

BS. Biomedical Technology Scheme of Study



Faculty of Allied Health Sciences

Health Services Academy (HSA) Park Road, Islamabad

BS. Biomedical Technology

1. Overview of the program

Biomedical technology, often abbreviated as "Biomedical Tech" or "Biomed Tech," is a multidisciplinary field that combines principles of biology, medicine, and engineering to develop innovative solutions for healthcare challenges. Biomedical technology plays a vital role in advancing healthcare by developing innovative solutions to improve diagnosis, treatment, and patient outcomes. It bridges the gap between science and medicine, driving progress in healthcare delivery and patient care.

2. Program Objectives

- **Improving Diagnosis:** Develop technologies and tools for accurate and early diagnosis of diseases and medical conditions, enabling prompt treatment and better patient outcomes.
- **Enhancing Treatment Options:** Innovate new therapies, medical devices, and pharmaceuticals to improve the effectiveness and precision of medical treatments while minimizing side effects and risks.
- **Advancing Medical Research:** Provide researchers with cutting-edge tools and techniques for studying biological systems, understanding disease mechanisms, and developing new medical interventions.
- **Increasing Access to Healthcare:** Develop affordable and accessible healthcare technologies that can be deployed in resource-limited settings, ensuring that people around the world have access to essential medical services.
- **Improving Patient Care and Comfort:** Design patient-centric technologies and solutions that prioritize comfort, convenience, and usability, thereby enhancing the overall healthcare experience for patients and caregivers.
- **Preventing and Managing Chronic Diseases:** Develop preventive measures, monitoring devices, and personalized treatment approaches to prevent the onset of chronic diseases and manage existing conditions more effectively.
- **Promoting Health and Wellness:** Create tools and technologies for promoting healthy lifestyles, disease prevention, and wellness management, empowering individuals to take control of their health and well-being.
- **Advancing Rehabilitation and Assistive Technologies:** Design rehabilitation devices, prosthetics, and assistive technologies to improve mobility, independence, and quality of life for individuals with disabilities or injuries.

- **Ensuring Safety and Regulatory Compliance:** Adhere to rigorous safety standards and regulatory requirements to ensure the reliability, safety, and effectiveness of biomedical technologies, protecting the well-being of patients and healthcare providers.
- **Addressing Societal Health Challenges:** Tackle pressing public health issues such as infectious diseases, antimicrobial resistance, aging populations, and healthcare disparities through innovative technological solutions and collaborative efforts.

3. Core Activities

Biomedical technologists are skilled professionals who play a crucial role in the healthcare industry by applying their expertise in technology and biology to support medical diagnosis, treatment, and research. Here are the core activities typically performed by biomedical technologists:

1. **Medical Equipment Maintenance and Repair:** Biomedical technologists are responsible for maintaining, calibrating, and repairing medical equipment and devices used in healthcare facilities, ensuring that they function accurately and reliably.
2. **Quality Control and Assurance:** They conduct quality control tests and inspections on medical equipment and instruments to ensure compliance with regulatory standards and maintain the highest level of patient safety and quality of care.
3. **Installation and Testing of Medical Devices:** Biomedical technologists install new medical equipment and perform comprehensive testing to verify functionality and accuracy before clinical use, collaborating with manufacturers and healthcare staff as needed.
4. **Training and Education:** They provide training and education to healthcare professionals on the proper use, maintenance, and safety protocols associated with medical equipment and technology, promoting efficient and effective utilization.
5. **Troubleshooting and Technical Support:** Biomedical technologists troubleshoot equipment malfunctions, diagnose technical issues, and provide technical support to healthcare staff to minimize downtime and ensure continuous operation of critical medical devices.
6. **Data Analysis and Interpretation:** They analyze data generated by medical devices and diagnostic equipment, interpret results, and provide insights to healthcare providers to aid in clinical decision-making and patient care.
7. **Research and Development:** Biomedical technologists may participate in research and development projects aimed at innovating new medical technologies, improving

existing devices, and advancing medical knowledge in collaboration with interdisciplinary teams.

8. **Biomedical Instrumentation Design:** They design and develop biomedical instruments and devices, applying principles of engineering, electronics, and biology to address specific healthcare needs and challenges.
9. **Regulatory Compliance and Documentation:** Biomedical technologists ensure compliance with regulatory requirements, maintain accurate documentation of equipment maintenance and repair activities, and participate in audits and inspections as needed.
10. **Continuous Learning and Professional Development:** They stay abreast of advancements in biomedical technology, attend training programs, and pursue professional certifications to enhance their skills and knowledge in this rapidly evolving field.

4. Teaching and Learning Methods

Students will experience a wide variety of teaching and learning methods from expert staff including *tutorials, lectures, seminars, workshops, small group discussions, and problem-based learning, and laboratory sessions*. As such the students will develop a wide range of skills useful in basic and applied environment. These skills will aid in *teamwork, scientific exploration, and problem solving and identifying relevant laboratory protocols*.

5. Assessment Methods

Students will be assessed both *formatively and summative*. Throughout the year formative assessment in the form of class tests, presentations and assignments along with the feedback will be carried out. Summative assessment will include end of the course terminal exam featuring multiple-choice questions. The practical aspects will be assessed using viva and Objective structured Practical examination (OSPE).

6. Registration in the Health Services Academy

- ❖ Registrar of the university shall maintain a register of BS Biomedical Technology through Admission Test and Open Merit list of HSA.
- ❖ A "notification of registration" for each candidate approved /allowed for admission to BS program shall be issued by the University.
- ❖ Registration may be renewed on payment of the prescribed fee if a scholar is re-admitted within a year after having been struck off the rolls for any valid reason.
- ❖ A person registered for the BS degree program shall be called Medical Microbiologist. Each student so selected shall be required to register and pay the dues within 30 days from the date of issuance of the notification of registration, failing which the admission of the selected candidate shall be deemed as cancelled. The university shall determine the tuition fee and other dues from time to time.

7. Mentors

The students shall select their teaching mentor in the first year and research mentor at the end of last year. The coordinator shall serve as mentor before selection of mentors.

8. Student Assessment Methods

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|---------------------------------|---------------------------------------|
| a. Class quiz | to assess continuous learning process |
| b. Mid and terminal examination | to assess learning outcomes |
| c. Presentations | to assess communication skills |
| d. Assignments | to assess writing skills |

9. Weighting of assessments for each course Total marks=100

Midterm exam	20
Terminal examination	50
Oral/practical examination	10
Presentations/Assignment	10
Class quizzes	10
Total	100

10. Frame work of the program as per Under Graduate Policy, 2023

Nature	Courses	Credit Hours
General Education Courses	Functional English	3+0=3
	Information and communication Technologies ICT	2+1=3
	Ideology and Constitution of Pakistan	2+0=2
	Islamic studies/Ethics	2+0=2
	Natural Sciences	2+1=3
	Quantitative reasoning - I	3+0=3
	Social sciences	2+0=2
	Quantitative reasoning II	3+0=3
	Arts and Humanities	2+0=2
	Expository writing	3+0=3
	Civics and community engagement	2+0=2
	Entrepreneurship	2+0=2
		30 credit hours
Major (Disciplinary) Courses	Introduction to biomedical Engineering	3+0=3
	Applied physics	2+1=3
	Basic mathematics / basic biology	3+0=3
	Biofluid mechanics & Bioheat transfer	3+0=3
	Clinical equipment	2+1=3
	Computer aided engineering drawing	2+1=3
	Biomedical electronics	2+1=3
	Biomedical instrumentation -I	2+1=3
	Signals & systems	2+1=3

	Biomaterials	2+1=3
	Modelling & simulation	2+1=3
	Medical image processing	2+1=3
	Engineering management	3+0=3
	Biomedical instrumentation -II	2+1=3
	Microprocessor & interfacing	2+1=3
	Biomedical signal processing	2+1=3
	Rehabilitation engineering	2+1=3
	Medical device quality system and standards	3+0=3
	Artificial intelligence	2+1=3
	Drug delivery systems	2+1=3
	Medical robotics	2+1=3
	Biophysics	2+1=3
	Medical data system	2+1=3
	Biomedical Control Systems	2+1=3
		72 credit hours
Interdisciplinary/Allied Courses	Biochemistry	2+1=3
	Human physiology-I	2+1=3
	Human physiology-II	2+1=3
	Human anatomy	2+1=3
	Biosafety and biosecurity	3+0=3
	Biomechanics	2+1=3
		18 credit hours
Field Experience/Internship		0+3=3
Capstone Project		0+3=3

Scheme of Studies for BS Biomedical Technology (4 Years)

- Eligibility F.Sc. premedical/engineering /A-level/12 years (equivalent) of schooling with science subjects (Math, Biology, Chemistry and Physics) with at least 50% marks in aggregate.
- Total numbers of Credit hours 126 (HEC recommended: 120- 140)
- Duration 4 years
- Semester duration 16-18 weeks
- Semesters 8
- Course Load per Semester 15-18 Credit hours

Semester	Name of Subject	Credits	Pre-requisite
First	FUNCTIONAL ENGLISH	3+0=3	
	INFORMATION AND COMMUNICATION TECHNOLOGIES ICT	2+1=3	
	IDEOLOGY AND CONSTITUTION OF PAKISTAN	2+0=2	
	INTRODUCTION TO BIOMEDICAL ENGINEERING	3+0=3	
	APPLIED PHYSICS	2+1=3	
	BASIC MATHEMATICS / BASIC BIOLOGY	3+0=3	
	Total Credit Hours	17	
Second			
	ISLAMIC STUDIES/ETHICS	2+0=2	
	NATURAL SCIENCES	2+1=3	
	QUANTITATIVE REASONING - I	3+0=3	
	SOCIAL SCIENCES	2+0=2	
	BIOCHEMISTRY	2+1=3	
	BIOFLUID MECHANICS & BIOHEAT TRANSFER	3+0=3	
	Total Credit Hours	16	
Third			
	QUANTITATIVE REASONING II	3+0=3	QUANTITATIVE REASONING I
	ARTS AND HUMANITIES	2+0=2	
	HUMAN PHYSIOLOGY-I	2+1=3	
	CLINICAL EQUIPMENT	2+1=3	
	COMPUTER AIDED ENGINEERING DRAWING	2+1=3	
	HUMAN ANATOMY	2+1=3	
	Total Credit Hours	17	
Fourth			
	EXPOSITORY WRITING	3+0=3	
	CIVICS AND COMMUNITY ENGAGEMENT	2+0=2	

	ENTREPRENEURSHIP	2+0=2	
	HUMAN PHYSIOLOGY-II	2+1=3	HUMAN PHYSIOLOGY-I
	BIOMEDICAL ELECTRONICS	2+1=3	
	BIOMECHANICS	2+1=3	HUMAN ANATOMY AND HUMAN PHYSIOLOGY
	Total Credit Hours	16	
Fifth			
	BIOMEDICAL INSTRUMENTATION -I	2+1=3	
	SIGNALS & SYSTEMS	2+1=3	
	BIOMATERIALS	2+1=3	BIOCHEMISTRY
	MODELLING & SIMULATION	2+1=3	
	MEDICAL IMAGE PROCESSING	2+1=3	
	BIOMEDICAL SIGNAL PROCESSING	2+1=3	
	Total Credit Hours	18	

Sixth			
	ENGINEERING MANAGEMENT	3+0=3	
	BIOMEDICAL INSTRUMENTATION -II	2+1=3	BIOMEDICAL INSTRUMENTATION -I
	MICROPROCESSOR & INTERFACING	2+1=3	
	BIOMEDICAL CONTROL SYSTEMS	2+1=3	BIOMEDICAL SIGNAL PROCESSING
	REHABILITATION ENGINEERING	2+1=3	
	Total Credit Hours	18	
Seventh			
	BIOSAFETY AND BIOSECURITY	3+0=3	
	MEDICAL DEVICE QUALITY SYSTEM AND STANDARDS	3+0=3	
	ARTIFICIAL INTELLIGENCE IN HEALTH CARE	2+1=3	
	DRUG DELIVERY SYSTEMS	2+1=3	
	MEDICAL ROBOTICS	2+1=3	
	INTERNSHIP	0+3=3	
	Total Credit Hours	18	
Eight			
	BIOPHYSICS	2+1=3	
	MEDICAL DATA SYSTEM	2+1=3	
	RESEARCH PROJECT	0+3=3	
	Total Credit Hours	09	

Total Course Credit Hours = 126