MS Biomedical Engineering Program

Department of Biomedical Engineering (BME), Faculty of Engineering & Applied Sciences (FEAS), offers Master of Science in biomedical specialization like Biomedical Instrumentation, Biomedical Signal Processing and Biomaterials. Master's degree is awarded after completion of 32 credit hours, 26 of which are coursework related and the remaining 6 credit hours are for a research thesis. In order to complete coursework, the student can take any from the list of offered subjects in respective semester.

Eligibility Criteria

Minimum 16 years of formal education BSc in Biomedical or relevant Engineering Fields equivalent with a
minimum CGPA of 2.00 on a 4.00 scale or equivalent
OR
MBBS / Equivalent allied sciences degree
with a minimum CGPA of 2.00 on a 4.00 scale or equivalent.

Degree Requirements:

- Minimum credit hours: 32 credit hours (26 Cr. Hr. of course work and 6 Cr. Hr. of thesis).
- The candidates are required to get a CGPA of 2.5.
- Internship is a mandatory requirement for the completion of the degree.

Duration:

Minimum 1.5 years & Maximum 4 years

Selection Criteria:

Marks in Relevant Engineering Program	50%
Entry Test/ Interview	33%
Interview	17%

Interview:

The Interview will be conducted to finalize the admission to the subject discipline.

(1) Talent Scholarship for First Semester:

Marks in Previous Degree		Scholarship (%age of Tuition Fee)
%age of marks obtained (For Annual/ Percentage based system)	CGPA obtained (For Semester/CGPA based system)	
80% and above	3.90 to 4.00	100%
75% to 79.99%	3.75 to 3.89	50%
70% to 74.99%	3.50 to 3.74	25%

Criterion for Continuation of Talent Scholarship to subsequent semesters:

1. You are required to maintain CGPA between 3.85 to 4.00 to avail same percentage of scholarship as awarded in first semester.
2. Talent scholarship shall be reduced by 25% in case you secure CGPA 3.75 to 3.84.
3. Talent scholarship shall stand revoked for respective semester/term in case CGPA is below3.75.

(2) Riphah / Industry Scholarship for First Semester:

A 25% waive-off in tuition-fee of 1st semester for the graduates of Riphah International University or the candidates already employed in the allied industry. An SGPA of 3.5 will be required to maintain the scholarship in subsequent semesters.

MS Biomedical Engineering Curriculum

List of Courses

Code	Subject	Cr. Hrs	Elective/Core
UR711	Ethics in Practice I	1 + 0	Compulsory
UR712	Ethics in Practice II	1 + 0	Compulsory
BM5001	Biology for Engineers* (Non Credit Course)	3 + 0	Elective
BM5002	Applied Mathematics & Basic Electronics** (Non Credit Course)	3 + 0	Elective
BM5011	**Systems Physiology**	**3 + 0**	**Core**
BM5012	Cell and Molecular Biology	3 + 0	Elective
BM5013	Molecular Biology	3 + 0	Elective
BM5021	Biomedical Signal Processing*	3 + 0	Elective
BM5022	Advanced Biomedical Signal Processing	3 + 0	Elective
BM5023	Biomedical Signals & Systems*	3 + 0	Elective
BM5024	Advanced Biomedical Signals & Systems	3 + 0	Elective
BM5025	Advanced Biomedical Image Processing	3 + 0	Elective
BM5026	Brain Computer Interface	3 + 0	Elective
BM5027	Human Computer Interaction	3 + 0	Elective
BM5031	**Advanced Biomedical Instrumentation**	**3 + 0**	**Core**
BM5032	Biomedical Engineering Systems	3 + 0	Elective
BM5033	Ultrasonic Instrumentation and Imaging	3 + 0	Elective
BM5034	Real Time Systems Design and Applications	3 + 0	Elective
BM5035	Advanced Medical Imaging	3 + 0	Elective
BM5036	Advanced Biomedical Control Systems	3 + 0	Elective
BM5037	Selected Topics in Biomedical Engineering	3 + 0	Elective
BM5038	**Biomedical Sensors**	**3 + 0**	**Core**
BM5039	Medical Microsystems	3 + 0	Elective
BM5040	Advanced Rehabilitation Engineering	3 + 0	Elective
BM5041	Advanced Biomedical Robotics	3 + 0	Elective
BM5042	Biomedical Microprocessor and Interfacing	3 + 0	Elective
BM5043	Embedded Systems & Applications	3 + 0	Elective
BM5044	Advanced Digital Design	3 + 0	Elective
BM5045	Biomedical Devices Design	3 + 0	Elective
BM5046	Modeling & Simulation of Physiological Systems	3 + 0	Elective
BM5047	Biomedical Optics and Lasers	3 + 0	Elective
BM6061	Biostatistics	3 + 0	Elective
BM6062	Machine Learning	3 + 0	Elective
BM6063	Pattern Recognition	3 + 0	Elective
BM6064	Neuralengineering	3 + 0	Elective
BM6071	Biomaterial Science & Engineering	3 + 0	Elective
BM6072	Advanced Biomaterials	3 + 0	Elective
BM6073	Biomaterials and Drug Delivery	3 + 0	Elective
BM6074	Advances in Tissue Engineering	3 + 0	Elective
BM6075	Nano Biotechnologies	3 + 0	Elective
BM6076	Advanced Techniques in Biotechnology	3 + 0	Elective
BM6077	Biomechanics*	3 + 0	Elective
BM6078	Advanced Biomechanics	3 + 0	Elective
BM6079	Advanced Biofluid Mechanics	3 + 0	Elective
BM6081	Operations Management	3 + 0	Elective
BM7099	Research Methodology	1 + 0	Elective
BM7100	Master Thesis	6	Compulsory

* For those students who have not studied these or relevant courses in their previous degrees and wish to take advanced courses.

Note: Two additional credit hours (Ethics shall be mandatory for all students as well).

RESEARCH GROUPS (BIOMEDICAL ENGINEERING)

BIOSIGNAL PROCESSING

Team Lead: Dr. Faraz Akram

Members: Muhammad Zia Ur Rehman, Hamza Toor, Falak Anjum, Shakeel Ishtiaq, Abdul Qadeer Khan

Working: The Bio-Signal Processing group at Riphah International University investigates the use of signal processing and machine learning techniques for the analysis and classification of biomedical signals, with special emphasis on EEG, EMG, and ECG signals.

Currently, the group is engaged in the following research projects.

- EEG based Brain-Computer Interfaces
- Design and Development of EMG Controlled Prosthetics
- Stress Detection using Pulse Rate Variability
- Non-invasive blood glucose monitoring

BIOMEDICAL INSTRUMENTATION

Team Lead: Hamza Toor

Members: Mashal Fatima, Mudassir Hussain, Shoaib zafar, Syeda Rida Zahra

Working: Biomedical instrumentation covers the area of design and development of devices that can detect and measure the physical quantity present in the body.

Currently work on following research projects is being carried out:

- Development of Smart Stick for visually impaired people
- Designing and Fabrication of a low-cost Computer aided auscultation device for developing countries
- Fall Detection Using wearable 3 axis accelerometer
- Designing and fabrication of EEG Measurement system using Gold Electrodes

BIOMECHANICS

Team Lead: Dr. Muhammad Zia Ur Rehman

Members: Faisal Amin, Ayub Khan, Dr. Sara Rehman, Shoaib Zafar, Abdul Malik Muhammad

Working: Biomechanics is the study and application of physical laws on living organisms. It includes ergonomics, orthopedic biomechanics, sports mechanics, rehabilitation mechanics etc. The group of biomechanics has been involved in several research projects and led to publish numerous conference and journal articles of international repute. The titles of main ongoing projects are given below:

- Footwear Affects Biomechanical Work and Knee Adduction Moment during Stance Phase in Medial Knee Osteoarthritic Male Pakistani Adults
- Pushing a Manual Wheelchair Requires More Muscular Force than Pulling
- Effect of toe-out and toe-in postures on static standing balance
- Effect of bunion on plantar pressure distribution

MEDICAL IMAGE PROCESSING

Team Lead: Dr. Jawwad Sami Ur Rahman

Members: Muddasir Hussain, Falak Anjum and Abdul Malik.

Working: Image Processing group aims to apply medical image segmentation techniques on the raw data of MRI to extract meaningful information to help the doctors in the diagnosis process.

- Development of Deep Learning method for tumor analysis in medical images.
- Use of Electron Microscopy images for the analysis of malignant cancer.