

# BioMedical Informatics

A Course For Health Professionals



Marine Biological Laboratory - National Library of Medicine



course overview »

Overview

Schedule

Faculty

Logistics

Application

Archives

Other MBL Courses

## What Is BioMedical Informatics?

**J. Cimino**

*Objectives*

- To provide open discussion among the participants on the definitions and scope of medical informatics
- To identify the component disciplines within the field of biomedical informatics
- To introduce a clinical case summary that will be used throughout the course to show how theoretical and practical aspects of informatics relate to health care

At the conclusion of the session, participants should:

- Have a basic understanding of the components of medical informatics
- Be able to characterize these components as technologies, concepts and skills

## Outline

- I. What is Medical Informatics - An open discussion
- II. Component Disciplines
- III. Concepts, Technologies and Skills
- IV. External Forces
- V. Case Presentation
- VI. Course Overview

## Current Issues in BioMedical Informatics

**D. Lindberg**

*Objectives*

This lecture will discuss some research opportunities in Medical Informatics.

At the completion of the session, participants will:

- be able to accept or challenge this list of research opportunities
- be able to operate and understand ClinicalTrials.gov
- be able to access and evaluate examples of new Interactive Publications

## Outline

1. Research Areas and Challenges in 2005
2. Electronic Health Record
3. Prospective Population Studies
4. Information for the Public: e.g., ClinicalTrials.gov
5. Interactive Publications

## Telemedicine: Today and Tomorrow

**T. Nesbitt**

*Objectives*

- To present the rationale for telemedicine as a means to address disparities in access to health care expertise
- To have the participants gain a general understanding of types of applications of telemedicine, locations where they may be used and technologies appropriate to each
- Briefly review evidence for the effectiveness of telemedicine
- To have the participants appreciate the potential of telemedicine in the future and some of the drivers for its expansion



## **Outline**

1. Introduction
2. Rationale for the use of telecommunications technology in health care delivery to under served populations
3. Telemedicine
  - Definition
  - Locations of use
  - Applications and technologies
4. Evidence for effectiveness
  - Satisfaction data
  - Efficacy
  - Quality of care and perceptions of quality
  - Cost effectiveness
5. The role of telehealth technology in clinical research
6. Future of Telemedicine

## **Bioinformatics**

**J. Mitchell**

*Objectives*

1. Be able to define Bioinformatics.
2. Compare and contrast bioinformatics and clinical informatics.
3. List several types of activities associated with the "OMICS": genomics, proteomics
4. Articulate the differences between microarray expression experiments and genomics.
5. Understand some of the ways in which bioinformatics is impacting electronic medical records.

## **Principles of Controlled Terminology**

**J. Cimino**

*Objectives*

- Describe terminology concepts and characteristics
- Provide examples of coding clinical data
- Examine the state of the art with respect to current standards
- Examine case studies of use and reuse of coded data

At the conclusion of the session, participants should:

- Understand the motivation for coding clinical data
- Understand the "desiderata" for high-quality controlled terminologies
- Be familiar with currently available terminologies

## **Outline**

This pair of lectures is organized into six "threads" that will be woven together concurrently:

- I. Clinical case
- II. Use and reuse of data
- III. Coding clinical data
- IV. Available terminologies
- V. Terminology concepts and desiderata
- VI. Practical considerations

## **Principles of Web Pages**

**C. Dematos**

*Objectives*

## **Outline**

## **Decision Support**

**T. Shortliffe**

## **Human-Computer Interface**

**J. Starren**

*Objectives*

## **Outline**

## **Handheld Computing**

**M. Al-Ubaydli**

*Objectives*

### **Outline**

## **Principles of Database Design**

**J. Cimino**

*Objectives*

- Define "database"
- Review the history of database architectures
- Teach the principles of database normalization
- Identify the basics for object-oriented database design
- Reinforce principles with a design exercise.

At the conclusion of the session, participants should:

- Understand the evolution of modern database architecture
- Understand some of the principles behind choices to be made when designing a database
- Have a basic understanding of database normalization

### **Outline**

- I. Definition
- II. History of Database Architectures
- III. Database Normalization
- IV. Object-Oriented Table Design
- V. Exercise: Database for Medline Records
- VI. Exercise: Clinical Database

## **Consumer Health Informatics**

**Alexa T. McCray, Ph.D.**

*Objectives*

This session will consider issues in consumer health informatics with a special focus on health literacy. The role of information technology in addressing the needs of consumers will be discussed. Students will develop a working list of potential informatics interventions in their own institutional settings. At the conclusion of the session, participants should:

- Have an understanding of issues in consumer health informatics
- Have gained insight into the problems of health literacy
- Have an understanding of the role of information technology in consumer health

## **Public Health Informatics**

**R. Kukafka**

*Educational Objectives*

### **Session Outline**

## **PubMed and the NLM Gateway**

**Kathi Canese**

*Educational Objectives*

This lecture and lab session will focus on NLM's PubMed. Searching techniques will be presented as well as a review of recent enhancements. New NCBI databases and the NLM Gateway will also be discussed. Students will be provided with hands-on lab time.

### **Session Outline**

- NCBI Resources
- NCBI Databases
- PubMed Overview
- My NCBI Features
- NLM Gateway
- Hands On Lab Time

## **Introduction to Personal Databases**

**D. Remsen**

*Objectives*

### **Outline**

## **Bioinformatics**

**N. Sarkar**

*Educational Objectives:*

- Define Bioinformatics within the context of Clinical Informatics;
- Understand the importance of biological information within the context of clinical data;
- Compare and contrast bioinformatics and clinical informatics;
- Grasp the range of biological data, from molecules to populations; and,
- Contemplate the requirements of Electronic Health Records that can accommodate biological data.

### **Outline:**

1. What is bioinformatics, and how it relates to the clinical realm
2. Why biological data matters to the clinician
3. What types of biological data are available, and how are they available?
4. How can bioinformatics be used to achieve clinical information needs?
5. Reality Check; The grand scheme of things-- use cases from biology from molecules to populations
6. Where do we go from here?

## **Human Computer Interaction**

**J. Starren**

The lecture will provide an overview of HCI issues in Biomedical Informatics including historical perspectives, theoretical foundations and practical strategies.

*Educational Objectives:*

At the completion of the session students should be able to:

- Describe instances where HCI affected patient care
- List at least three practical heuristics for designing good user interfaces
- Describe the intrinsic tradeoffs in choosing user interface features
- List two common pitfalls in evaluations of user interfaces in  
biomedicine.

## **Picking an Enterprise Target**

**W. Stead**

This lecture explores how to align enterprise and information technology strategies.

*Educational Objectives:*

- Learn four questions to ask to align enterprise and IT strategies
- Appreciate that IT can provide value to an enterprise in many ways, each with distinct costs and benefits
- Recognize trends in technology and informatics that are changing the art of the possible
- Appreciate the discontinuous nature of change in work process required to benefit from IT

### **Session outline:**

1. Framework to guide thinking about alignment of enterprise and IT strategies.
2. Picking the purpose of IT in your business
3. Key trends in IT and informatics
4. One vision of how ready access to information might change health care in the near term
5. Status check

## **E3/E5: Lesons Learned Regarding Change Management, Disease Management, and Patient Engagement**

**J. Jirjis**

*Objectives*

### **Outline**

### **Vendor-Enterprise Roles**

**W. Stead**

This lecture explores how to implement information technology infrastructure to provide ready access to information in clinical workflow.

*Educational Objectives:*

- Appreciate that the fragmented nature of the health care information technology industry is a barrier to optimal clinical information access
- Appreciate how an architectural strategy of managing information separately from information systems might overcome the problems caused by this fragmentation.
- Distinguish between what may be purchased from a vendor and what must be provided by the enterprise

### **Session outline:**

1. Health care information technology industry profile
2. An architectural approach to managing information as a corporate asset
3. Enterprise-vendor responsibilities
4. Case studies of system integration.

## **Developing and Inserting Clinical Decision Support and Documentation Applications into Clinical Environments**

**T. Rosenbloom**

*Objectives*

### **Outline**

### **Building Web Interfaces to Databases**

**D. Remsen**

*Objectives*

### **Outline**

### **Evaluation**

**C. Friedman**

*Objectives*

### **Outline**

### **The Informatics of Clinical Research**

**D. Masys**

*Objectives*

This session provides an overview of the information science and technology requirements for conducting high quality clinical research. At the completion of the session, participants will:

- Understand the regulatory context for research data management approaches
- Be aware of specialized information technologies that are useful for clinical research
- Understand basic principles of information security as applied to research data
- Have access to curriculum materials for teaching this topic to healthcare professionals

### **Outline**

1. Importance of information management methods for clinical research
2. Federal regulations: Good Clinical Practice standards and 21 CFR 11 guidance on electronic systems
3. Rational forms design
4. Specialized data acquisition technologies

5. Data archiving: database design principles
6. Using the Internet to conduct multi-center studies
7. Data Security: requirements of the HIPAA Security Rule
8. Availability of curriculum materials for this topic

## **Decision Support**

### **E. Shortliffe**

#### **Objectives**

- Introduce or reinforce probabilistic concepts such as sensitivity, specificity, and predictive value
- Provide a clinically relevant example of how confusion about text characteristics can lead to waste and unnecessary risks for patients
- Introduce decision analysis as a useful extension to probabilistic reasoning principles
- Relate methods and concepts to the effective construction of computer-based tools to assist with clinical decision making

At the conclusion of the session, participants should:

1. Understand basic probabilistic concepts and their relevance to test interpretation and clinical decision making
2. Understand how failure to understand such concepts by clinicians has led to errors and misallocation of resources
3. Appreciate the core theories and principles that underlie the creation of computer-based clinical decision support systems

## **Public Health Informatics**

### **J. Loonsk**

#### *Objectives*

- To understand the principle public health functions and issues as well as related informatics activities
- To understand public health emergency response needs
- To understand the relationship between clinical care, clinical informatics and public health informatics

## **The Internet: Reflections on What's Coming**

**Lawrence C. Kingsland, III, Ph.D.**

#### *Educational Objectives*

This lecture discusses several aspects of upcoming technologies that are having and will have an impact on the way we view and use the Internet. At the completion of the session, participants will:

- Have received an introduction to the elements that underpin the Internet
- Be introduced to protocols present and emerging
- Receive a quick tour of the 802.xx wireless stew
- Be aware of some truly fascinating new technologies on the way
- Receive links to useful sites tracking developments in these fields

#### **Session Outline**

- The Internet is ...
- Protocols, addresses, names, oh my
- Routing
- Virtual Private Networks (VPNs)
- Quality of Service (QoS)
- Unlimited bandwidth
- Digital spread spectrum
- Bluetooth
- 802.egad
- New tech
- Ubiquity
- Dissemination