BME 350       FALL 2004

COURSE:        Clinical Engineering Fundamentals

DESCRIPTION:   Fall semester, even years. Three credits. Prerequisite: consent of the instructor. This course is designed to provide the fundamental concepts in managing medical technology, establishing and operating a clinical engineering department and the role of the clinical engineer in designing facilities used in patient care. Topics covered include managing safety programs, technology assessment, technology acquisition, the design of clinical facilities, risk management, personal management, budgeting and ethical issues of concern to the clinical engineer.

TEXTBOOK:      Handouts from current literature

GIVEN BY:      Frank R. Painter, MS, CCE
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CLASS TIME:    Wednesday, 4-7 pm in Koons Hall Room 201, although class will primarily be held in the hospitals involved in the clinical engineering internship program. See the attached schedule for exact locations of each class.

ATTENDANCE:    Attendance in class is mandatory. Missing more than two classes will result in a final letter grade reduction for each additional class missed.

COURSE GRADE:  The following weighting will be used to determine the final grade:
                Homework 15%
                Project 15%
                Quizzes 20%
                Exams (mid-term & final) 50%

Additional coursework in this area:

SPRING 2005:  Engineering Problems in the Hospital BME351
FALL 2005:    Human Error and Medical Device Accidents BME 352
Spring 2006:  Medical Instrumentation in the Hospital BME 356
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<td>Introduction to Clinical Engineering</td>
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<td>11/30 &amp; 12/1 (Tues &amp; Wed)</td>
<td>Philadelphia</td>
<td>Field Trip to ECRI &amp; Drager in Philly and Orbis &amp; Cornell Weil MC in NYC</td>
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<td>12/8/04</td>
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<td>Special Topics / Directors forum / Graduates forum</td>
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Introduction to Clinical Engineering - Week 1

Definition of Clinical Engineering
Terminology
Evolution of the Discipline
Evolution of the Role of Technology in Healthcare
Structure of the Hospital Organization & Where CE Fits
Role of Clinical Engineering in Healthcare Technology
Professional Status of Clinical Engineering
Professional Development
Certification in Clinical Engineering
Professional Organizations
  ACCE, AAMI, IEEE, ASHE, IFMBE, EMBS,
Future of Healthcare Technology
Systems Approach to Managing Healthcare
Potential Employers of Clinical Engineers
Potential Jobs for Clinical Engineers

Technology Management - Week 2

Equipment Control
Scheduled Maintenance
Risk Based Scheduled Maintenance
Outcomes Based Scheduled Maintenance
Unscheduled Maintenance
Documentation
AAMI Technology Management Standard (ANSI EQ 56)
JCAHO Environment of Care Standard for Technology Management
Tracking Cradle to Grave
Electronic tracking
Standardization
Utilization

Technology Assessment - Week 3

New Technologies
Determining Appropriateness
Role of New Technologies in Health Care
Research and Development

Technology Evaluation

Selecting Vendors
Evaluating equipment
Usability Testing
How evaluations fit into the acquisition process

Equipment Acquisition

Acquisition Process - Committee Approach
  RFI, RFQ, RFP, Equipment Specifications
Service Management - Week 4

Sources of Service
- In-house
- 3rd Party (ISO)
- OEM
  Contracts & Time & Materials Service
Customer Service
Record Keeping & Gathering
Service Analysis
Vendor Relations
Productivity & Cost Effectiveness

Codes and Standards / JCAHO Environment of Care - Week 5

History of Standards
Role of Standards in Society
JCAHO – Environment of Care
NFPA
Federal Government
  HHS
  FDA
  OSHA / NIOSH
Administrative Law
Voluntary Standards
Body Having Jurisdiction
ANSI
AAMI
CAP
ISO 9000, 9001, 9002
QI

Safety - Week 6

Electrical Safety
Radiation Safety
Laser Safety
Laboratory Safety
Environmental Safety
  OR / Anesthesia
  Central Supply
  Endoscopy
  MRI
Infection Control – Needle sticks, Universal Precautions
MSDS
Safety Manual

Risk Management - Week 7
Reducing Risk
User Training
Medical Error Issue
Role of Maintenance
Hazards
Policies
Incident Investigation – Expert Witnessing
SMDA – FDA
Medical Devices to Market – FDA 501K
Recalls & Alerts
Role of Insurance – Malpractice, liability, Errors & Omissions

Technology Planning - Week 8
Determining equipment needs
Selecting the right equipment

Facilities Design
Life Safety Codes
National Electric Code
NFPA 99 Code
JCAHO Codes
Universal Building Code (UBC)
Design Considerations
  ICUs
    General Patient Care Areas
    Surgical Suites
    Imaging Suites
    Outpatient Clinics

Computer Systems & Database Management - Week 9
Database Structures
Inventory everything
  Departments – Systems – Components – accessories
Service Events
Parts
System Demo – St Croix Wosyst & BIOTEK Medimiser
Overview of Software used by VA, HH, UCHC, BMC, YNNH
Integrated Test Systems
Internet Based
Performance Analysis Add-ons
Computer Applications in CE Management
Personnel Management - Week 10

Pay for performance
Leadership
Motivators
Job descriptions
  Task based
  Criteria Based
Evaluations
Training
Selection
Recruiting
Career ladders
Professionalism
Pay Scales, Salary Surveys
Relationships, Organizations & Politics

Starting a CE Program: In-house Program & Outside Business - Week 11

In-house Program
Space, Layout
Tools
Plan
Staffing
Workload Planning

Outside Business
Starting a business
Setting up a program
Selling
Delivering
Examples

Financial Management

Budgeting
Costs
Saving Costs ➔ What it means
Starting a CE Business
Re-engineering to improve financial performance
Asset Management business methodology
OEM & ISO Profit requirements
Examples

Field Trip to Philadelphia - Week 13

Visit to ECRI
Equipment Evaluations
Risk Management
Library
Jobs for CE’s @ ECRI

Visit to Thomas Jefferson University Hospital
Tour and explanation of Clinical Engineering activity (inside and outside the hospital)
Tour of Hospital
OR
Field Trip to New York City
stay overnight in Northern New Jersey and
visit Orbis International (eye hospital on a 747 plane), Cornell Univ Med Ctr & Sloan Kettering Memorial Cancer Center and be back in Hartford by 5pm on Wednesday 10/13

Special Topics - Week 14 (a few, but not all of below)
Topics that came up and need special attention
New Issues
Open Discussion
Topics Needing Extra Attention
Presentation by Clinical Engineering Guest Celebrity (e.g. Bob Steifel, Malcolm Ridgeway, Henry Stankiewicz, Dave Harrington, Ray Zambuto, Joe Dyro)
Directors Forum (all the CE directors form a panel and students ask questions)
Graduates Forum (some past Graduates who are practicing CEs form a panel and students ask questions)