Course Description
Telemedicine and Imaging Informatics
(Subtitle: Introduction to Mobile Medicine and Internet of things in Medicine)

SYLLABUS

Instructor:

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Office Hours:
9:00am – 3:00pm Tuesday/Thursday
1:00pm - 5:00pm Monday/Wednesday

Prerequisites by Topic:
1. Integral Calculus
2. basic mathematics
3. physics
4. Familiarity with MATLAB

Textbooks:

"Hand book of Telemedicine"
Author: Olga (EDT) Ferrer – Roca, M.Sosa (EDT) Iudicissa
Publisher: IOS press 2002

"Essentials of Telemedicine and Telecare"
Author: A.C. Norris,
Publisher: John Sons & Ltd, 2002

"E-Health, Telehealth and Telemedicine : Guide to Startup and Success"
Author: Marlene Maheu
Publisher: John Wiley & Sons, Inc.
ISBN10: 0787959030, ISBN13: 9780787959036

"Telemedicine in Hospitals: Issues in Implementation (Health Care Policy in the United States)"
[Hardcover]
Author: Sherry Emery
Ships from and sold by **Amazon.com**. Gift-wrap available.

"Telehealth in the Developing World"
Richard Wooton (Author), Nivritti G. Patil (Author), Richard E. Scott (Author), Kendall Ho (Author)
Ships from and sold by **Amazon.com**. Gift-wrap available.

Course Outline:

Projects:
Students will be leading to design and implement the following two projects:

Project 1: *(as a choice of Midterm Exam)*
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Remote ECG, EEG or EMG Monitoring
Mobile Phone and Internet based ECG Solution for monitoring cardiac patients
iPad, iPhone get remote monitoring application to ECG EEG EMG,….
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Project 2: *(as a choice of Final Exam)*
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Design of Mobile Phone (such as iPhone, iPad) medical imaging display for lung  or
breast cancer diagnosis
        But, iPads are treated as communication aids, helping doctors and patients look
at images together, the ease of doing so needs to be balanced against the risk of
starting to treat the device as a diagnostic tool.

Our work is how to design and explore iPhone, iPad function to being a diagnostic tool,
using our computer aided algorithms to improve the situation.

Actually, the iPad screens had the same resolution as the desktop screens: 130 dots per
inch (dpi), but it is mobile,....
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Course Contents:

Telemedicine is a rapidly developing application of clinical medicine where medical information is transferred through interactive audiovisual media for the purpose of consulting, and sometimes remote medical procedures or examinations. Dermatology, radiology, and pathology are common specialties that are conducive to asynchronous telemedicine. Radiology in Telemedicine, called Teleradiology, is the most popular use for telemedicine and accounts for at least 50% of all telemedicine usage. Teleradiology is the ability to send radiographic images (x-rays, CT, MR, PET[5]/CT, SPECT/CT, MG, US...) from one location to another.

Telemedicine for low resource settings can be broken into three main categories: **store-and-forward**, **remote monitoring** and **interactive services**.

Store-and-forward telemedicine involves acquiring medical data (like medical images, biosignals etc) and then transmitting this data to a doctor or medical specialist at a convenient time for assessment offline. It does not require the presence of both parties at the same time. . A properly structured Medical Record preferably in electronic form should be a component of this transfer. A key difference between traditional in-person patient meetings and telemedicine encounters is the omission of an actual physical examination and history. The store-and-forward process requires the clinician to rely on a history report and audio/video information in lieu of a physical examination.

Remote monitoring, also known as self-monitoring or testing, enables medical professionals to monitor a patient remotely using various technological devices. This method is primarily used for managing chronic diseases or specific conditions, such as heart disease, diabetes mellitus, or asthma. These services can provide comparable health outcomes to traditional in-person patient encounters, supply greater satisfaction to patients, and may be cost-effective.

Interactive telemedicine services provide real-time interactions between patient and provider, to include phone conversations, online communication and home visits. Many activities such as history

review, physical examination, psychiatric evaluations and ophthalmology assessments can be conducted comparably to those done in traditional face-to-face visits. In addition, "clinician-interactive" telemedicine services may be less costly than in-person clinical visits.
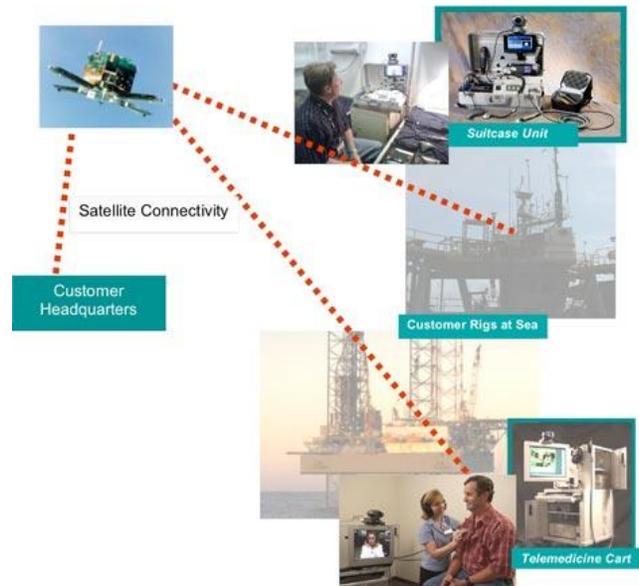
Course Objectives

1. Execute formal training in areas of technology applied to healthcare including computer sciences and telecommunication technologies to facilitate the deployment of telemedicine.
2. Understand the basic requirements for the delivery of telemedicine services.
3. Differentiate and apply telemedicine technologies and practices in a variety of health care environments.
4. Be aware of basic knowledge of the Telemedicine Standards.
5. The course will also be committed as a public awareness tool to promote and advocate the use of advanced communication technology to expand health care outreach and overcome geographic barriers to deliver patient care and education.

Topics Covered:

I. Healthcare Delivery in Low Resource Settings by using Advanced Technologies

1. Healthcare in high- and low-resource settings.
2. Healthcare distributions in Low resource settings and corresponding problems.
3. Definition of telemedicine for low-resource settings.
4. Block diagram of telemedicine system in low-resource settings.
5. Telehealth, Telecare, Teleradiology, Teleoncology, Telesurgery Telecatriology scope, Benefits.
6. Potential and limitations of Telemedicine and Tele-Health in low resource settings
7. Basic structures of Telemedicine and Tele-Health in low resource settings
8. Practical Examples of Telemedicine development in low resource settings:

   o Teleconferencing
   o Teleconsultation

o Telemonitoring
o Telelearning
o Telerobotics

9. Legal and ethical issues in Low resource settings:

o Definition of Confidentiality
o Definition of Patient privacy
o Understanding of Ethical and Legal Considerations
o Data security
o Data transmission
o Understanding of the need for data and information security
o Key Functions of Security implementation
o Description and elaboration on the concept of accountability
o Achieving a technical implementation of security – PKI
o Legal frameworks: example the HIPAA framework in the United States

II. Introduction of Telemedicine

1. Why use Telemedicine?
2. History
3. Terminology
4. Types of Telemedicine Systems
5. Examples of Telemedicine in Clinical Practice
6. Values to the Patient, Clinician, and Health Care Organization
7. Challenges to Successful Implementation
8. Internet in Medicine

III. Clinical

Focuses on the application of telemedicine for patient care in a clinical setting.

1. Services provided through telemedicine
   o Routine and Follow up examinations
   o Urgent or Emergent Care
   o Clinical Research
   o Administrative Meetings
   o Clinical Support Services
   o Medical Education
   o Disaster Preparedness and Response
2. Medical images
   o Capture
   o Manipulation /Compression
   o Storage
   o Retrieval
3. Electronic Medical Records

IV. Technical

Focuses on the planning, construction, development and deployment of telemedicine technology systems.

1. Site Selection and Planning
2. Telemedicine Systems
3. Connectivity Options
4. Bandwidth Limitations
5. Asynchronous vs. Real-time Interactive
6. Data applications
7. The World Wide Web
8. Technical requirements of the Communications and Information Society:
   - Audio
   - Data
   - Images
   - Video
   - Networks
   - Telecommunications
   - Processing
   - Displays
   - Storage
   - Wireless Devices
9. Imaging big data and big data analytics
10. Health big data and big data analytics
11. Mobile medicine and Internet of things in Medicine
12. Health informatics in a global perspective
13. Data – information – knowledge
14. Computers, databases and telecommunication
15. Radiology information systems, Radiology, MRI, Ultrasound,...
16. Medical Imaging and Multi-imaging Modalities
17. Imaging Informatics across all scales from organ level, cellular and molecular image processing and transmission.

V. Administrative

1. Human Resources
2. Organizational Structure
3. Scheduling
4. Health care administration
   - Training
   - Medical records management
   - Liability
   - Legal aspects
   - Quality of Service
   - Health economics: Cost-benefits, strategic planning
   - Sustainability and Funding
5. Clinical Acceptance
6. Public Awareness, Government officials, Community leaders
7. Patient Satisfaction

VI. Standards in Telemedicine

1. Requirement
   2. Application prerequisites
   3. Study
   4. Implementation

VII. Hands-On Training

   1. Practical training with telemedicine equipment required for potential TM sites: computers, cameras, video cameras, videoconferencing units, peripherals, etc.
   2. Observation of clinical telemedicine in practice
   3. Emphasis on equipment use and application

Grading & Evaluation

The course grade will be determined by paper writing assignment (30%), proposal writing assignment (40%), and Presentation assignment (30%).

Computer Usage: Students will use MATLAB in all calculations, verification of results, and plotting.

Prepared by: Wei Qian, Professor ECE, Spring 2010

Academic Integrity

The University of Texas at El Paso prides itself on its standards of academic excellence. In all matters of intellectual pursuit, UTEP faculty and students must strive to achieve based on the quality of the worked produced by the individual. In the classroom and in all other academic activities, students are expected to uphold the highest standards of academic integrity. Any form of scholastic dishonesty is an affront to the pursuit of knowledge and jeopardizes the quality of the degree awarded to all graduates of UTEP. Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. Proven violations of the detailed regulations, as printed in the Handbook of Operating Procedures (HOP) and available in the office of the Dean of Students, may result in sanctions ranging from disciplinary probation, to failing grades on the work in question, to failing grades in the course, to suspension or dismissal, among others.

Students with Disabilities

If you believe you may have a disability that requires accommodations, contact the Disabled Student Services Office at 747-5148, go to room 306 E. Union, or email: dss@utep.edu.

Student Responsibility

Individual students must operate with integrity in their dealings with faculty and other students; engage the learning materials with appropriate attention and dedication; maintain their engagement when challenged by difficult learning activities; contribute to the learning of others; and perform to standards set by the faculty

Policies & Procedures

1. The instructor reserves the right to change the class schedule as needed during the semester.
2. All students are expected to arrive in class prepared, i.e., assigned readings completed and homework ready to turn in for grading.
3. If there is a problem taking an exam at the assigned time, students MUST contact the instructor PRIOR to the day of the exam or NO make-up test will be allowed and the student will receive a zero for the missed exam.
4. NO projects and/or homework will be accepted after the due date and time.
5. Project and/or homework material left with the instructor at the end of the semester will be retained only four (4) weeks into the next semester, after which they will be destroyed.
6. There will be no make-ups for missed quizzes.
7. Cell phones, beepers and other electronic devices must be turned off during class.
8. Please see attached sheet on UTEP policy on academic dishonesty.

Grading & Evaluation

The course grade will be determined by Homework assignment (30%), Midterm Exam (30%), and Final (40%).

ATTENDANCE

You are expected to attend classes regularly and on time. You take full responsibility when you miss class or come to class late. If you miss class, it is your responsibility to find out about new assignments/exercises and pick up missed handouts.

EXAMINATION POLICIES:

The midterm and final exams will be essay and short answer. Both exams will be closed book, open notes, and you are required to do your own work on the exams. University policy states that missed exams receive a grade of 0. If you miss the midterm exam, the weight of the mid-term exam will be placed on the final. If you miss the final exam, you will receive a 0.