

## BIOMEDICAL ENGINEER SERIES

<b>Code No.</b>	<b>Class Title</b>	<b>Occ. Area</b>	<b>Work Area</b>	<b>Prob. Period</b>	<b>Effective Date</b>	<b>Last Action</b>
1313	Biomedical Engineer I	01	032	6 mo.	10/15/11	Rev.
4548	Biomedical Engineer II	01	032	6 mo.	10/15/11	Rev.

### *Promotional Line: 160*

#### Series Narrative

Employees in this series apply knowledge of engineering, biology, and biomechanical principles to the design, development, and evaluation of biological and health systems and products including electro medical machines, devices, equipment, or instruments. The work pertains primarily to associated phenomena concerned with electromagnetic or acoustical wave energy or electrical information. The Biomedical Engineer II may assign, direct, and evaluate the work of lower level Biomedical Engineer.

A Biomedical Engineer is distinguished from a Biomedical Engineering Technician in that the Engineer has a working knowledge of engineering theory (a knowledge of the principles and methods of engineering rather than its practice). This theory is used to research and design or conceptualize complex electromedical equipment. The Technician takes the designs or concepts of the Engineer and puts them into practical use. For example, the Engineer may research and design the schematics for a circuit; the Technician then takes that information, which may be on blueprint sheets, and constructs the actual physical apparatus. The Technician may also test, repair, and maintain the apparatus.

Another feature distinguishing the Engineer from the Technician involves educational preparation. The Engineer, being in a professional position, must have a Baccalaureate degree with course work in engineering theory, design, and other advanced engineering courses; whereas, the Technician, who is more application-oriented than theoretically oriented, must have completed only a two-year program in a technical school or college or equivalent training and/or experience.

#### DESCRIPTIONS OF LEVELS OF WORK

##### **Level I: Biomedical Engineer I**

**1313**

Employees at this level, under supervisory direction, design, repair, maintain, and test electromedical machines and equipment and assist in conducting research by applying experimental and empirical methods and techniques. They also interpret results and select or recommend approaches appropriate to the solution of design, testing, and maintenance problems. They are thoroughly familiar with the theory, design, characteristics, operation, and functions of the equipment they work on, as well as the individual requirements and modifications deriving from site and program characteristics.

A Biomedical Engineer I typically –

1. designs and prepares specifications for new equipment and modifies specifications for older equipment when requirements change
2. performs engineering tasks necessary for the construction and installation of new or modified equipment including creating new and/or special methods; prepares detailed installation plans and instruction, including checkout procedures, tolerances, and criteria for inspection
3. conducts site surveys to determine what must be done to prepare the specific environment for the new equipment (such as removal of older types of equipment)
4. investigates reports of post-installation equipment failures or unsatisfactory performance; prescribes corrective measures on site if necessary
5. carries out maintenance, repair, and testing assignments for in-service medical equipment, machines, and/or systems
6. evaluates electronic components of different manufacturers to determine those having highest reliability under a wide range of conditions (such as circuit overloads)
7. recommends the use of outside service organizations when instruments are beyond in-house repair; recommends the replacement of equipment that has reached the end of its useful life
8. conducts training to educate clinicians and other personnel on proper use of equipment
9. maintains records and reports of laboratory and field research, test, construction, new processes or equipment and maintenance results
10. writes instructional material on adjusting and calibrating equipment
11. produces and reviews all reports related to the medical equipment database, utilized both for ongoing operational needs and for any other ad hoc report requests
12. collaborates with other departments (i.e. Information Services or Facilities) to address multidisciplinary issues. This includes the participation in multidisciplinary meetings to represent the CES department
13. performs follow-up and produces information for hazard alerts, recall notices, or risk management investigations
14. understands and complies with all Joint Commission and other standards and regulations

15. performs other related duties as assigned

**Level II: Biomedical Engineer II**

**4548**

Employees at this level, under administrative review, initiate and conduct research studies and experimental investigations of electronic medical systems, machines, and equipment. They develop theoretical concepts used to substantiate the physical aspects of constructing, maintaining, and repairing electromedical equipment. They may also assign, direct, coordinate, and evaluate the work of lower level Biomedical Engineers.

A Biomedical Engineer II typically –

1. conducts or directs different investigations, analyses, experiments, and tests pertaining to the design, construction, installation, and modification of electro medical equipment and/or systems including the installation of complex electronic systems, particularly where there are problems of site selections and modification of the equipment to adapt to novel site characteristics
2. develops circuitry design
3. analyzes, develops, and designs computer interphase systems
4. researches and evaluates the application of new developments in the field of electronics that pertain to biomedical engineering
5. consults with medical personnel on the theoretical aspects of engineering projects in a medical environment, analyzing the unique problems of the various medical disciplines in order to write specifications on how to modify existing equipment or develop new systems
6. writes test specifications for new equipment and technical reports to summarize projects; prepares technical papers for publication in scientific journals
7. provides budgetary advice to the administration and also carries out the technical processes involved in budget formulation, presentation, and execution
8. writes the engineering specifications and related technical aspects of grant applications and grant renewals
9. submits bids to the administration, after attending pre-bid conferences
10. bids on the purchase of new equipment and orders equipment, machines, and devices with the approval of administration

11. assigns, directs, and evaluates the work of lower level Biomedical Engineers; selects and orients new employees; and develops a planned program for their training and development
12. performs duties of the lower-level in this series as required
13. performs other related duties as assigned

MINIMUM ACCEPTABLE QUALIFICATIONS REQUIRED FOR ENTRY INTO:

**Level I: Biomedical Engineer I**

**1313**

CREDENTIALS TO BE VERIFIED BY PLACEMENT OFFICER

1. Bachelor's degree in biomedical, electrical, or electronic engineering or bio-engineering that includes course work in physics, chemistry, dynamics, physiology, and calculus
2. One (1) year (12 months) of work experience in biomedical technology (i.e., as a biomedical engineer or a biomedical engineering technician)

KNOWLEDGE, SKILLS AND ABILITIES

1. knowledge of the mechanical layout and design of electrical and electronic equipment
2. knowledge of the design, operation, and function of various electro medical equipment such as high and low voltage windows and wide band amplifiers
3. knowledge of test equipment such as oscilloscopes, voltmeters, ohmmeter, and frequency generators)
4. knowledge of electronic and electrical theory and circuit design
5. knowledge of the physical, biological, and engineering sciences and mathematics such as physiology, chemistry, physics, electrical and electronic engineering, and calculus
6. knowledge of electrical distribution systems, signal systems, and electrical equipment and machinery
7. skill in following schematic diagrams and block diagrams
8. skill in constructing devices in accordance with design instructions
9. skill in designing circuitry for electromedical equipment, machines, and systems

10. skill in interpreting test results
11. ability to prepare technical reports
12. ability to conduct scientific surveys
13. ability to maintain records
14. ability to follow oral and written instructions
15. ability to work in emergency situations

**Level II: Biomedical Engineer II****4548****CREDENTIALS TO BE VERIFIED BY PLACEMENT OFFICER**

1. Bachelor's degree in biomedical engineering, electrical engineering or bio-engineering that includes course work in physics, chemistry, dynamics, physiology, and calculus
2. Three (3) years (36 months) of work experience, of which two (2) years (24 months) must have been spent performing duties comparable to those listed for the Biomedical Engineer I

**KNOWLEDGE, SKILLS AND ABILITIES (KSAs)**

1. knowledge of digital and analogue electronic design
2. knowledge of transmission line, semi-conductor, and transistor theory
3. knowledge of theory, design, construction, and maintenance of complex biomedical electronic equipment (such as gas-chromatographs, digital computer terminals, electron microscopes, nuclear magnetic resonant spectrometers, video and medical monitors, X-ray equipment, and peripheral equipment for computers)
4. knowledge of tool design, installation and maintenance of electromedical equipment, construction estimating, and specification writing
5. knowledge of primary manufacturer of electromedical equipment and other sources of supply
6. knowledge of equipment cost and bid practices
7. ability to conduct cost analysis and studies regarding electronic equipment, machines, and systems

8. ability to analyze program and accounting details in order to identify and apply significant data in preparing budget estimates and reports
9. ability to understand the design characteristics and theoretical basis of operation of electromedical equipment
10. ability to visualize and design workable and practical solutions to design or operational problems
11. ability to conduct research studies regarding electromedical systems
12. ability to develop and design complex circuitry and write technical specifications
13. ability to act as consultant to medical personnel
14. ability to organize, direct, assign, and evaluate the work of others
15. ability to make statistical computations involving percentages, ratios, and averages
16. ability to coordinate budget activities with other staff functions (such as accounting, personnel, and administration)
17. ability to compute construction costs