

H.U. INSTITUTE OF HEALTH SCIENCES
COURSE SYLLABUS

PROGRAM NAME			BIOSTATISTICS		
CODE	BIS 761	TITLE	Introduction to Bioinformatics		
LECTURER(S)			Prof.Dr.Ergun Karaağaoğlu Prof.Dr.Hakan S. Orer Prof.Dr.Nuhan Puralı Prof.Dr.Ediz Demirpençe Prof.Dr.Hayat Erdem Prof.Dr.Nurten Akarsu Doç.Dr.Erdem Karabulut		
TYPE	<input type="checkbox"/> COMPULSORY <input checked="" type="checkbox"/> SELECTIVE	LANGUAGE	<input checked="" type="checkbox"/> TURKISH <input type="checkbox"/> ENGLISH	LEVEL	<input checked="" type="checkbox"/> MASTER OF SCI. <input type="checkbox"/> DOCTORATE <input type="checkbox"/> PREREQ. PREP.

THEORETICAL (HRS/WK)	2	PRACTICAL (HRS/WK)	2	H.U. CREDIT	3	ECTS CREDIT	7
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WHAT IS THE IMPORTANCE OF THIS COURSE IN THE PROGRAM'S LEARNING OBJECTIVES?	
PRE-REQUISITE(S)	-
COURSE OBJECTIVES	This is an introductory course for the students who wish to become an expert in bioinformatics. The content of this course is designed so that students from different disciplines will be harmonized and form a basis for further courses. Students will learn some basic concepts of information, ways of measuring information, basic biological concepts and statistical analysis techniques. The concept of information and use of information theory in biological and medical sciences, coding and transmitting information in perception systems, the concept of phenomics, genomics, proteomics and metabolomics and pharmacogenetic techniques which are frequently used methods in bioinformatic researches in recent years will be taught. For all course topics, real life data will be used for practices and students will learn to use proper statistical techniques during these practices.
LEARNING OUTCOMES AND ACQUIRED COMPETENCES	Students first will learn what is included within bioinformatics, which is an intersection of many disciplines. They will learn how to measure information, be able to apply these concepts in biological sciences. They will gain knowledge on the components, structure and functions of the cell which is the structural unit of living things. Students will also learn genetic information flow in prokaryotic and eukaryotic cells, types of RNA, transcription, basic mechanisms which are effective in gene expression and control and gene expression analysis techniques. They will learn structure-function relationship and its role in the metabolic regulation in proteins, how to use these

	<p>information when defining an illness by the help of bioinformatic methods. They will also learn the importance of pharmacogenetic approaches in bioinformatic researches. They will have a detailed knowledge on R and Matlab and their use in bioinformatics. They also will gain an insight on data mining and machine learning techniques which will be useful in statistical analysis.</p>																														
COURSE CONTENT	<p>Interdisciplinary Science Field: Bioinformatics – Information and Evaluation of Information, Basic Terminology of Bioinformatics, Basic Information of Cell and Biomolecules, Phenomics, Genomics - Its Technologies, Fenomics-Genomics- Discussion, Transcriptomics and Its Technology, Proteomics, Metabolomics, Applications of Proteomics and Metabolomics , Pharmacogenetics, Usage of Bioconductor, “R” and MATLAB in Bioinformatics Researches, Data Mining and Machine Learning Methods in Bioinformatics Researches</p>																														
COURSE SCHEDULE	<table border="1"> <tr> <td>Week 1</td> <td>Interdisciplinary Science Field: Bioinformatics – Information and Evaluation of Information</td> </tr> <tr> <td>Week 2</td> <td>Basic Terminology of Bioinformatics, Basic Information of Cell and Biomolecules</td> </tr> <tr> <td>Week 3</td> <td>Phenomics</td> </tr> <tr> <td>Week 4</td> <td>Genomics - Its Technology-1</td> </tr> <tr> <td>Week 5</td> <td>Genomics - Its Technology-2</td> </tr> <tr> <td>Week 6</td> <td>Fenomics-Genomics- Discussion</td> </tr> <tr> <td>Week 7</td> <td>Transcriptomics and Its Technology-1</td> </tr> <tr> <td>Week 8</td> <td>Transcriptomics and Its Technology-2</td> </tr> <tr> <td>Week 9</td> <td>Proteomics</td> </tr> <tr> <td>Week 10</td> <td>Metabolomics</td> </tr> <tr> <td>Week 11</td> <td>Applications of Proteomics and Metabolomics</td> </tr> <tr> <td>Week 12</td> <td>Pharmacogenetics</td> </tr> <tr> <td>Week 13</td> <td>Usage of Bioconductor, “R” and MATLAB in Bioinformatics Researches</td> </tr> <tr> <td>Week 14</td> <td>Data Mining and Machine Learning Methods in Bioinformatics Researches-1</td> </tr> <tr> <td>Week 15</td> <td>Data Mining and Machine Learning Methods in Bioinformatics Researches-2</td> </tr> </table>	Week 1	Interdisciplinary Science Field: Bioinformatics – Information and Evaluation of Information	Week 2	Basic Terminology of Bioinformatics, Basic Information of Cell and Biomolecules	Week 3	Phenomics	Week 4	Genomics - Its Technology-1	Week 5	Genomics - Its Technology-2	Week 6	Fenomics-Genomics- Discussion	Week 7	Transcriptomics and Its Technology-1	Week 8	Transcriptomics and Its Technology-2	Week 9	Proteomics	Week 10	Metabolomics	Week 11	Applications of Proteomics and Metabolomics	Week 12	Pharmacogenetics	Week 13	Usage of Bioconductor, “R” and MATLAB in Bioinformatics Researches	Week 14	Data Mining and Machine Learning Methods in Bioinformatics Researches-1	Week 15	Data Mining and Machine Learning Methods in Bioinformatics Researches-2
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SUGGESTED COURSE MATERIAL	<ol style="list-style-type: none"> 1. P.M. Selzer , R.J. Marhöfer , A. Rohwer ,2008, Applied Bioinformatics : An Introduction Springer-Verlag Berlin Heidelberg 2. David Posada,Editor, 2009, Bioinformatics for DNA Sequence Analysis Humana Press, a part of Springer Science+Business Media, LLC 3. Zoc Lacroix and Terence Critchlow, Editor, 2003, Bioinformatics: Managing Scientific Data, Elsevier Science (USA) 4. Rune Matthiesen, 2010, Bioinformatics Methods in Clinical Research, Humana Press, A part of Springer Science+Business Media, LLC 5. Andreas D. Baxevanis , B. F. Francis Ouellette, 2001, BIOINFORMATICS A Practical Guide to the 																														

	<p>Analysis of Genes and Proteins, John Wiley & Sons, Inc.</p> <p>6. Kal Renganathan Sharma, 2009, Bioinformatics Sequence Alignment and Markov Models The McGraw-Hill Companies, Inc.</p> <p>7. Cynthia Gibas, Per Jambeck, Developing Bioinformatics Computer Skills 2001, O'Reilly & Associates, Inc</p> <p>8. Alexander Isaev, 2006, Introduction to Mathematical Methods in Bioinformatics, Springer-Verlag Berlin Heidelberg</p> <p>9. Andrew R. Jones, Simon J. Hubbard: Editors, 2010, Proteome Bioinformatics, Springer Science+Business Media, LLC</p> <p>10. Warren Ewens Gregory Grant, 2005, Statistical Methods in Bioinformatics: An Introduction Springer Science+Business Media, Inc.</p> <p>11. Nelson DL, Cox MM (editors), 2005, Lehninger Principles of Biochemistry 4th edition, WH Freeman and Company, New York.</p> <p>12. Paul Davies ve Niels Gregersen, 2010, Information and the nature of reality: Cambridge University Press.</p> <p>13. Fred Reike, David Warland, 1997, Spikes: Exploring the neural code. The MIT press.</p> <p>14 Jose Luis Bermudez. Cognitive Science, 2010, Cambridge University Press.</p> <p>15. Marketa J.Zvelebil, Jeremy O. Baum (2008), Understanding bioinformatics, Garland Science</p>
<p>TEACHING METHODS</p>	<p>The course is instructed by the responsible instructor's input, applications on Bioconductor, PLINK, Matlab and R programs and discussions on the work handed by the students. Students are provided with the latest developments by discussing the methods which appear in the current publications. The student will be able to find solutions to different problems by using up-to date methods.</p>
<p>ASSESSMENT METHODS</p>	<p>Participating the discussions during the course (% 10), Interval Work (40 %), General Exam-Report (50 %)</p>