

The Clinical Engineering Internship Program - Introduction

Clinical engineering is the application of engineering methods and technology to the delivery of health care. The clinical engineer is a member of the health care team responsible for the management of medical technology in the hospital environment. The tasks that a clinical engineer provides include supervising a clinical engineering department, designing or modifying sophisticated medical instruments, evaluating new medical equipment for purchase, repairing equipment, testing the safety of equipment, asset management, vendor service management, projects (i.e., R&D, re-engineering, new system implementations), regulatory support (i.e., JCAHO [Joint Commission for the Accreditation of Healthcare Organizations], CAP [College of American Pathologists]), and instructing clinicians (nurses) in the proper use of medical equipment. Clinical engineering, therefore, involves the application of engineering techniques to health care delivery.

The Clinical Engineering internship program offers an in-depth, rigorous, clinical experience that matches the engineering expertise gained in the classroom. The primary objectives of this intense internship program are as follows:

- Provide exposure to hospital organization and administrative functions.
- Permit hospital experience of clinical engineering; that is, provide an opportunity to apply engineering techniques to patient care and hospital-based research.
- Provide substantial experience working with hospital personnel, including administrators, nurses, technicians, and medical staff.

These objectives are not traditional classroom experiences; rather, they emphasize the practical side of health care technology. They are achieved not only by observing, but also by actually working on projects in the clinical environment. All of these experiences are obtained during two phases of the internship: a) rotation through a majority of hospital departments during the first year; and b) in-depth involvement with a significant, clinically oriented project during the second year of the program. Because the program requires that the intern spend the entire two academic years working approximately twenty (20) hours per week at the hospital with the remaining time concentrated in classroom activities, there is ample time for the student to be thoroughly indoctrinated into hospital operation and procedures and to select those courses most helpful to them as they profit from experience in the clinical environment.

The medical institutions currently participating in the program are as follows:

- John Dempsey Hospital (The University of Connecticut Health Center)
- Hartford Hospital
- Baystate Health System
- West Haven VA Hospital
- UMass Medical Center (Worcester)
- Providence VA Hospital
- Boston VA Hospital
- West Roxbury VA Hospital
- Rhode Island Hospital (Providence)
- Middlesex Hospital

Clinical Engineering Internship Program - Details

The Clinical engineering Internship Program at the University of Connecticut is a hospital-based, two-year program that includes Hartford Hospital, the University of Connecticut Medical Center, West Haven VA Hospital, UMass Medical Center, St. Francis Hospital in Hartford (Premier Inc.), Rhode Island Hospital in Providence, RI, Middlesex Memorial Hospital in Middletown, CT, and the Baystate Health System in Springfield, Massachusetts. This program was first established in the greater Hartford area in 1974 and moved its academic affiliation to the University of Connecticut in 1996. The Director of the Clinical Engineering Internship Program is Mr. Frank Painter.

As part of the selection process of candidates, students are invited to the hospital and campus in February and March for an interview. An interview is required to secure a graduate assistantship (paid internship). Students selected and participating in the M.S. Clinical Engineering Internship Program receive a stipend during the academic year and a tuition waiver from UConn along with a generous health benefits package. Summer support is also available from some of the hospitals.

M.S. Degree and Curriculum

The degree awarded is either a Plan A or Plan B Master of Science in Biomedical Engineering from the University of Connecticut.

Plan A

A total of eight graduate courses (24 credit hours) are required and Thesis Project (9 credits of GRAD 5950). The following courses are required for all Clinical Engineering Interns:

- BME 5000 (310) - Physiological Systems I
- BME 5020 (350) - Clinical Engineering Fundamentals
- BME 5500 (311) - Clinical Instrumentation Systems
- BME 5050 (351) - Engineering Problems in the Hospital
- BME 5030 (352) - Human Error and Medical Device Accidents
- BME 5040 (356) - Medical Instrumentation in the Hospital

The remaining courses are taken from the BME graduate course offerings and should be from engineering disciplines related to the intern's background, interests and future career plans. BME 5600 (Human Biomechanics), BME 5700 (Biomaterials and Tissue Engineering) and BME 5100 (Physiological Modeling) are strongly encouraged. Most classes meet one night per week in the evening, Monday through Thursday, usually from 6-9 PM.

Most students take two classes a semester and leave the summers free to work on their Master's Thesis.

Interns are expected to present and publish their Master's Thesis at a conference (or have their paper accepted) before graduation.

Plan B

A total of ten graduate courses (30 credit hours) are required. The following courses are required for all Clinical Engineering Interns doing a Plan B:

- BME 5000 (310) - Physiological Systems I
- BME 5020 (350) - Clinical Engineering Fundamentals
- BME 5500 (311) - Clinical Instrumentation Systems
- BME 5100 (315) - Physiological Modeling
- BME 5050 (351) - Engineering Problems in the Hospital
- BME 5030 (352) - Human Error and Medical Device Accidents
- BME 5040 (356) - Medical Instrumentation in the Hospital

Note that BME 5100 is the capstone course that is required for all Plan B Master of Science in Biomedical Engineering. The remaining courses are taken from the BME graduate course offerings and should be from engineering disciplines related to the intern's background, interests and future career plans. BME 5600 (Human Biomechanics) and BME 5700 (Biomaterials and Tissue Engineering) are strongly encouraged. Most classes meet one night per week in the evening, Monday through Thursday, usually from 6-9 PM.

There are no publication requirements for Plan B MS degree students.

Master's Proposal, Project and Thesis Requirements

During the second year, student interns undertake hospital-oriented projects in the area of their particular interest. This project activity has a twofold purpose: (1) to enable the student to learn how to conduct research and development projects and (2) to satisfy the requirements of a M.S. degree.

The Thesis Proposal should be written in the third person and consist of the following items:

- Title Page with Thesis Title, Intern Name, Hospital Address, Committee Members
- 1 Page Executive Summary (Abstract) that describes the problem investigated and its importance
- 2-3 pages of background information so that the project is placed in historical context or its importance within the field
- 2-3 pages about the solution method to the problem
- References Cited
- A list of any publications in this project that you have authored or co-authored

The Master's Thesis is a document that describes a project carried out by the student. Style documentation for the Master's Thesis is available from the Graduate School. Typically, this includes the following sections:

- Abstract
- Introduction
- Methods
- Results
- Discussion

- Conclusion

The introduction should describe background history that illustrates the relevance of the project. It should also provide a roadmap for the rest of the thesis.

There must be a minimum of three faculty on the thesis committee (Dr. Enderle (Major Advisor), the Hospital Director and a UConn BME graduate faculty member). The third committee member should be a faculty whose research focus match those of the project. The committee members are usually chosen in the beginning of the second year.

Timeline

The program requires that the entire two academic years be spent working at the hospital, taking courses, and working on the Master's project.

Internship Start Date, End Date, Holidays and Work Hours

The time commitment by the intern to the hospital is at least 20 hours per week for your internship. Working more than 20 hours per week is at the discretion of the intern. It should be noted that the more hours worked in the internship, the better the internship experience. The rotations through hospital departments and work on the MS thesis are not part of the 20 hours per week of internship.

The first day of the year is August 24th and the last day of the year is May 23rd. This is true for both 1st and 2nd year interns. For 2nd year interns, graduation is usually the end of the first week of May; you are still required to work as an intern 20 hours per week until May 23rd. The schedule of hours worked each week by the intern are at the discretion of the hospital Clinical Engineering Director so that the intern can be included in meetings, planned work events, etc. The only time not scheduled for the internship is during class time (typically 6-9pm on two days a week), and travel to the class.

During the academic year, the intern's vacation schedule usually coincides with holidays observed in the University of Connecticut academic calendar (from August to May). If UConn is closed for a snow day, the intern does not have to make the day up. The only vacation for interns are the official holidays observed by the State of Connecticut and 2 weeks provided for the Christmas holidays, usually from December 18 - January 5. The time off for the Christmas holidays are decided mutually between the intern and the hospital Clinical Engineering Director. Those are the only vacations during the August to May time period. Spring break is not a holiday for the interns and you are expected to work that week.

If for some reason an intern needs to take time off during the academic year, those hours missed can be made up if approved by the hospital Clinical Engineering Director. If an intern is sick, you must make up the hours missed.

Interns not working the appropriate number of hours during the internship will have their graduation delayed until all internship hours are worked. Before graduation, the hospital Clinical Engineering Director will sign off that the intern has fulfilled the number of internship hours for two academic years, and that the 2nd year intern will work from graduation until May 23rd.

First Year

During the first year, the student works in the hospital by rotating through various departments (such as plant engineering, emergency room, operating room, cardiac and pulmonary laboratories, etc.). He or she is considered part of the staff of that department during the rotation, and is expected to contribute to the function of the department by providing engineering services. Work on the Master's Thesis is also expected to occur during the first year by first identifying the project and then doing a background investigation (a good source of a project is identifying it during the rotations).

The rotation schedules vary among institutions, but for the most part include:

Clinical Engineering	Respiratory Therapy
Operating Room	Physical Therapy
Anesthesiology	Lab Medicine/Pathology
Emergency Room	Radiology
ICU, Adult and Neonatal	Nuclear Medicine
OB/GYN, Labor & Delivery	Radiation Oncology

These rotations are usually between two-weeks to one-month.

The intern must be aware of the vast opportunities available in the internship program. Individual initiative and drive are important. Hospital staff members are not always fully aware of a student's knowledge and background. Therefore, the intern must ask questions and become involved. During this process, opportunities for learning present themselves only by proactive measures by the intern.

The responsibilities of the intern during the first year may include some of the following:

- Assisting in the equipment management program by performing corrective maintenance and preventive maintenance on specific medical equipment
- Performing incoming inspections on new equipment
- Performing electrical safety testing, and medical gas outlet testing
- Providing in-services for new equipment or new medical equipment users
- Preparing technology assessments or product comparisons
- Providing administrative support to the Director of Clinical Engineering with budgeting and JCAHO requirements.

Summer Between the First and Second Year

During the summer between the 1st and 2nd years, the intern begins work on their Master's Project. The intern works on the Thesis Proposal (details about the content of the Thesis Proposal, Thesis Project and Thesis are contained in the section "Master's Proposal, Project and Thesis Requirements"). An approved Thesis Proposal is due by September 15th. It should be reviewed first by the Clinical Engineering Director at the intern's hospital, and then Dr. Enderle. The third faculty member then reviews the proposal.

Second Year

The schedule of work is similar to the first year except the rotations are replaced by work on the MS Thesis. The intern will schedule a meeting with the Thesis Committee during October. The committee will review the Thesis Proposal, Plan of Study and general plan for the year.

Instructions for Registering for Graduate Courses for Clinical Engineering Interns

1st Year Students Fall Semester:

1. Meet with Dr. John Enderle to discuss courses
 - Register for BME 5000 (Physiological Systems I), BME 5020 (Clinical Engineering Fundamentals) and GRAD 5950 (3 credit hours).
 - Get an Email Account
2. Register for courses: via on-line Peoplesoft registration.
3. Go to Wilbur Cross Building—Take care of Student ID, etc.
4. Go to Budds Building
 - Fee Bill—Bursar (2nd Floor)

1st Year Students Spring Semester:

1. Meet with Dr. John Enderle to discuss courses
 - Register for required BME course, GRAD 5950 (3 credit hours) and one course that meets professional interests or requirements.
2. Register for courses: via on-line Peoplesoft registration.

2nd Year Students Fall Semester:

1. Meet with Dr. Enderle to discuss courses
 - Register for required BME course, GRAD 5950, (3 credit hours) and one course that meets professional interests or requirements.
2. Register for courses: via on-line Peoplesoft registration.
3. Go to Budds Building Fee Bill—Bursar (2nd Floor)

2nd Year Students Spring Semester:

1. Meet with Dr. Enderle to discuss courses
 - Register for required BME course(s), and one course that meets professional interests or requirements.
2. Register for courses: via on-line registration.
3. Go to Budds Building Fee Bill—Bursar (2nd Floor)

What to Expect from the Clinical Engineering Intern

- 20 hours / week – clinical engineer in the department working as if a regular employee
- 4-6 hours / week – “clinical rotations” in the hospital during both semesters of their first year
- 6-10 hours / week – working on their thesis project during both semesters of their first year
- 40 hours / week – working on the MS Thesis during the summer between the first and second year
- 20 hours / week – working on their thesis project during both semesters of their second year
- 20 hours / week –work to satisfy university course assignments (10 hour per course) each semester

The CE directors should have the same job expectations of the interns as any other employee and as such the interns must establish a mutually agreeable schedule and follow it. Unanticipated or unexcused absences are not acceptable, unless the department rules are followed.

The interns are expected to be productive, responsible and professional members of the clinical engineering department to which they are assigned. The directors are expected to mentor them in that direction.

What to Expect from the Internship Director

Frank Painter, the Clinical Engineering internship director, will arrange to meet with the department director and the interns at each hospital once per year to discuss important issues and current topics related to the internship program at that hospital. If additional meetings are needed they may be requested.

Each department director may be asked to guest lecture at least once per year, teaching a class on material with which they are familiar. An outline of the material to be covered will be provided in advance.

The clinical engineering internship director will meet with the interns for a 3-4 hour organized “Internship Meeting” which will take place once per year in each separate internship hospital. We expect the hospital Clinical Engineering Director to give a 30-45 minute presentation on their career, their department, current CE challenges, department development or some other interesting topic at these meetings. We will also have each of the interns give a 20-30 minute presentation, the internship program director will give a 30 minute presentation, we may ask a nearby CE director to give a guest presentation and finally we will ask that the interns arrange for a tour of an interesting area in the hospital.

Clinical Engineering Work Assignments in the Hospital

It is expected that the intern will be assigned to participate in the majority of the following activities at some point in their two year program.

- Establish a basic understanding of general medical equipment through 2-3 months of shadowing BMETs, performing inspections and minor repairs of a variety of devices contained in checklist of basic medical devices
- Develop new equipment inspection procedures
- Review and update/expand (if appropriate) department policy and procedures manual.
- Review / update employee job descriptions (if appropriate)
- Participate in an employee evaluation process (if appropriate – with consent)
- Prepare at least two short CE department staff in-service presentations (one per year) to teach

- Become familiar with JCAHO technology management standards and compare and comment on department practices designed to meet the standards
- Participate in department based JCAHO mock survey and participate in resolution of problems found.
- Participate in risk assessment of new technology for JCAHO inclusion
- Participate in the department's competency assurance program
- Participate in at least one HFMEA or RCA development process.
- Participate in (and eventually lead if appropriate) department performance improvement program data collection process, including among other things a customer satisfaction survey
- Accompany department director to hospital safety committee; technology selection committee; capital planning committee and other committee meetings as appropriate
- Accompany department director to one department management meeting, hospital management meeting and department director's one-on-one meeting with their administrator
- Make one presentation on behalf of the department to higher level hospital managers
- Be given the opportunity to interact with outside agencies, vendors or consultants
- Technology assessment to evaluate appropriateness of device to meet clinical need
- Evaluation of equipment for purchase including life-cycle cost analysis report, total cost of ownership report or new technology business plan
- Incoming inspections of new equipment or systems
- Installation of new equipment or systems (or oversee installation)
- Clinical staff in-service training program development (or oversee vendor training)
- Participate in the hospital's equipment replacement planning process
- Participate in the process to manage the CE department's website
- Participate in the development / management of the CE department's computerized medical equipment management system
- Participate in a hospital expansion / renovation project, becoming involved review of the architectural, engineering and equipment selection parts of it
- Participate (if appropriate) in development of the annual department budget.
- Review codes & standards to evaluate the department's /hospital's regulatory compliance
- Participate in the management of an extended project
- Participate in the management of recalls and alerts program
- Participate in the evaluation of several service contracts
- Participate in the investigation of at least one incident involving a medical device.

Clinical Rotations in Technology Intensive Areas of the Hospital

- Time spent in the clinical environment observing the clinician - patient - technology interface
- Done during the first year only
- Arranged by the intern with the assistance of the second year intern, department manager or supervisor
- The intern would be the only CE person in the environment
 - Operating Room
 - Orthopedic Surgery
 - Ophthalmic surgery
 - Cardiac surgery

- Neurosurgery
 - Vascular surgery
 - Outpatient surgery
 - Endoscopic / laser / image guided
- Anesthesiology
 - Post-anesthesia Recovery Room
- ICU
 - Surgical ICU
 - Post Cardiac
 - Pediatric
 - Neonatal
 - Specialty (burn/neuro/....)
- Diagnostic Imaging
 - X-ray
 - Special procedures
 - Vascular
 - Ultrasound
 - Mammography
 - Nuclear Medicine
 - Cystoscopy
 - CT
 - MRI
 - Specialty (PET/SPECT/....)
- Laboratory
 - Chemistry
 - Hematology
 - Pathology
 - Bacteriology
 - Blood bank
- Endoscopic gastroenterology
- Hyperbaric medicine
- Ophthalmology laser clinic
- Oncology / radiation medicine
- Emergency room
- Clinics (in hospital & remote)
- Homecare
- Dialysis
- Electrocardiography
- Electrophysiology
- General Medical Floor
- General Surgical floor
- Administration (Finance, Purchasing, Receiving, Stores, Central Supply)
- Engineering (medical gases, electricians, HVAC, energy management)
- Information Services (Networking, Software support, Help Desk, PACS, electronic patient record)

Clinical Engineering Phone Numbers and Addresses

Baystate Health System

(413) 784-3382

3601 Main Street
Springfield, MA 01199

St Francis Hospital

114 Woodland St.
Hartford, CT 06105-1299

Hartford Hospital

(860) 545-3915

80 Seymour Street
Hartford, CT 06115

John Dempsey Hospital

(860) 679-2954

University of Connecticut Health Center
263 Farmington Avenue
Farmington, CT 06032

Boston VA Hospital

Providence VA Hospital

(401) 273-7100, EXT. 2096

Clinical Engineering Department
830 Chalkstone Ave.
Providence, RI 02908

Rhode Island Hospital

(401) 444-4066

593 Eddy St.
Providence, RI 02903

West Haven VA Hospital

(203) 932-5711, EXT. 5550

Clinical Engineering Dept.
950 Campbell Ave.
West Haven, CT 06516

UMass Medical Center

119 Belmont St.
Worcester, MA 01605

Middlesex Memorial Hospital

28 Crescent St.
Middletown, CT

The University of Connecticut

(860) 486-5838

Biomedical Engineering
260 Glenbrook Road, U-2157
Storrs, CT 06269-2157
Dr. John Enderle

The University of Connecticut Health Center—John Dempsey Hospital

General Information:

SIZE	210 beds (small)
LOCATION	Farmington, CT (10 miles west of Hartford)
PATIENT CARE	General, Surgery, Teaching

Clinical Engineering Dept. Information:

The Clinical Engineering Department has 11 full-time persons. It is divided into three teams (Administrative, Hospital, and Hospital Support) each headed by a clinical engineer. All medical equipment is supported, including beds, sphygmomanometers, etc. In addition, the department supports the Clinical Laboratories as well as Radiology, which are excellent opportunities not available in most hospitals.

Student Information:

Selected interns are considered graduate research assistants at the University of Connecticut; therefore, they receive a stipend and a waiver of tuition. The stipend is provided monthly during the nine month academic year.

Responsibilities:

First year students spend 20 hours per week in the Clinical Engineering Department doing electronics work, self-paced courses, reading of manuals, repairs, inspections of medical equipment, and special projects for the director. Students gain knowledge of all equipment, as the intern is paired with each engineer and technician for a period of time. All areas of the hospital are available for rotations and welcome interns, and, depending on his or her interests, the intern can determine where and how long to spend on each rotation.

Second year students spend 20 hours per week in the Clinical Engineering Department. The intern assists the department with special projects, works on management projects including QA activities, customer satisfaction surveys, analysis of service histories, special equipment installations and more in-depth training on a wide range of health care technology.

Time off for personal needs, holidays and vacations can be arranged. Students usually take vacations in accordance with the schedule of classes at the University of Connecticut.

Living Arrangements:

There are no living arrangements at the hospital, though the Medical School Office has a listing of available apartments in the area.

Hartford Hospital

General Information:

SIZE	900 beds (large)
LOCATION	Downtown Hartford (south side)
PATIENT CARE	General, Surgery, Trauma

BME Dept. Information:

The BME Department consists of 20 people divided into two teams: Respiratory, OR, Anesthesia & Medical Electronics. The BME Department primarily provides technical support and consultation to all other engineering and maintenance departments throughout the hospital. Each individual department in the hospital has its own technical support personnel where required (e.g. radiology, chemistry, and respiratory therapy). The general electrical repair of monitoring equipment from the floors is handled by the Medical Electronics division of engineering services. The intern, however, has access to all areas of engineering services and the hospital.

Student Information:

Selected interns are considered graduate research assistants at the University of Connecticut; therefore, they receive a stipend and a waiver of tuition. The stipend is provided monthly during the nine month academic year.

Responsibilities:

First year students spend 20 hours per week in clinical rotations. It is the responsibility of the students to schedule these rotations and to determine the amount of time to be spent in each department. (Certain rotations are required.) All areas of the hospital are available for rotations and welcome interns. Some time is spent in the department doing repairs, inspections of medical equipment, and special projects for the director.

Second year students are required to spend all time working on their project. Arrangement of tours, and interviews of prospective students are responsibilities shared with the first year intern.

Time off for personal needs, holidays and vacations can be arranged. Students usually take vacations in accordance with the schedule of classes at the University of Connecticut.

Living Arrangements:

The Educational Resource Center at Hartford Hospital has a dormitory which certain staff and Allied Health students are allowed to occupy. The clinical engineering students can rent a room on a month by month basis for the two year internship or until other living arrangements can be made. For more information contact Hartford Hospital.

Baystate Health System

General Information:

SIZE 700 beds (large)
LOCATION Springfield, MA (30 miles north of Hartford)
PATIENT CARE General, Surgery, Trauma, Teaching

Clinical Engineering Dept. Information:

The Clinical Engineering Department has 25 full time persons and is considered large. This department supports medical equipment, as well as typewriters and paging systems. For example they do not fix beds, sphygmomanometers etc. It possesses modern test equipment as well as computer facilities. Opportunities exist to work with all equipment supported by the department.

Student Information:

Selected interns are considered graduate research assistants at the University of Connecticut; therefore, they receive a stipend and a waiver of tuition. The stipend is provided monthly during the nine-month academic year.

Responsibilities:

First year students spend 20 hours per week in the Clinical Engineering Department doing reports, presentations, asset management, database management, and inspections of medical equipment. Clinical rotations occur during work, depending on the schedule the intern sets up. All departments in the hospital are available for rotations and welcome interns. The students also have an opportunity to assist in many administrative capacities by participating on Medical Center Committees.

Second year students spend 20 hours per week in the department, with the additional time spent working on the project. Arrangement of tours, and interviews of prospective students are responsibilities shared with the first year intern.

Time off for personal needs, holidays and vacations can be arranged. Students usually take vacations in accordance with the schedule of classes at the University of Connecticut.

Living Arrangements:

There are no living arrangements at the hospital. Previous interns have lived in Springfield and Chicopee, while others have chosen to live closer to Hartford.

VA Connecticut Healthcare System (West Haven)

General Information:

The VA Connecticut Healthcare System is a part of VISN1 (VA New England Healthcare System) of the 22 VISN (Veterans Integrated Service Networks) facilities nation wide.

Services:

VA Connecticut Healthcare System provides specialized services for women, Geriatric Rehabilitation and Extended Care Services, hospice and respite care, pharmacy services, dental care, psychological/pastoral counseling, psycho-social support services, podiatry, prosthetics, same day surgery, alcohol and substance abuse treatment and specialized services for diabetics.

In summary, VA Connecticut provides primary, secondary and tertiary care in medicine, geriatrics, neurology, psychiatry and surgery with an operating bed capacity of 170 VA Connecticut encompasses an **Inpatient facility** and **Ambulatory Care Center in West Haven**; an **Ambulatory Care Center** of Excellence in **Newington**, and five primary care Community Based Outpatient Clinics throughout the Connecticut region.

Research and National programs:

VA Connecticut conducts research in psychiatry, medicine, surgery, neurology and related basic sciences. National Veterans Health Administration programs located at VA Connecticut include the following:

- Eastern Blind Rehabilitation Center and Clinic
- Northeast Program Evaluation Center (NEPEC)
- Coordinating Center for Cooperative Studies Program
- National Virology Reference Laboratory for Tuberculosis and Other Mycobacterial Diseases
- Mental Illness Research, Education and Clinical Center (MIRECC)
- National Center for PTSD
- National Center for Research in Alcoholism and Substance Abuse
- VA/Yale Center for Neuroscience and Nerve Regeneration
- Rehabilitation Research Center for Excellence
- Clinical Epidemiology Center

Clinical Engineering Program:

The Clinical Engineering services at VA Connecticut is part of the consolidated Clinical Engineering Program of VISN 1, which allows the Clinical engineering services and resources to be shared amongst the facilities within the network. The Chief of Clinical Engineering at VA Connecticut is responsible for the West Haven CT, Newington CT and Northampton VA Medical Center at Leeds MA. Currently there are 6 Tech. Stationed at the West Haven facility each having their own specialty areas e.g. Radiology, Laboratory, Specialty care units, Cardiology etc. There is one tech stationed at the Newington campus. First and second year students spend 20 hours per week in the Clinical Engineering Department doing reports, presentations, asset management, database management, and inspections of medical equipment. **The vastly diversified areas of the VA Connecticut facilities and it being part of a wide network of VA facilities in the New England region widens the horizon of opportunities to acquire and explore knowledge giving a hands on experience on virtually each aspect of healthcare.**

University of Massachusetts Memorial Medical Center

Clinical Engineering Department, South 4
119 Belmont Street,
Worcester, MA 01605-2982.
Ph: 508 334 6327

General Information:

SIZE 780 beds (large)
LOCATION Worcester, MA (40 miles west of Boston)
PATIENT CARE General, Surgery, Trauma, Teaching

Clinical Engineering Dept. Information:

The Clinical Engineering Department has 21 full-time persons. It is divided into three teams (Memorial, University and Hahnemann campuses, Clinton and Health Alliance Hospitals and other satellites). All medical equipment is supported, including beds, sphygmomanometers, etc. In addition, the department supports the Clinical Laboratories as well as Radiology. The intern has access to all areas of engineering services and the hospital.

Student Information:

Selected interns are considered graduate research assistants at the University of Connecticut; therefore, they receive a stipend and a waiver of tuition. The stipend is provided monthly during the nine month academic year.

Responsibilities:

The student spends 20 hours per week in the Clinical Engineering Department doing electronics work, reading of manuals, repairs, inspections of medical equipment, and special projects for the director. Students gain knowledge of all equipment, as the intern is paired with each engineer and technician for a period of time. All areas of the hospital are available for rotations and welcome interns, and, depending on his or her interests, the intern can determine where and how long to spend on each rotation. The intern also assists the department with special projects, works on management projects including QA activities, customer satisfaction surveys, analysis of service histories, special equipment installations and more in-depth training on a wide range of health care technology.

Time off for personal needs, holidays and vacations can be arranged. Students usually take vacations in accordance with the schedule of classes at the University of Connecticut.

Living Arrangements:

There are no living arrangements at the hospital. Previous intern has lived at Worcester which has colleges close to the hospital. Apartments for rent near the hospital can be found easily.

Veterans Affairs Medical Center

Providence, Rhode Island

Providence VA
Clinical Engineering Department
830 Chalkstone Ave.
Providence, RI 02908
(401) 273-7100
Director of Clinical Engineering: Gil Pina, ext. 2096

General information:

SIZE: 119 beds
LOCATION: Providence, RI
PATIENT CARE: General, Surgery, Teaching

The VA Connecticut Healthcare System is part of VISN1 (VA New England Healthcare System) of the 22 VISN (Veterans Integrated Service Networks) facilities nation wide.

Services:

VA Providence Healthcare System provides specialized services for geriatric rehabilitation and extended care services, hospice and respite care, pharmacy services, dental care, psychological/pastoral counseling, psycho-social support services, podiatry, prosthetics, same day surgery, alcohol and substance abuse treatment and specialized services for diabetics. In summary, VA Providence provides primary, secondary, and tertiary care in medicine, geriatrics, neurology, psychiatry, and surgery with an operating bed capacity of 119. VA Providence encompasses an Inpatient facility and Ambulatory Care Center in Providence; and five primary care Community Based Outpatient Clinics throughout Massachusetts and Rhode Island including Hyannis, New Bedford, Middletown, Martha's Vineyard, and Nantucket.

Clinical Engineering Program: The Clinical Engineering services at VA Providence are part of the consolidated Clinical Engineering Program of VISN 1, which allows the Clinical engineering services and resources to be shared amongst the facilities within the network. Currently there is a Director of Clinical Engineering and 4 BMETs stationed at the Providence facility each having their own specialty areas e.g. Radiology, Laboratory, Specialty care units, Cardiology, etc. First and second year students spend 20 hours per week in the Clinical Engineering Department working with the Director of Clinical Engineering and BMETs doing reports, presentations, asset management, database management, and inspections of medical equipment. Additionally, interns make arrangements to do clinical rotations in their areas of interest. The vastly diversified areas of the VA Providence facilities and its part of a wide network of VA facilities in the New England region widen the horizon of opportunities to acquire and explore knowledge giving a hands-on experience in virtually every aspect of healthcare.

RELATED INFORMATION

What publications will tell me more about clinical engineering?

The following is a short list of the major publications where you can find information on Clinical Engineering. Because the field is growing every day, more information is readily available.

1. *The Journal of Clinical Engineering*
2. *IEEE: Engineering in Medicine & Biology* (IEEE/EMBS)
3. *Biomedical Instrumentation & Technology* (AAMI)

For more information about these publications, contact your local Medical School Library or one of the interns.

What professional organizations will I be eligible to join?

With any profession comes obligations to continue your education and further the development of your profession. Clinical Engineering is no exception. There are a wide variety of organizations that as an intern you are eligible to join. Below is a short list of some of the more important organizations and a number to call to find more out about it.

1. AAMI (Association for the Advancement of Medical Instrumentation); 703-525-4890
2. IEEE EMBS (Institute of Electrical and Electronics Engineers, Engineering in Medicine & Biology); (908) 562-5523
3. ACCE (American College of Clinical Engineers); 610-825-6067
4. ASHE (American Society of Healthcare Engineering, part of American Hospital Association); (312) 422-3800
5. AFSMI (Association for Field Service Management International)
6. NESCE (New England Society of Clinical Engineering); 860-679-2954

The various activities of these organizations will include conferences, meetings, and critical networking to aid you in your professional career as a Clinical Engineer.

What are past interns doing today?

Most of the past interns have positions as Clinical Engineers or Directors of Clinical Engineering. Other interns go into industry and work for companies like Hewlett Packard, Eli Lilly Corp., or Medtronic Corp. Still others enter the service industry and work as a Service Representative for large companies like General Electric or Siemens. Finally, there are students that go on to medical school or pursue a Ph.D in a related field. In essence, the opportunities are tremendous with the internship experience and the degree.

Even though no actual recruiting takes place, most students are able to locate employment prior to graduating in May of their second year.

What has been written about this program?

The following are some articles that you may find useful as you think about this program. If you have difficulties finding them, please do not hesitate to contact one of the interns, as they will be happy to send you a copy.

The entire issue of the May 2004 *EMB Magazine* is devoted to Clinical Engineering.

Bauld TJ. "The Definition of a Clinical Engineer." *Journal of Clinical Engineering* 1991; 16(5):403-405.

Bronzino JD. "Education of Clinical Engineers in the 1990s." *Journal of Clinical Engineering* 1990; 15(3): 185-188.

Pacela AF. "Careers 'Fact Sheets' for Clinical Engineering & Biomedical Technology." *Journal of Clinical Engineering* 1991; 16(5): 407-416.

Finally, for those with a love of statistics and a streak of greed, the *Journal of Clinical Engineering* conducts a yearly survey of the salaries and responsibilities of clinical engineers and biomedical technicians. It is very comprehensive, and is definitely worth looking at.

Checklist

In order to make your transition into the Clinical Engineering Internship easier, the following checklist is provided.

1. Receive notice in mid-April regarding acceptance _____
2. Contact your future director in April and thank him or her _____
3. In mid-July start thinking about Living arrangements _____
4. In August, contact the other interns and introduce yourself _____
5. Put your apartment hunt in high gear if you haven't yet found a place _____
6. Plan on moving to the area (mid to late August) _____
7. Official start date for interns is August 24 _____
8. Contact your director to notify that you are in the area _____
9. Register for classes if you haven't already done so _____
10. Start classes (late August) _____

Remember, this is only a suggested checklist. You are in no way required to adhere to it, though it does provide some important recommendations.