan), two port networks (Impedance, Admitance, Hybrid and Transmission Matrixes), Graph theory in
network analysis, Laplace transform and its application in LTI networks.

Logic Circuits 3 Cr. T
Number systems, Boolean algebra and related rules, Logic functions and their reduction, Logic gates and logic families (such as RTL, DTL,TTL, ECL, CMOS).

Combinatorial circuits (such as comparators, coders, code converters, combiners), Sequential circuits (such as flip flops, shift registers, counters, synchronous and Asynchronous logic circuits), study of various types of codes.

Linear Algebra 3 Cr. T
Linear Equations, Matrix algebra, Echelon Form, vector spaces, Norms, Inner products and orthogonality, Determinants, Eigen values and Eigen vectors, review of all chapters and how to combine some of them to solve problems.

Protection, Safety & General standards of Hospital 2 Cr. T
Introduction to the types of hazards in hospitals and clinics, electrical hazards safety requirements of power distribution in hospitals, biological, safety codes and standards for biomedical equipment's and facilities, test instruments for checking safety parameters of medical instruments.

Bioelectric phenomena 3 Cr. T
Physical interpretation of electric phenomena in living tissue constitutes a special area of biophysics. The subject ,Bioelectric phenomena 'acquaints the students with biophysical basis of the genesis of electric signals on different structural levels , with passive electric properties a of living tissue, and with currently available methods of bioelectric measurements.

Principles of Radiology & Medical Imaging Systems 3 Cr. T

Radioactivity, X -ray physics and imaging techniques, Computed tomography (CT imaging), introduction to SPECT and PET imaging techniques, biological effects of radiation and safe handling. Medical ultrasound imaging techniques, modes of operation, magnetic resonance imaging techniques (MRI), principles of operation, components of MRI machines, computer based reconstruction, biological effects of magnetic fields, static magnetic fields, radio frequency fields, gradient magnetic fields.

Principles & Generalities of Healthcare Services Management 2 Cr. T

Introduces healthcare organizations and organizational management concepts. Develops a broad perspective by integrating conceptual, strategic, and systemic frameworks using four knowledge themes; the management role, organizational theory, management economics, and theory and practice of systemic organizational change within overall strategic management and systemic contexts.

Linear Control Systems 3 Cr. T
Feedback systems, definitions of stability, transfer functions F(S), zeros and poles of transfer functions and their representations in the coordinate systems (S plane), criteria of system efficiency in transient and stable states, kinds of systems, servo-mechanisms, controllers (such as O,PI,PD,PID)investigation of the stability of a system by the methods of root locus and Hurwitz, extended fractions, frequency response and Bode diagram, and M curves and their applications approximate methods for the reduction of high order systems, state space, control system design and compensators, analog modeling.

Algorithm calculation 2 Cr. T

This course teaches techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice. Topics covered include: sorting; search trees, heaps, and hashing; divide-and-conquer; dynamic programming; amortized analysis; graph algorithms; shortest paths; network flow; computational geometry; number-theoretic algorithms; polynomial and matrix calculations; caching; and parallel computing.

Electronics II 3 Cr. T
Physics of FET transistor, FET bias and amplification circuits, power amplifiers, current sources, feedback in amplifiers, DC amplifiers, differential amplifiers, operational amplifiers, offset in OP Amps and its compensation, various linear and nonlinear applications of OP Amps, regulated power supplies.

English (for special purpose) for Biomedical Engineers 2 Cr. T
Engineering technical words, especially in the major of Biomedical Engineering for future use. Other skills such as Listening, Speaking and Reading are evaluated.

Family Science And population 2 Cr. T

Lectures in selected topics in human development and family studies.

Circuit Laboratory 1 1 Cr. P

This course is designed to provide students with fundamental concepts of Electronic Circuits for lab experience. Transient analysis and frequency response of Single and Multistage BJT and FET Amplifier. Study of operation of Oscillators and Waveform generators like Multivibrators and Schmitt trigger. Study of frequency response of Tuned and Feedback Amplifier. Application of simulation tools (PSPICE or Multisim) to understand the circuit characteristics.

Medical informatics 3 Cr. T
A Brief History of Medical Informatics, Standards in medical informatics, The Organization of Health Information, Health Information Systems in Clinical Settings, Issues with The Electronic Medical Record, eHealth, Systems for Health Finance & Health Insurance, Issues in Telemedicine, Systems for Clinical Decision.

Principles of Rehabilitation, Equipment & Devices 3 Cr. T
Introduction to rehabilitation engineering, disability, rehabilitation engineering technology, assistive devices, physiological and biomedical measurement techniques, disability assessment, application of rehabilitation engineering, prosthetics and orthotics.

General Equipment's of Hospital & Medical Clinics 2 Cr. T

Knowing General devices and its electronic parts like Amplifiers and filters, bio-potential amplifiers, design of power system in medical electronics, oscillator circuits, Analog to digital converter (ADC), digital to analog converter (DAC) and data acquisition circuits.

Computer Architecture 3 Cr. T
Principles of an assembly language programming, introduction to computer architecture, internal representation of data and instruction, memory organization, microprogramming multi-level machines, Control
memory, common bus organization, stack organization and RISC and CICS structures, pipeline and basics of parallel machines.

General Physics II Laboratory 1 Cr. P
Laboratory experiments designed to complement Physics I. Electromagnetism, wave motion, optics, atomic structure.

Microprocessor I 3 Cr. T
Definition and applications of Microprocessors, Taxonomy of Microprocessors, programming a Microprocessor, Memory System Design, IO System Design, Design Examples, Example Microprocessors and Microcontrollers (including Z80, 80x86, 8051, AVRs).

Digital Signal Processing (DSP) 3 Cr. T

his course provides an introduction to digital signal processing for both undergraduate and for graduate students. In this course, a detailed examination of basic digital signal processing operations including sampling/reconstruction of continuous time signals, Fourier and Z-transforms will be given. The Fourier and Z-transforms will be used to analyze the stability of systems, and to find the system transfer function. The discrete Fourier transform (DFT) and fast Fourier transform (FFT) will be studied. Finally, we will examine time and frequency domain techniques for designing and applying infinite impulse response (IIR) and finite impulse response (FIR) digital filters. Two-dimensional signals and introductory image processing operations will also be discussed.

Practical & Educational workshop and understanding Healthcare systems 2+2 Cr. T+W

How to improve healthcare systems in Iran based on global model.

General Equipment of Hospital & medical clinics workshop 1 Cr. W

The workshop for the main course in purpose of visiting clinics and hospitals and learning about the rules for medical devices in hospitals.

Electronics I Laboratory 1 Cr. P
Familiarization with diodes and their volt-ampere characteristics, diode applications in rectifiers, diode applications as clipper, clamper and limiter, voltage multipliers, familiarization with transistors, such as their types, measurement of leakage currents (ICBO,ICEO,ICES)and, input/output characteristics curves of transistors (such as PNP and NPN), determination of h parameters by transistor characteristics, investigation of active states of transistors (cut-off, saturation, operating point), transistor amplification

in configurations of common-emitter, common-collector and common-base, Darlington amplifiers, two – stage amplifier, simple power supplies using Zener diode and transistors.

Electronics laboratory II 1 Cr. P

High-frequency characteristics of transistors and transistor amplifiers. Feedback in electronic circuits. Electronic oscillators. Differential amplifiers. Properties of linear IC operational amplifiers and their application in amplifier circuits and waveform generation circuits. Linear circuit design and analysis.

Microprocessor Laboratory 1 Cr. P
This is a one credit hour lab, which comes as hands-on experience on topics that are theoretically covered in the microprocessor and microcontroller design course. During this lab course, the student utilizes a real 8-bit microprocessor and microcontrollers, different types of application, ranging from sensing simple environment parameter such temperature to controlling simple systems using closed loop controller such as room temperature.

Direct & Alternate Electric Machine 3 Cr. T
Magnetic circuits, magnetic field energy, force and torque in electromagnetic system, DC machines: machine construction, review and determination of electromotive force (emf), armature winding, armature reaction, compensating windings, types of machine excitations, load characteristics of motor and generators. Control of DC motors, loss and efficiency, parallel connection of DC generators, various applications of DC machines.

Electronic Measurement 2 Cr. T
Concepts and importance of electrical measurements, primary definitions, components of measurement systems, errors and error analysis, classification of measurement equipment, ordinary oscilloscope, recorders, analog measuring equipment (with permanent magnets, moving coils, moving soft iron, electrodynamics, inductive Ferro dynamic, electrostatic), DC/AC ammeters and voltmeters, methods of measuring very low and very high values of voltage and current.

Computer Programming (web) 2 Cr. T

Concepts and structures in design and implementation of widely used programming especially using C# in web design and how to develop that.

B.Sc. Final Project 3 Cr. P
Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the requirement for the degree. An appropriate experimental or analytical thesis or project may be accepted. Mine was redesign a 3-lead ECG amplifier.

Numerical Analysis 2 Cr. T
Building upon calculus and computer programming, the course covers basic numerical methods, including linear and nonlinear algebraic equations, interpolation and approximation, ordinary differential equations, numerical integration and differentiation, finite element and perturbation. Weekly assignments involve both pencil-and-paper and computer work.

Logic Circuits Laboratory 1 Cr. P

Logic gates, familiarization with several logic circuits and determination of parameters of digital IC's, several combinational circuits (decoder, multiplexer, parity generators and checkers), displays. Study of types of flip flops, asynchronous counters, synchronous counters, familiarization with several IC counters, shift registers.

**** In University, Educational System during Each Academic Semester, Each Theoretical Credit is taught in 16 hours, practical credit in 32 hours and workshop operations in 48 hours.

P= practical , T=Theoretical, W= workshop Cr = Credit