

## Courses Description

**College:** Engineering

**Department:** Biomedical Engineering

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**Couse ID:** 406210      **Description:** Engineering Mechanics

**Full Course Description:** s

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**Couse ID:** 406211      **Description:** Biomaterials

**Full Course Description:** Exploration of the nano-structure of matter (i.e. atomic structures), atomic bonding, building up the picture to the micro-structure (i.e. molecules), molecular bonding, crystalline structure, then proceeding to the macro structure of matter. The course will be divided into two main categories; the first being natural biomaterials (ex. bone, muscles, wood, etc.) their structure, function, and structure-function relationship. The second part of the course will study engineering biomaterials (ex. metallic, ceramics, polymeric, composites, etc.) and their use in implant technology such as skeletal reconstrucrion, various implants, and biocompatibility issues.

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**Couse ID:** 406212      **Description:** Biomechanics(1)

**Full Course Description:** Giving the student solid foundation in the analysis methods used in the course such as statics, dynamics, elasticity, and vector analysis. The course will give the student also the foundations of mechanics (i.e. deformations, stress, and strain in matter). Then the tuning of mechnaics to biological structures (i.e. biomechanics) will be presented. Balance and motion dynamics in biological structures, function of bone, muscles, skin, tendon, and ligaments.

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**Couse ID:** 406261      **Description:** Applied Mathematics for BME

**Full Course Description:** f

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**Couse ID:** 406310      **Description:** Biomaterials

**Full Course Description:** k

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**Couse ID:** 406311      **Description:** Biomechanics(2)

**Full Course Description:** The course is designed to focus on the applications of the material presented in biomechanics 1 such as the utilisation of the design and function of bone and muscles in ensuring the short and long term success of skeletal implants, exploring new techniques for the restoration of lost function based on biomechanical considerations, the interaction of biological, mechanical, electrical, and magnetic aspects in the human body and their role in fracture healing, growth, and maintenance of the human body. Experimental methods to measure mechanical properties of bone, skin, muscles, and tendon such as tensile and compressive testing, fatigue testing, strain gauge measurements, optical testing met

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**Couse ID:** 406313      **Description:** Bio-Fluids

**Full Course Description:** l

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**Couse ID:** 406320      **Description:** Biomedical Electronics

**Full Course Description:** g

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**Couse ID:** 406322      **Description:** Biomedical Instrumentation(1)

**Full Course Description:** An introduction to the history of the development of biomedical engineering and basic concepts of biomedical instrumentation. Biomedical sensors for measurements of biopotentials. Review of amplifiers and filters. Origin of biopotentials. Biopotential electrodes and biopotential amplifiers. Blood pressure, heart sounds, blood flow, and volume of blood measurements. Respiratory system instrumentation. Safety requirements.

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**Couse ID:** 406323      **Description:** Biomedical Instrumentation (2)

**Full Course Description:** Concepts and design strategies for advanced medical instrumentation systems. Chemical biosensors. Clinical laboratory equipment: spectrophotometry, hematology and electrophoresis. Medical imaging devices: US, X-ray, CT, and MR; nuclear medicine, and radiotherapy equipment. Therapeutic and prosthetic devices: dialysis machine, electric stimulators, defibrillaters, ventilators, and infant incubaters. Electro surgery instruments and lithotripsy.

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**College:** Engineering

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**Couse ID:** 406324      **Description:** Biomedical Instrumentation Lab

**Full Course Description:** Biopotential amplifiers, filters, signal conditioning. Interfacing with digital computer. Applications: ECG, EEG, EMG, pressure, heart rate, and temperature. Medical measuring devices: blood pressure, flow, sound, and volume. Safety standards.

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**Couse ID:** 406325      **Description:** Bio-Transducers & Interfacing

**Full Course Description:** Static, dynamic and statistical characteristics of measurement system elements. Loading effects in measurement systems. Sensing elements: Resistive, capacitive, inductive, electromagnetic, thermoelectric, elastic, piezoelectric and electrochemical sensing elements. Optical and ultrasonic measurement systems. Signal conditioning elements: Deflection bridges and amplifiers. Signal processing elements: Analogue to digital (A/D) conversion. Strong emphasis on transducers use in biomedical Engineering.

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**Couse ID:** 406326      **Description:** Bio-Transducers & Interfacing Lab.

**Full Course Description:** Experiments on bio-transducers and their construction. Experimental identification of static characteristics of sensing elements: Ideal straight line, non-linearity, sensitivity, hysteresis, resolution, and error bands. Experiments on loading effects in measurement systems. Experiments on deflection bridges and amplifiers. Analogue to digital conversion and data acquisition.

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**Couse ID:** 406327      **Description:** Bioelectromagnetism

**Full Course Description:** Foundations of electromagnetism, electric and magnetic characteristics of body proteins (collagen for example), cell response to electric and magnetic fields, electromagnetic fields within body tissues such as bone, skin, nervous system, and glands. In depth study of the effect of electrical and magnetic fields on the regeneration and growth of body tissue and organs.

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**Couse ID:** 406328      **Description:** Biomedical Signal Analysis

**Full Course Description:** Energy and power contents of signals. System impulse response. Time domain analysis of contineous time LTI systems. Fourier series representation and properties. Fourier and Hilbert transforms. Frequencey response. Bandwidth of signals. Bandwidth of signals. Transfer functions and feedback. Analogue filters. Z-transform analysis of LTI systems. Discrete time Fourier transform (DFT) and fast Fourier transform (FFT). Digital filters. Utilization of the previous concepts to analyze and process signals originating from biological sources: ECGs, EMGs, and EEGs.

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**Couse ID:** 406329      **Description:** Biomedical Electronics Lab.

**Full Course Description:** g

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**Couse ID:** 406341      **Description:** Biomedical Computer Simulation Methods

**Full Course Description:** Computer simulation is a main branch of biomedical engineering, the student in this course will study the foundations of computer modelling of biological strucures in addition to modelling and simulation of complete body systems such as the musculoskeletal, nervous, and circulatory systems. In addition to material and geomterical modelling of biological systems using numerical techniques such as finite element analysis and analytical methods. Applications using software packages such as: ANSYS, MATLAB, C++, and others. Investigation on how the results obtained from computer models can be used to devise better surgical techniques (virtual surgery), design of implants (implant planning), etc.

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**Couse ID:** 406342      **Description:** Biocontrol Systems

**Full Course Description:** Introduction to control theory, modelling of physical systems in control science, transfer functions, open and closed loop systems, time and frequency domain analysis, analytical and numerical methods to analyze control systems, optimal control systems, matlab control tool box tutorials. Applications of control theory in biomedical engineering (for example, musculo-skeletal system feedback loop, nervous system control on various systems within the human body, etc.). The development of control systems to regulate diseased body functions (for example pace makers, muscle stimulation and contractions, etc.).

## Courses Description

**College:** Engineering

**Department:** Biomedical Engineering

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**Couse ID:** 406410      **Description:** Biomechanics (2)

**Full Course Description:** n

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**Couse ID:** 406411      **Description:** Biomedical Transport

**Full Course Description:** Foundation of mechanical, electrical, magnetic, and optical transport phenomena. Study of fluid mechanics and fluid flow in rigid and flexible conduits (application on blood and renal flow in the human body), energy transmission in optical systems (applications on light transmission within the retina (visual system)), elastic energy transmission in mechanical wave guides (applications on stress waves transmission within skeletal structure). Transport across permibable and semi-permable membranes (applications on mineral transport across cell membrane). Applications of biotransport in the design of artificial organs and prosthetic systems.

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**Couse ID:** 406412      **Description:** Cardiovascular Mechanics

**Full Course Description:** b

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**Couse ID:** 406420      **Description:** Biomedical Instrumentation (2)

**Full Course Description:** m

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**Couse ID:** 406425      **Description:** Bio-Electromagnetism

**Full Course Description:** n

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**Couse ID:** 406430      **Description:** Prosthetic Systems

**Full Course Description:** g

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**Couse ID:** 406433      **Description:** Artificial Organs

**Full Course Description:** Exploration of the biological, mechanical, electrical, and magnetic mechanisms utilized in the maintenance of body systems such as the musculoskeletal system, heart, lung, kidney, and other organs. From the understanding of these mechanisms active in the healthy case an engineering replacement for such organs will be addressed and factors involved in these replacements such as the geomtery, material, electrical, magnetic, and mechanical aspects. Biocompatibility issue will be discussed in relation to the interaction of body systems to such replacements. Surgical considerations are also discussed.

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**Couse ID:** 406434      **Description:** Tissue Engineering

**Full Course Description:** g

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**Couse ID:** 406440      **Description:** Bio-Control Systems

**Full Course Description:** m

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**Couse ID:** 406443      **Description:** Modeling and Simulation of Biomedical Systems

**Full Course Description:** l

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**Couse ID:** 406444      **Description:** Fundamentals of Bioinformatics

**Full Course Description:** v

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**Couse ID:** 406470      **Description:** Medical Imaging

**Full Course Description:** n

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**Couse ID:** 406471      **Description:** Medical Signals and Image Processing

**Full Course Description:** m

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**Couse ID:** 406490      **Description:** Engineering Medicine

**Full Course Description:** h

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**Couse ID:** 406495      **Description:** Special Topics in Biomedical Engineering

**Full Course Description:**

## Courses Description

**College:** Engineering

**Department:** Biomedical Engineering

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**Couse ID:** 406520      **Description:** Clinical Engineering

**Full Course Description:** o

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**Couse ID:** 406530      **Description:** Artificial Organs

**Full Course Description:** h

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**Couse ID:** 406531      **Description:** Rehabilitation Engineering

**Full Course Description:** s

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**Couse ID:** 406570      **Description:** Medical Signals and Image Processing Lab.

**Full Course Description:** d

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**Couse ID:** 2406212      **Description:** Biomechanics (1)

**Full Course Description:** c

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**Couse ID:** 2406322      **Description:** Biomedical Instrumentation (1)

**Full Course Description:** h

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**Couse ID:** 2406324      **Description:** Biomedical Instrumentation Lab.

**Full Course Description:** m

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**Couse ID:** 2406325      **Description:** Biomedical Sensors

**Full Course Description:** m

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**Couse ID:** 2406326      **Description:** Biomedical Sensors Lab.

**Full Course Description:** b

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**Couse ID:** 2406328      **Description:** Biomedical Signal Analysis

**Full Course Description:** m

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**Couse ID:** 2406400      **Description:** Practical Training

**Full Course Description:** m

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**Couse ID:** 2406423      **Description:** Biomedical Telemetry

**Full Course Description:** r

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**Couse ID:** 4406321      **Description:** Instrumentation & Measurements for Biomedical Eng.

**Full Course Description:** Familiarization with common electrical engineering instrumentation and demonstration of basic principles. Experimental exercises in use of laboratory instruments. Voltage, current, impedance, frequency and wave form, both analog and digital. Oscilloscopes, unit concepts, error concepts, wave and spectrum analyzers, transducers, frequency and transient response. Digital data acquisition systems. Grounding. The use of previous concepts in the biomedical field.

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**Couse ID:** 4406331      **Description:** Prosthetic Systems

**Full Course Description:** Overview of the biomechanics of upper and lower extremities, analysis of the aftermath of various injuries to the human body, the methodology and requirements in the reconstruction of an injured or diseased system in the human body. Overview of various prosthetic systems for the upper and lower extremities, neuromuscular, and retinal replacements. An introduction to functional electrical stimulation (FES) technique and osseointegration (direct integration of prosthetic systems into bone).

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**Couse ID:** 4406421      **Description:** Medical Imaging

**Full Course Description:** Basic physics associated with Ultrasound, X-ray, CT, MRI and PET. Engineering applications of these principles in clinical equipment. Analysis of medical images (contrast, enhancement, filtration, threshold). Safety requirement associated with these systems.

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**College:** Engineering

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**Couse ID:** 4406422      **Description:** Medical Imaging Lab.

**Full Course Description:** Applications on viewing, processing, and enhansement of images. 3D-image techniques. Biomedical applications of imaging systems such as: X-ray, ultrasound, and others.

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**Couse ID:** 4406423      **Description:** Biomedical Telemetry

**Full Course Description:** Introduction and classification of biomedical telemetry systems. Types of modulation, such as amplitude, frequency, and pulse code. Analogue and digital transmission in single and multichannel telemetry systems. Principle of antenna. Receivers and demodulators. Passive telemetry. Applications of the previous concepts in Biomedical Engineering.

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**Couse ID:** 4406424      **Description:** Biomedical Digital Signal Processing

**Full Course Description:** Signals and Systems, Sampling theorem, Z-Transform, ARMA model, Linear Prediction, Fourier Analysis, Discrete Fourier transform (DFT), Power spectrum estimation, windowing, Applications: Filter design, speech and audio processing, image processing. Applications of the concpets mentioned in the analysis of biological signals such as, ECG, EEG, EMG, and HRV.

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**Couse ID:** 4406431      **Description:** Rehabilitation Engineering

**Full Course Description:** Overview of rehabilitation science, design and function of functional electrical stimulation (FES) for the rehabilitation of nueromuscular injuries and diseases (experimental use of FES equipment). In depth study of osseointegration (direct integration of titanium implants into bone) for the rehabilitation of injuries and diseases to various regions of the musculoskeletal system. A study of new avenues to utilize these techniques in rehabilitation centres in Jordan and the possibility to manufacture osseointegrated titanium implants using C&C machines available in the Hashemite University.

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**Couse ID:** 4406495      **Description:** Special Topics

**Full Course Description:** Current trends and developments in the field of biomedical engineering.

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**Couse ID:** 110406210      **Description:** Biomechanics (1)

**Full Course Description:** 1

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**Couse ID:** 110406229      **Description:** Fundamentals of Electrical Circuits

**Full Course Description:** 1

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**Couse ID:** 110406260      **Description:** Applied Mathematics

**Full Course Description:** 1

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**Couse ID:** 110406310      **Description:** Biomaterials

**Full Course Description:** 1

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**Couse ID:** 110406311      **Description:** Bio- Fluids

**Full Course Description:** 1

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**Couse ID:** 110406320      **Description:** Biomedical Electronics

**Full Course Description:** 1

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**Couse ID:** 110406321      **Description:** Biomedical Instrumentation (1)

**Full Course Description:** 1

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**Couse ID:** 110406370      **Description:** Signal & System Analysis for biomedical engineering

**Full Course Description:** 1

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**Couse ID:** 110406410      **Description:** Biomechanics (2)

**Full Course Description:** 1

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**College:** Engineering

**Department:** Biomedical Engineering

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**Couse ID:** 110406421      **Description:** Biomedical Instrumentation Lab (1)

**Full Course Description:** 1

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**Couse ID:** 110406422      **Description:** Biomedical Instrumentation Lab (2)

**Full Course Description:** 1

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**Couse ID:** 110406424      **Description:** Biomedical Transducers & Telemetry Lab.

**Full Course Description:** 1

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**Couse ID:** 110406425      **Description:** Bio-Electromagnetism

**Full Course Description:** 1

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**Couse ID:** 110406430      **Description:** Artifitial Organs & Prosthetics

**Full Course Description:** 1

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**Couse ID:** 110406440      **Description:** Modeling & Simulation of Biomedical Systems

**Full Course Description:** 1

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**Couse ID:** 110406450      **Description:** Practical Training

**Full Course Description:** 1

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**Couse ID:** 110406470      **Description:** Medical Imaging

**Full Course Description:** 1

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**Couse ID:** 110406510      **Description:** Biomaterials Design & Characterization

**Full Course Description:**  
1

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**Couse ID:** 110406511      **Description:** Fundamentals of Micro/Nanotechnologies in Biomedical Engineering

**Full Course Description:** 1

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**Couse ID:** 110406520      **Description:** Robotics Surgery

**Full Course Description:** 1

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**Couse ID:** 110406521      **Description:** Therapeutic Ultrasound

**Full Course Description:** 1

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**Couse ID:** 110406530      **Description:** Rehabilitation Engineering

**Full Course Description:** 1

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**Couse ID:** 110406532      **Description:** Fundamentals of Tissue Engineering

**Full Course Description:** 1

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**Couse ID:** 110406570      **Description:** Medical Digital Image Processing

**Full Course Description:** 1

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**Couse ID:** 110406594      **Description:** Special Topics in Biomedical Engineering

**Full Course Description:** 1

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**Couse ID:** 110406595      **Description:** Clinical Engineering

**Full Course Description:** 1

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**Couse ID:** 150406450      **Description:** Practical Training

**Full Course Description:** ١

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**Couse ID:** 160406360      **Description:** Biostatistics

**Full Course Description:** h

Courses Description

College: Engineering  
Department: Biomedical Engineering

Couse ID: 1904061531	Description: Biomechanics & Rehabilitation Engineering Lab
Full Course Description:	
Couse ID: 2004061450	Description: Practical Training
Full Course Description:	
Couse ID: 2104061411	Description: Cardiovascular Mechanics
Full Course Description:	
Couse ID: 2104061420	Description: Biomedical Instrumentation (2)
Full Course Description:	
Couse ID: 2104061423	Description: Biomedical Transducers & Telemetry
Full Course Description:	
Couse ID: 2104061471	Description: Medical Imaging Lab
Full Course Description:	
Couse ID: 2104061591	Description: Graduation Project (1)
Full Course Description:	
Couse ID: 2104061592	Description: Graduation Project (2)
Full Course Description:	
Couse ID: 2204061593	Description: Fundamentals of Medical Devices Design & Development
Full Course Description:	