Medical Informatics

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http://www.yildiz.edu.tr/~naydin

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Course Details

- Course Code: BME 448
- Course Name: Medical Informatics (Tıbbi Bilişim)
- Credit: 3
- Nature of the course: Lecture
- Course web page:
  http://www.yildiz.edu.tr/~naydin/na_MeI.htm
- Instructors: Nizamettin AYDIN

  Email: naydin@yildiz.edu.tr

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Assesment

- Quiz : 10%
- Midterm : 25%
- Homework : 20%
- Final : 40%
- Attendance & participation : 05%

(The requirement for attendance is 70%)

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Rules of the Conduct

- No eating /drinking in class
  - *except water*
- Cell phones must be kept outside of class or switched-off during class
  - *If your cell-phone rings during class or you use it in any way, you will be asked to leave and counted as unexcused absent.*
- No web surfing and/or unrelated use of computers,
  - when computers are used in class or lab.

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Rules of the Conduct

- You are responsible for checking the class web page often for announcements.
  - http://www.yildiz.edu.tr/~naydin/na_ MeI.htm
- Academic dishonesty and cheating
  - will not be tolerated
  - will be dealt with according to university rules and regulations
    - http://www.yok.gov.tr/content/view/475/
    - Presenting any work that does not belong to you is also considered academic dishonesty.

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Attendance Policy

- The requirement for attendance is **70%**
  - **Hospital reports** are **not** accepted to fulfill the requirement for attendance.
  - **The students, who fail to fulfill the attendance requirement, will be excluded from the final exams and the grade of F0 will be given.**

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Scope of Medical Informatics

- Medical Data
  - Their Acquisition, Storage, and Use
- Electronic Health Records
- Integrated Practice Management Systems
- Health Information Technology Interoperability
- Networks
- Patient Informatics
- Online Medical Resources

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Scope of Medical Informatics

- Search Engines
- Mobile Technology
- Evidence Based Medicine
- Clinical Practice Guidelines
- Disease Management and Disease Registries
- Patient Safety and Technology
- Electronic Prescribing
- Telehealth and Telemedicine

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Scope of Medical Informatics

- Picture Archiving and Communication Systems (PACS)
- Bioinformatics
- Public Health Informatics
- E-Research
- Emerging Trends in Health Information Technology

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Scope of Medical Informatics

- Medical Decision-Making
- Medical Computing
- System Design and Engineering
- Standards in Medical Informatics
- Ethics and Health Informatics
- Computer-Based Patient-Record Systems
- Management of Information

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Scope of Medical Informatics

- Public Health and Consumer Uses of Health Information
- Patient-Care Systems
- Patient-Monitoring Systems
- Imaging Systems
- Information-Retrieval Systems
- Clinical Decision-Support Systems
- Computers in Medical Education

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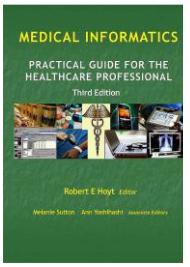
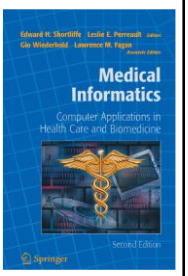
Recommended Texts





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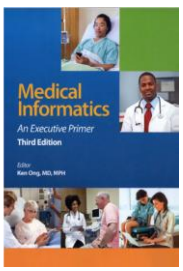
Recommended Texts - 2



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Recommended Texts - 3

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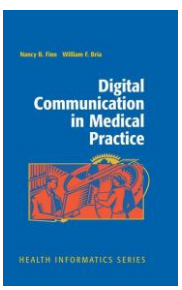
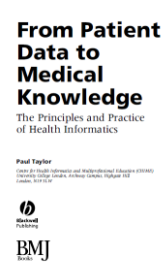
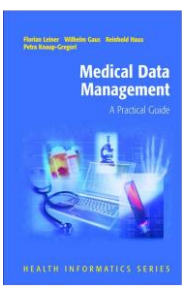
Recommended Texts - 4







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Medical Informatics

- the study and application of methods to improve
  - the management of patient data,
  - clinical knowledge,
  - population data,
  - their information relevant to patient care and community health
- multidisciplinary science, which interacts with
  - the clinical sciences,
  - the public health sciences
  - cognitive, computing, and information sciences.

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Healthcare Informatics

- combines the fields of information technology and health to develop the systems required to
  - administer the expansion of information,
  - advance clinical work flow,
  - improve the security of the healthcare system.
- involves the integration of
  - information science, computer technology, and medicine

  to collect, organize, and secure information systems and health–related data.

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Healthcare Informatics

- utilizes
  - computer hardware, specialized software, and communication devices

  to form complex computer networks to
  - collect, analyze, and transmit medical processes.
- Health information systems should allow for
  - the assimilation of clinical directives,
  - understanding of formal medical jargon,
  - storage of data,
  - transmission of clear communication.

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Healthcare Informatics

- Medical informatics can be applied in all types of health environments, including
  - primary care,
  - general practice,
  - hospital care,
  - rehabilitation.
- It is also inclusive of many of the specialties within the healthcare field.

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Healthcare Informatics

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Biomedical Informatics

- the scientific field that deals with biomedical information, data, and knowledge
  - their storage, retrieval, and optimal use for problem solving and decision making.
- concerned with the broad range of issues in the management and use of biomedical information,
  - including biomedical computing and the study and nature of biomedical information itself

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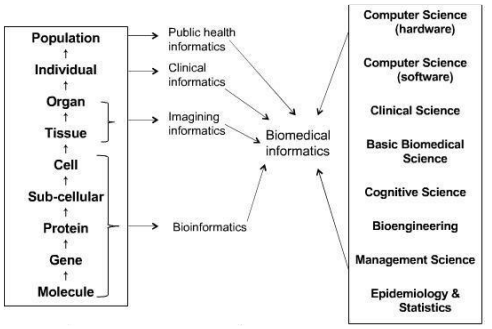
Biomedical Informatics



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Biomedical Informatics

- Some examples of a biomedical informatics application :
  - Reducing diagnostic uncertainties and improving clinical decision-making by using computing techniques and information technologies.
  - Utilizing computational approaches and modern computer-based techniques in drug design, molecular genetics and cellular genetics to solve complex clinical problems.
  - Designing large databases of digitized medical images for use in medical decision-making, teleradiology, or teleconsultation.

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Public Health Informatics

- deals with the problems drawn from the domain of public health.
  - population- and society-focused.
- Examples include:
  - National Notifiable Disease Surveillance System
  - The National Electronic Telecommunications System for Surveillance (NETSS)
  - Immunization registries
  - Immunization information systems
  - Homeland Security
  - Bioterrorism

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Clinical Informatics

- the application of biomedical informatics in the patient care domain.
  - a combination of computer science, information science, and clinical science designed to assist in the management and processing of clinical data, information, and knowledge to support clinical practice.
  - individual (patient-oriented) focused.
- An example of clinical informatics applications would be the electronic medical record.

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Imaging Informatics

- concerned with the common issues that arise in all image modalities, relating to the acquisition of image in, or conversion to, digital form, and the analysis, manipulation, and use of those images once they are in digital form.
  - tissues- and organs-focused.
- An example of imaging informatics applications is a CT scanner, which uses software algorithms to recreate a three-dimensional image of the body parts.

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Imaging Informatics

- Another example is *Picture Archiving and Communication Systems* (PACS) which are a combination of hardware and software dedicated to the short- and long-term storage, retrieval, management, distribution, and presentation of images.

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Bioinformatics

- an interdisciplinary field that develops
  - methods and software tools for understanding biological data
- combines
  - computer science,
  - statistics,
  - mathematics,
  - engineering

  to analyze and interpret biological data

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Bioinformatics

- has been used for in silico analyses of biological queries using mathematical and statistical techniques.
  - [In silico (Latin for "in silicon") is an expression used to mean "performed on computer or via computer simulation.]
- primary goal is to increase the understanding of biological processes.
- focuses on developing and applying computationally intensive techniques to achieve this goal.

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Bioinformatics

- Techniques used include
  - pattern recognition, data mining, machine learning algorithms, and visualization
- Analyzing biological data to produce meaningful information involves writing and running software programs that use algorithms from
  - graph theory, artificial intelligence, soft computing, data mining, signal processing, image processing, and computer simulation.

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Bioinformatics

- The algorithms in turn depend on theoretical foundations such as
  - discrete mathematics
  - control theory
  - system theory
  - information theory
  - statistics

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The component sciences that biomedical informatics draws on and contributes to

- Computer science
  - the study of computation and computer technology, hardware, and software.
- Clinical science
  - the practical study of medical principles or investigations using controlled procedures to evaluate results.
- Biomedical science
  - the application of information technology to the fields of biomedical research and health care.

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The component sciences that biomedical informatics draws on and contributes to

- Cognitive science
  - The study of the nature of various mental tasks and the processes that enable them to be performed.
- Bioengineering
  - The application of engineering principles to the fields of biology and medicine, as in the development of aids or replacements for defective or missing body organ.

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The component sciences that biomedical informatics draws on and contributes to

- Management science
  - school of management emphasizing the use of mathematics and statistics as an aid in resolving production and operations problems.
- Epidemiology & Statistics
  - the branch of medical science dealing with the transmission and control of disease and the mathematics of the collection, organization, and interpretation of numerical data, especially the analysis of population characteristics by inference from sampling.

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Bioengineering

- It advances fundamental concepts;
  - creates knowledge from the molecular to the organ systems levels;
  - develops innovative biologics, materials, processes, implants, devices, and informatics approaches

  for the
  - prevention,
  - diagnosis, and
  - treatment of disease,

  for patient rehabilitation, and for improving health

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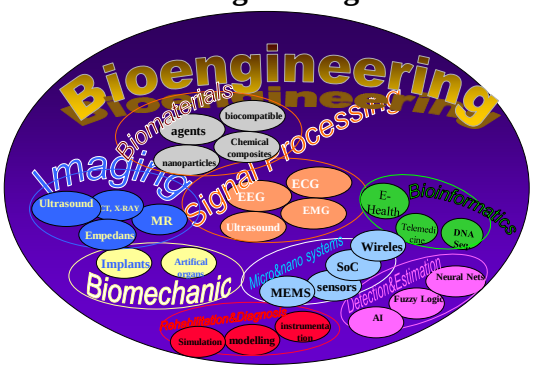
Bioengineering



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