King Saud University
College of Applied Medical Sciences
Department of Biomedical Technology

1. Introduction

1.1. About the department

Over recent years, the health care systems have seen an increase use of advanced medical devices in the diagnosis and treatment of diseases. Currently, many of the disorders in body functions can be detected by direct or indirect use and application of such devices with complicated technology. Such situations require specialized skills of professionals who are highly qualified in the development, operation, and maintenance of these complex medical devices. The preparation of such competent professional requires providing them with knowledge in areas such as: mechanical and electrical skills, medical electronics, computer technology application in the medical engineering fields, knowledge of medical equipment and biological systems principles with the ability to apply these principles, knowledge of safety procedures with the ability to plan and implement safety program for medical devices, the ability on planning and technical analysis of medical devices, interaction with the medical team, the ability to analyze biological data and medical images, and dealing with medical information systems. Therefore, the Biomedical Technology Department was established at the College of Applied Medical Sciences as the first academic department specializing in the Kingdom to achieve such goal.

1.2. Description of the profession

Medical equipment specialist: Specialized who can manufacture, develop, calibrate, test, selection, marketing, maintenance and/or repair of medical devices.

1.3. Career opportunities

Graduates of this program will be working as a **medical equipment specialist** (as classified by the civil service). Graduates will work in the areas of technical medical equipment whether in public or private sectors such as hospitals, health authorities (e.g. Saudi Food and Drug Administration), industrial fields, academic institutions and medical equipment companies or agencies. In addition, graduates can work in research centers and authorities concerned with standards and specifications in government agencies. A graduate will be working in jobs such as:

- In hospitals: in the installation, maintenance, repair, testing, and specification writing of medical devices
- In the industry: in the field of manufacturing and development of medical devices to suit the biological systems of the humans
- In academic institutions: in the field of technical training and academic lab teaching for some courses for students of program students or similar programs
- In the medical equipment companies or agencies: in the field of marketing, sales, maintenance and repair of medical devices
- In research centers: in the development and innovation of new products and materials suitable for biological human systems associated with the ongoing evolution of medical devices and the development of systems for collecting and analyzing biological data.

- In government bodies for Standardization and Metrology: in the field of testing and calibration of medical devices in hospitals and health centers(governmental and private) for the issuance of certificates of airworthiness for these devices as well as to develop standard specifications for equipment and biomaterials internationally accepted and which should determine the extent of their use in the Saudi Arabia.

2. Department Vision

Pioneering and Excellence in preparing competent professional in the field of Biomedical Equipment Technology

3. Department Mission

Preparing highly competent graduates in the field of Biomedical Equipment Technology capable of producing distinct research to serve their community and support the economy.

4. Department Goals

Preparing highly competent graduates in the field of Biomedical Equipment

- Provide working environment that promote education and creativity.
- Ensure the quality of education
- Prepare qualified staff in the field of medical technology
- Promote distinctive research and dissemination of technology in the field of medical equipment.
- Attract a number of faculty members with expertise in the field of technical medical equipment.
- Offering master's program in technical medical devices
- Activating internal and external partnerships in the areas of educational, applied research, and consultation services.
- Contribute effectively to community service and development.

5. Department Features

None for the time being

6. Academic program

Currently only one program is being offered which is Bachelor in Biomedical Device Technology.

7. Admission Requirements

To be enrolled in this program a student has be a graduate of high school diploma (Science specialty) with a grade of 90% or more and show excel in mathematics and physics.

8. Graduation Requirements

To get the B.Sc. degree the student has to complete the requirements shown in the table below

Requirements	No. of study hours
Preparatory subjects	50
Specialty subjects	86
Total (B.Sc.) hours	136
An internship period of full **one** year in hospital or biomedical related organizations	

9. The program

9.1. Program Description

The program of medical devices covers general engineering principles and bioelectronics as well as their application to the development, maintenance and operation of various types of medical devices. Subjects are provided with appropriate laboratory and field training in health institutions in order to develop and increase the efficiency of graduates through the daily work in the field of health services.

9.2. Program Vision

Leadership and excellence in preparing qualified specialists in the field of biomedical equipment technology.

9.3. Program mission

Prepare qualified specialists in the field of biomedical equipment technology to support health care section in both the governmental and private sectors.

9.4 Program goals

- Application of quality standards into the program
- Preparation of specialized professionals in the field of biomedical equipment technology
- Provide the graduates with high level intellectual and professional skills.
- Update the program to cope with the rapid development of technology, medical equipment and to achieve academic accreditation of the department.

9.5. Program Outcomes

Consistent with the College's Mission Statement, the goals of Medical Equipments Technology Program are:

- The structure of the curriculum provides both breadth and depth across the range of biomedical technology topics.
- Ability to design a system, component, or process to meet desired needs.
- Ability to work with multi-disciplinary teams.
- Ability to identify, formulates, and solves biomedical engineering problems.
- Ability to understand the impact of biomedical solutions in a global and societal context.
- Knowledge of contemporary issues of biomedical technology.
- Ability to use the techniques, skills, and modern engineering, and computing tools necessary for biomedical practices.
- Ability to design and conduct experiments, as well as to analyze and interpret data.
- Understanding of professional and ethical responsibility.
- Culture of self and life-long learning.

9.6. Curriculum

Level 4				
Course #	**Course Title**	**L**	**P**	**T**
BMT 227	Principles of Computing	1	1	2
*BMT 211	Biomedical Electronics I	3	1	4
BMT 221	Mechanical Skills	1	2	3
*BMT 222	Applied Mathematics for BMT I	2	-	2
BMT 224	Applied Physics for BMT	3	1	4
IC 103	Islamic Economy	2	-	2
Total	17			

Level 5				
Course #	**Course Title**	**L**	**P**	**T**
*BMT 212	Biomedical Electronics II	3	1	4
*BMT 223	Applied Mathematics for BMT II	2	-	2
BMT 225	Measurement Techniques	2	1	3
BMT 226	Basic Electrical Skills (1)	1	1	2
BMT 228	Biomechanics	2	-	2
BMT 232	Principles of Mechanical Biomedical Instrumentation (1)	2	1	3
IC 104	Fundamentals of Islamic Politics	2	-	2
Total	18			

Level 6				
Course #	**Course Title**	**L**	**P**	**T**
*BMT 313	Biomedical Electronics III	2	1	3
BMT 323	Advanced Electrical Skills II	1	1	2
BMT 333	Electrical Machines in Biomedical Equipment	2	0	2
BMT 335	Mechanical Biomedical Instrumentation II	2	1	3
BMT 336	Optical Biomedical Instrumentation	2	1	3
BMT 337	Biomaterials	2	-	2
Total	15			

Level 7				
Course #	**Course Title**	**L**	**P**	**T**
*BMT 314	Biomedical Electronics IV	2	1	3
BMT 315	Introduction to Biopotentials	1	1	2
BMT 334	Biomedical Imaging Equipment	2	1	3
BMT 338	Bioengineering Design	2	-	2
BMT 367	Hospital Safety	1	1	2
RHS 372	Audiology	1	1	2

Total	14

Level 8				
Course #	**Course Title**	**L**	**P**	**T**
*BMT 413	Biomedical Electronics V	2	1	3
BMT 415	Digital Signal Processing	2	1	3
BMT 437	Biological Control Systems	2	-	2
BMT 484	Automation in Clin. Labs.	2	1	3
BMT 432	Special Topics	3	1	4
Total	15			

Level 9				
Course #	**Course Title**	**L**	**P**	**T**
BMT 414	Biomedical Electronics VI	2	1	3
BMT 465	Maintenance Management	2	-	2
BMT 468	Clinical Practice / Project	-	3	3
BMT 485	Biomedical Computing	3	1	4
RHS 422	Rehabilitation Procedures	1	1	2
Total	14			

9.7 summary of course description

BMT 211 Biomedical Electronics I (3+1)
Basic circuit theorems. Nodal and mesh analysis. RLC circuits. Natural and steady state response. AC circuits. Resonance .

BMT 212 Biomedical Electronics II (3+1)
Electronic Tubes. Solid state electronics. Diodes. Bipolar and FET transistor as amplifiers and switching devices .

BMT 221 Basic Mechanical Skills (1+2)
Simple mechanical devices. Engineering drawing basics. Hand tools. Machining processes in metal cutting. Soldering, brazing, welding and adhesion .

BMT 222 Applied Mathematics for BMT I (2+0)
Complex numbers. Determinants and Matrices. Simultaneous linear equations. Trigonometric, Exponential and logarithmic functions. Number systems and conversion .

BMT 223 Applied Mathematics for BMT II (2+0)
Introduction to Boolean algebra. Derivatives of algebraic and trigonometric functions. Maxima and minima of functions. Definite and indefinite integration. Infinite series, analytical and solid geometry. Vector analysis

BMT 224 Applied Physics for BMT (3+1)

Units and dimensions of physiological parameters. Particle mechanics and fluid mechanics. Optics. Sound and ultrasound. Isotopes, nature and properties of ionizing radiation, dose calculation, protection methods. Lasers. Electromagnetic theory .

BMT 226 Basic Electrical Skills (1+1)
Basic hand tools, common electronic components. Circuit construction and testing. Cathode ray oscilloscope. Use of Test equipment. Component replacement .

BMT 227 Introduction to Personal Computing (2+0)
Definitions. PC block diagram. Introduction to DOS, programming, use of word processing, graphics packages and spreadsheets .

BMT 228 Biomechanics (2+0)
Forece and equilibrium. Mechanics of body muscle and movements. Orthopedic structures. Body segment parameters. Concepts of body links .

BMT 229 Measurements Techniques (2+1)
Measurements and errors. System of units. Multimeters. Oscilloscopes. Instruments for measuring basic physical parameters; such as angle, strain, pressure, and viscosity. Static and dynamic performance of instruments and error analysis .

BMT 232 Principles of Mech. Biomed. Instrumentation (2+1)
Fluid mechanics, Fluid pressure and its measurements. Hydraulic pumps. Applications of continuity and Bernoulli's equations to measuring devices. Thermodynamics and heat transfer .

BMT 313 Biomedical Electronics III (2+1)
Introduction to integrated circuits. Operational amplifiers, signal conditioning and signal processing circuits. Power electronics. Applications in biomedical instrumentation .

BMT 314 Biomedical Electronics IV (2+1)
Logic gates and Boolean algebra. Logic circuit design. Sequential circuits and memories. A/D and D/A conversion. Biomedical applications .

BMT 315 Introduction to Biopotentials (1+1)
Origins of biopotentials, genesis of different biopotentials and their parameters. Bioelectrodes. Bioelectric amplifiers and signal processing .

BMT 323 Advanced Electrical Skills (1+1)
Printed circuit design, generation, and rounding. Computerized design and drafting. Signal tracing, troubleshooting. Introduction to biomedical circuits .

BMT 324 Applied Mathematics for BMT III (2+0)
First and second order ordinary differential equations. Partial differential equations, and their applications. Laplace, Fourier and z transforms. Linear algebra .

BMT 333 Electrical Machines in Biomedical Equipment (2+0)
Polyphase systems. Transformers. Motors; construction and principle of operation, speed control of small motors and motor controllers .

BMT 334 Biomedical Imaging Equipment (2+1)
Ultrasonic transducers, imaging techniques, scanning modes and intensifiers. X-ray and Fluoroscopic equipment. Testing and quality control .
BMT 335 Mechanical Biomedical Instrumentation (2+1)
Operation and construction of mechanical biomedical equipment such as ventilators, respirators, artificial kidney machine, artificial heart, heart-lung machine, and anesthesia equipment .

BMT 336 Optical Biomedical Instrumentation (2+1)
Microscopes. Light sources and detectors. Signal conditioning. Monochromators. Photometry, emission and absorption spectrometry. Lab. Instrumentation Endoscopy and Laser .

BMT 337 Biomaterials (2+0)
Mechanical properties of materials. Polymers, metals, ceramics and composites. Fixation, host response, testing and introduction of new materials. Material retrieval and analysis .

BMT 367 Hospital Safety (1+1)
Types and hazards in hospitals and their control. Safety principles and standards. Safety program and insurance .

BMT 413 Biomedical Electronics V (2+1)
Architecture of microprocessors. Architecture of a specific 16-bit processor. Assembly language programming. Memory and I/O interfacing. Biomedical applications .

BMT 414 Biomedical Electronics VI (2+1)
Measurement of Biopotentials and Physiological parameters. Introduction to FES, cardiac stimulation, ICU and CCU equipment, respiratory therapy equipment .

BMT 415 Digital Signal Processing (2+1)
Characteristics of biomedical signals. Noise detection and reduction. Analog and digital signal processing. Digital filters. Biomedical applications .

BMT 432 Special Topics in Biomedical Instrumentation (3+1)
Trends and developments in biomedical instrumentation and systems .

BMT 437 Biological Control Systems (2+0)
Models of physical systems. Root-locus and frequency response analysis. Biomedical applications .
BMT 465 Maintenance Management (2+0)
Establishing maintenance procedures. Instrument selection, evaluation and control. Preventive maintenance and failure reporting. Equipment planning. Computerized maintenance management .

BMT 468 Clinical Practice / Project (0+3)
Interaction with hospital personnel and practical maintenance procedures .

BMT 485 Biomedical Computing (3+1)

Application of computers in medicine such as patient record, clinical laboratory, Radiology. Computer assisted Diagnosis.

9.8. Summary of Internship program

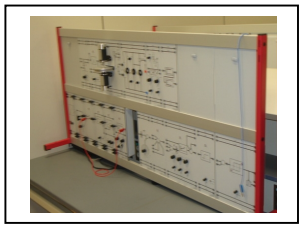
To complete graduation requirements, students spend a field training (internship) of a one year period in a hospital; governmental or private; or bodies that have oversight on medical devices or in one of the companies with the strong association of medical equipment. The department assigns a faculty member to a group of trainees to follow up daily/weekly in collaboration with training supervisor in the hospital or the company. The staff member must write a periodic report on the progress of the student accompanied by the students' feedback about the training program in general and in particular the training place as well as exploring the view of training supervisors on the program and the level of the trainees, together with any suggestions as trainers or trainees. During the training period is keen field training supervisors and faculty training venue whenever possible to:

- Students' participation in periodic maintenance medical equipment teams and assigning some of the work of the maintenance of the students.
- Students' participation; at least to observe; work on of medical devices repair.
- Students' attendance of scientific lectures taking place in the training place or in some companies supplying medical equipment to training place.
- Students' participation in the workshops, if any, in the place of training.
- Refine the student's ability to work in groups and dealing with others.
- Building Students' knowledge of the domestic market needs of medical devices.
- Develop student's ability to determine the specifications of medical devices and present it in writing.

10. Laboratories

Electronics

Digital electronics



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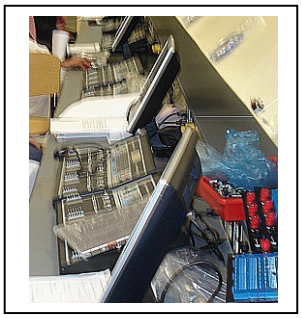

Advanced Electronics

Biomedical Equipment

Computer

11. Faculty

Department Head
Dr. Ali Ben Saleh Almejrad

No.	Name	Rank	Contact
1	Dr. Mohamed Ben Hamad Almejali	Associate professor	4693669
2	Dr. Ali Ben Saleh Almejrad	Assistant professor	4693663
3	Dr. Saleh ben Sulaiman Altayyar	Assistant professor	4693655
4	Dr Nabil Ben Ali Alrajeh	Assistant professor	4693661
5	Prof. Ranu Singh	Professor	4693659
6	Dr. Ali Samir Abdelsalam Saad	Associate professor	4693653
7	Dr. Mohamed Rizon	Professor	4693655
8	Dr. Mohamed Soheil Alabed	Assistant professor	4693662
9	Dr. Mohamed Zoubir Bendjaballah	Assistant professor	4693670
10	Dr. Javed Alshikh Ahmed	Assistant professor	4693654
11	Eng. Abdallah Alomran	Lecturer	4693651
12	Eng. Mohamed Nizar	Lecturer	4693660
13	Eng. Amr Radwan	Technician	4693671
14	Eng. Mohamed Zirar	Technician	4693673
15	Eng. Mohamed Elwhaiby	Technician	4693675
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