

course description



این فایل به منظور کمک به متقاضیان تحصیل در کشور ایتالیا توسط گروه فلی تو ایتالی به صورت رایگان تهیه شده است لطفاً از خرید این فایل خودداری فرمایید.

اسفاده از این فایل در صفحات مجازی و وبسایت ها با ذکر نام تهیه کننده بلامانع است.

کانال تلگرام
فلی تو ایتالی



کانال یوتیوب
فلی تو ایتالی



پیج اینستاگرام
فلی تو ایتالی



سایت
فلی تو ایتالی



معرفی فلای تو ایتالی

سلام!

تیم فلای تو ایتالی متشکل از چند دانشجو که فعالیت خودمون را از ماه بهمن سال 1401 آغاز کردیم و هدف تیم ما این است که به شما کمک کنیم تا بتوانید به صورت مستقل و بدون نیاز به مشاوران مهاجرتی برای دانشگاه های ایتالیا اپلای کنید و پذیرش بگیرید . با توجه به اینکه بسیاری از موسسه های مهاجرتی هزینه های بالایی را برای اخذ پذیرش از دانشگاه های ایتالیا از دانشجو دریافت میکنند ، ما تصمیم گرفتیم با تلاش و تجربه خود به دانشجو ها کمک کنیم که بدون هزینه اضافه کار های مهاجرتی خودشان را انجام بدهند .

در این راستا در طی سال های گذشته ویدئو های مختلفی را برای نحوه اپلای کردن دانشگاه های ایتالیا ضبط و منتشر کردیم تا به دانشجویان کمکی کرده باشیم تا بتوانند در این مسیر با کمترین هزینه از دانشگاه های ایتالیا پذیرش بگیرند .

پس اگر سوال یا نیاز به راهنمایی در زمینه مهاجرت تحصیلی به کشور ایتالیا داشتید ، با ما همراه باشید و سوالات خودتون را از ما بپرسید . ما در کنار شما خواهیم بود و شما را همراهی خواهیم کرد .

مدیریت fly to italy



طریق استفاده از فایل

برای استفاده از این فایل ، صفحات بعد را کپی گرفته و به
دانشگاه مبدا ببرید و تاییدات لازم را بگیرید

Description of Courses in Biomedical Engineering (Biomaterial), Bachelor Program

BASIC COURSES

General Mathematics I 3 Cr. T

Prerequisite: none, duration: 48h

Introduction to Calculus, Cartesian coordinates, differentiation and limit functions, approximation of roots of equations. The set $\mathbb{R}$ of real numbers, relation of order in $\mathbb{R}$, principle of mathematical Induction, complex numbers, 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 coordinates, polar curves.

General Mathematics II 3 Cr. T

Prerequisite: General Mathematics I, duration: 48h

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. Introduction to differential calculus, integral double and triple, three variable equations, and Matrix series analysis, partial derivative.

Differential Equations 3 Cr. T

Prerequisite: General Mathematics I, duration: 48h

Analysis of engineering problems formulated in terms of partial differential equations. solutions of these mathematical models by means of analytical and numerical methods. The use of second-order equations in physics, Laplace transforms, curves and vertical routes.

General Physics I 3 Cr. T

Prerequisite/ Co-requisite: General Mathematics I, duration: 48h

Familiarity with sorts of movements- Cinematic and Dynamic motion analysis. measurement, motion in one dimension, motion in one page. topics include vector algebra, motion, gravity, work, energy, momentum, angular momentum, conservation laws, and vibrations and waves.

General Physics lab I 1 Cr. P

Prerequisite: General Physics I, duration: 48h

Related to the course.

General Physics II 3 Cr. T

Prerequisite: General Physics I & General Mathematics I, duration: 48h

Gauss' Law, magnetism, capacitance, current and resistance, Ampère's circuital law, Faraday's law of induction, induced electric fields, magnetic properties of materials, Maxwell's equations, magnetism of matter. alternating current, electromagnetic waves, magnetic field and electric potential.

General Physics lab II 1 Cr. P

Prerequisite: General Physics II, duration: 48h

Related to the course.

Principles & Fundamentals of Computer and Network 2 Cr. T

Prerequisite: none, duration: 32h

Familiarity with computer hardware, software useful for medical research, computer networks and global communication medium. 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.

Biostatistics and Probabilities 3 Cr. T

Prerequisite: General Mathematics I, duration: 48h

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. Statistical parameters, random sampling, sampling methods, regression and possibilities.

Algorithmic Computations 2 Cr. T

Prerequisite: Principles & Fundamentals of Computers and Networks, duration: 32h

Scheme programming language, structure of programming, flowcharts and basic knowledge of rules in programming.

Numerical Methods 2 Cr. T

Prerequisite: Algorithmic Computations & General Mathematics I, duration: 32h

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.

MAIN COURSES

Physiology 3 Cr. T

Prerequisite: none, duration: 48h

Cardiovascular physiology, respiratory, gastrointestinal, central nervous system, kidney and urinary tract.

Physiology lab 1 Cr. P

Co-requisite: Physiology, duration: 48h

Related to the course.

Anatomy 2 Cr. T

Prerequisite: none, duration: 32h

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

Medical Physics 3 Cr. T

Prerequisite: Physiology, Anatomy & General Physics II, duration: 48h

Solid state physics, the physics of fluids in the body, pressure physics of sound in the ears and hearing, physics of vision - the use of ultrasound in medical diagnosis - use of electricity in the body.

Introduction to Biomedical Engineering 3 Cr. T

Prerequisite: Physiology, Anatomy & Medical Physics, duration: 48h

Introduction to Bioelectrics, Biomaterials and Biomechanics, biopotentials resources, transducers and electrodes, amplify and filtering of biosignals.

Medical Informatics I 3 Cr. T

Prerequisite: Algorithmic Computations & Introduction to Biomedical Engineering, duration: 48h

Medical Terminology, factors to determine the patient's condition and the information extracted from them, how to record and archive patient information. 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.

Research Methodology and Medical Informatics 2 Cr. T

Prerequisite: Principles & Fundamentals of Computers and Networks, duration: 32h

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.

Computer Programming (web) 2 Cr. T

Prerequisite: Algorithmic Computations, duration: 32h

Concepts and structures in design and implementation of widely used programming especially using C# in web design and how to develop that. Introduction to Visual Studio, and programming with MATLAB.

General Standards, Security & Safety of Hospitals 2 Cr. T

Prerequisite: Introduction to Biomedical Engineering, duration: 32h

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 and facilities, test instruments for checking safety parameters of medical instruments. Standards of safety, electrical safety tests, GFCI systems, physiological effects of current passing through the body, IEC standard systems, Isolation, Micro and Macro Shock.

Engineering Mathematics 3 Cr. T

Prerequisite: General Mathematics II & Differential Equations, duration: 48h

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

General Equipment of Hospital and Medical Clinics 2 Cr. T

Prerequisite: Introduction to Biomedical Engineering, duration: 32h

Brief introduction for medical equipment, categorized by invasive or non-invasive medical device based, imaging, diagnosis, treatment, laboratory use.

General Equipment workshop of Hospitals and Medical Clinics 1 Cr. P

Prerequisite: General Equipment of Hospital and Medical Clinics (Co-requisite), duration: 48h

Related to the course.

Public Health 1 Cr. T

Prerequisite: none, duration: 16h

The history of medical issues, health care, maternal and child health, environmental health, nutrition and eating habits.

Rehabilitation Principles and Equipment 3 Cr. T

Prerequisite: Introduction to Biomedical Engineering, duration: 48h

Joints and kinesiology, orthotics and prosthetics, gait analysis, muscle biomechanics, physiotherapy. Introduction to rehabilitation engineering, disability, rehabilitation engineering technology, assistive devices, physiological and biomedical measurement techniques, disability assessment, application of rehabilitation engineering.

Medical-Therapeutic Management Principles 2 Cr. T

Prerequisite: none, duration: 32h

Financial management, the various stages of planning in health care, hospital management systems, international organizations. 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.

Fundamentals of Radiology and Medical Imaging Systems 3 Cr. T

Prerequisite: Medical Physics, duration: 48h

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.

Biomedical Terminology 2 Cr. T

Prerequisite: General English Language & Introduction to Biomedical Engineering (Co-requisite), duration: 32h

Engineering technical words, especially in the major of Biomedical Engineering for future use. Other skills such as listening, speaking and reading are evaluated.

Biophysics 2 Cr. T

Prerequisite: Physiology, Anatomy & General Physics II, duration: 32h

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.

Educational and Introductory Workshop on Health and Treatment Centers 2 Cr. T

Prerequisite: Passing at least 80 credits, duration: 32h

Practical introduction to medical equipment and facilities used in laboratories of technical medicine, diagnosis and treatment, operation room.

Educational and Introductory Practical Workshop on Health and Treatment Centers 2 Cr. P

Prerequisite: Educational and Introductory Workshop on Health and Treatment Centers (Co-requisite), duration: 160h

Related to the course.

Project 3 Cr. P

Prerequisite: Based on Professor evaluation, duration: 48h

with faculty guidance and approval.

SPECIALTY MANDATORY COURSES

General Chemistry 3 Cr. T

Prerequisite: none, duration: 48h

Atom structure, thermos-chemistry, gas state, chemical bonds, liquids, solids and solutions, equilibrium in chemical systems, kinetic of chemical reactions, acids, Redox, alkaline and ionic equilibrium.

Static and Resistance of Materials 3 Cr. T

Prerequisite: General Mathematics I & General Physics I, duration: 48h

Basic concepts: vector algebra, Newton's laws, law of gravitation, statics of particles, equilibrium in two dimensions, equilibrium in three dimensions, an introduction to moments and static equilibrium, rigid bodies: equivalent systems of forces, forces and couples, wrench equivalent force, equilibrium of rigid bodies, distributed forces: moments of inertia of areas, hydrostatic pressure, analysis of trusses by using method of joints, analysis of frames and machines, cable analysis, tether analysis in statics, drawing shear force and bending moment diagram by cross – sectional method, friction, hydrodynamic analysis of friction bearings, surface torque, calculating of moment of inertia, polar moment of inertia, Mohr's circle for moments of inertia.

Organic Chemistry 3 Cr. T

Prerequisite: General Chemistry, duration: 48h

A brief history of organic chemistry, alkanes and cycloalkanes, alkyl halide, alkenes, alcohols, ethers, alkynes, aromatic compounds, aldehydes and ketones, carboxylic acid and its derivation.

Thermodynamics 3 Cr. T

Prerequisite: General Mathematics I & General Physics I, duration: 48h

Definition and history of thermodynamic science, properties of pure material: Triple Phase Balance (gas, liquid, solid), work and heat, first law of thermodynamic, second law of thermodynamic, entropy: Clausius unequal, solution thermodynamic: ideal solution, reversible work and its availability.

Physical and Mechanical Properties of Materials 3 Cr. T

Prerequisite: General Physics I & General Chemistry, duration: 48h

Introduction to material science, atomic structure of solids: crystallization, crystalline systems, imperfection in solids: point defects, line defects, vacancy defect, structure and properties of mono- phase metals, phase diagram, structure and properties of multi-phase metals, chemical composition of phases, iron- carbon phase systems, application and selection of metals and alloys based on their structure and properties, mechanical properties: stress- strain, elastic and plastic deformation, different type of engineering materials and their differences in composition.

General Chemistry lab 1 Cr. P

Prerequisite: General Chemistry (or Co-requisite), duration: 48h

Introduction to lab equipment, Solubilization, alkaline titration, acidometric titration, redox titration, effect of heat on the kinetic of reactions, effect of concentration on the kinetic of reactions, chromatography, stoichiometry, density determination of solids, molecular weight determination, gas laws.

Biochemistry 3 Cr. T

Prerequisite: Organic Chemistry, duration: 48h

Structure and reaction of proteins, structure and reaction of lipids, nucleic acid and nucleotides, enzymes and their relation to vitamins, energetic and biologic oxidation and energy production, metabolism biochemistry, metabolism of lipids, metabolism of nucleic acid, metabolism of amino acids and proteins, vitamins and their mechanism, role of DNA & RNA in genetic engineering.

Organic Chemistry lab 3 Cr. P

Prerequisite: Organic Chemistry, duration: 48h

Safety in laboratory, crystallization, melting point, extraction, drying organic solvents, simple and fractional distillation, vacuum distillation, sublimation, thin layer chromatography (TLC).

Fluids Mechanics 2 Cr. T

Prerequisite: Engineering Mathematics, duration: 32h

Fundamentals of fluid mechanics. Microscopic and macroscopic properties of liquids and gases, the continuum hypothesis, review of thermodynamics, general equations of motion, kinematics,

stresses, constitutive relations, vorticity, circulation, Bernoulli's equation, potential flow, thin-airfoil theory, surface gravity waves, buoyancy- driven flows, rotating flows, viscous creeping flow, viscous boundary layers, introduction to stability and turbulence, quasi one-dimensional compressible flow, shock waves, unsteady compressible flow, acoustics.

Mass Transfer and Heat Phenomena 3 Cr. T

Prerequisite: Fluids Mechanics, duration: 48h

Steady state conduction: Rectangular, cylindrical, spherical (1-D); conduction with generation. Diffusion: steady state diffusion: Rectangular, cylindrical, spherical (1-D); diffusion with reaction, both at surfaces, and in the bulk medium. Transient conduction and diffusion: Basics of Fourier analysis, unsteady state conduction and diffusion (1-D), transient conduction/diffusion with generation/reaction. Basics of convective transport: (i) The empirical correlation based approach: Non-dimensional analysis, heat and mass transport correlations (ii) The first principles approach: Convective balances; the interplay between flow and heat/mass transport. Applications: (i) Heat Transfer: Analysis and design of Heat Exchangers (ii) Mass Transfer: Mass transport in Biomedical and Biological Engineering: Haemodialysis, Diffusion and uptake of ligands by cells, oxygen transport in tissue and capillaries.

Fundamentals of Biocompatibility 3 Cr. T

Prerequisite: Biochemistry, duration: 48h

Introduction to biocompatibility and biomaterials, cytotoxicity, irritation and their effect on blood and genes, cell-biomaterial interaction, physiochemical properties of biomaterials and biocompatibility, blood compatibility, methods of determination of blood compatibility, wound healing process in presence of biomaterials, artificial vessels, fabrication of blood-compatible biomaterials.

Introduction to Application of Materials in Medicine 3 Cr. T

Prerequisite: Physical and Mechanical Properties of Materials, duration: 48h

Review of engineering materials properties, mechanical properties of materials, thermal and electrical conduction, magnetic and light properties, metals, ceramics, polymers, composites and biological materials and their application in medicine, deterioration and corrosion of engineering materials used in medicine.

Synthetic, Fabrication and Forming Processes of Biomaterials 3 Cr. T

Prerequisite: Biochemistry, duration: 48h

Introduction to different types of engineering materials (metals, polymers, ceramics and composites), introduction to methods of fabrication and producing, different types of casting with focus on investment casting, introduction to metal formation, introduction to production methods of plastic, injection molding and important parameters in mold design, introduction to ceramic production process, introduction to composite production methods, spinning methods, rapid prototyping and their application in medicine, new formation methods.

Fundamentals of Tissue Engineering 3 Cr. T

Prerequisite: Fundamentals of Biocompatibility, duration: 48h

Introduction of body tissues, tissue engineering fundamentals (cell, scaffold, signaling molecules and growth factors), materials used in tissue engineering: natural and synthetic polymers, ceramics and composites, fabrication methods of tissue engineering scaffold, methods of porosity measurements and considering the effects of percentage, size and shape of porosity on cell growth and tissue formation.

Biological Evaluation and Sterilization Methods 2 Cr. T

Prerequisite: Fundamentals of Biocompatibility, duration: 32h

Introduction to biocompatibility Standards (FDA, ESO, ANSI), Cell, Interaction of cell tissue and biomaterial, cell culture tests, *in vivo* tests, blood compatibility tests, sterilization methods of biomaterials in medicine.

SPECIALTY ELECTIVE COURSES

Introduction to Analysis Methods of Materials 3 Cr. T

Prerequisite: Organic Chemistry & Physical and Mechanical Properties of Materials, duration: 48h

Introduction to the importance of material identification in material engineering and biomaterials, determination of chemical composition of materials: infra-red spectrometry (ATR, FTIR, IR), Raman spectrometry, ultra violet and visible spectrometry, NMR, XRD, AES, ESCA, SIMS, determination of mechanical properties of materials: liquid chromatography, porosity distribution measurements in materials, particle distribution measurements in materials, microscopic methods: SEM, TEM, AFM, determination of polymeric properties: GPC method for determination of molecular weight, DSC.

Engineering of Release Control Systems 2 Cr. T

Prerequisite: Introduction to Application of Materials in Medicine & Mass Transfer and Heat Phenomena, duration: 32h

History of release control systems, definition of release rate, benefits of release control systems, dosage forms, routes of administration, polymers used, regulations and pharmacopeial directives, consideration in developing drugs and delivery systems, kinetics of delayed release, sustained and controlled release, diffusion, permeability, dissolution, pharmacopeial tests, reservoir systems, zero order, rate limiting membrane, first order, demonstrations of tablets and capsules, osmotic delivery, demonstrations, matrix delivery systems, demonstration of tablets and capsules, hydrophilic matrices, degradable matrices, demonstrations, injectable and implantable delivery systems, demonstrations.

Materials lab 1 Cr. P

Prerequisite: Physical and mechanical properties of materials, duration: 48h

Metallography: preparation of the material, determination of three metallic structures (stainless steel, co-cr alloy, titanium), determination of ceramic structures, determination of one polymeric and one composite structures, mechanical properties evaluation: introduction to tensile, pressure, bending machine, tensile strength test on metals, bending test on ceramics, bending test on polymers and composites, effect of heat and the speed of loading force on the mechanical properties.

Bone Injuries 3 Cr. T

Prerequisite: Anatomy, Physiology & Introduction to Application of Materials in Medicine, duration: 48h

Bone tissue, properties and biomechanical function of bone, bone defect mechanisms, bone reaction to force, heat, magnetic field of electrical currents, ossification mechanism, bone replacement implants, bone tissue engineering, histology, pathology.

Biomaterials Ceramic 2 Cr. T

Prerequisite: Physical and Mechanical Properties of Materials, duration: 32h

Ceramics, their structure, mechanical, physical and chemical properties of ceramics, categorizing of bioceramics: bioinert, absorbable, bioactive, hydroxyl apatite, hydroxyl apatite coating, glass and bioactive ceramic glass, carbon, porous ceramics, application of ceramics in dentistry, healing application of ceramics in tissue engineering etc.

Metallic Biomaterials 2 Cr. T

Prerequisite: Physical and Mechanical Properties of Materials, duration: 32h

Metals and their properties: metallic bond, crystalline systems, mechanical properties, electrical and thermal conductivity, iron alloys (steels, stainless steels): their composition, properties and application in medicine, titanium and its alloys: their composition, properties and application in medicine, cobalt- Chromium alloys: their composition, properties and application in medicine, amalgam, other metals used in medicine (gold, silver, tantalum etc.), application of metals in orthopedics, dentistry, suture and cardiovascular, metal corrosion in body, coating metals with biocompatible materials (like hydroxyl apatite).

Polymeric Biomaterials 2 Cr. T

Prerequisite: Physical and Mechanical Properties of Materials, duration: 32h

Review of polymers and their structures, review of mechanical properties and deformation mechanisms, medical grade polymers, polyethylene, polyurethane, bone cement, hydrogels, degradable polymers and their application in medicine, tissue-implant interaction, other applications (sutures, dental, silicones and etc.).

Intelligent Materials 2 Cr. T

Prerequisite: Introduction to Application of Materials in Medicine, duration: 32h

Definition of smart materials, metals and shape memory alloys, one-way and two-way shape memory, different shape memory alloys used in medicine and their application, smart polymers (hydrogels, polyurethanes and etc.), medical application of smart polymers, smart ceramics.

Biomaterial Prostheses 3 Cr. T

Prerequisite: Introduction to Application of Materials in Medicine, duration: 48h

orthotics and prosthetics, hard tissue replacements: orthopedic prosthesis (hip and knee prosthesis), dental prosthesis, soft tissue replacements: cardiovascular prosthesis (heart valves), eye prosthesis (contact lenses), skin grafts, sutures, biomaterial standards, sterilization methods.

Special Topic I 2 Cr. T

Prerequisite: Based on the content, duration: 32h

Based on the content and latest subjects and innovations in the world.

Special Topic II 3 Cr. T

Prerequisite: Based on the content, duration: 48h

Based on the content and latest subjects and innovations in the world.

Special Topic III 3 Cr. T

Prerequisite: Based on the content, duration: 48h

Based on the content and latest subjects and innovations in the world.

***Abbreviation: **Cr.** :Credit, **T**: Theoretical, **P**: Practical