Name of activity	The role of Chemical Engineering in the development and evolution of Biomedical Technology
Number of working hours	1h
Type of activity	Lecture
Lecturer	Professor Vasilios Zaspalis (Aristotle University of Thessaloniki)
Short summary of content	In this presentation the role of Chemical Engineering as a science that lies on the basis of many Biomedical applications will be outlined with some case examples. Subsequently some research results will be presented from a certain topic dealing with the development of functionalized magnetic materials for medical diagnostic or therapeutic applications.
Bibliography	No Bibliography needed
Expected effect	The students will realize the interdisciplinary character of medical biotechnology as a field into which many traditional scientific disciplines converge.

Name of activity	Basic principles in Biomedical Engineering
Number of working hours	2h
Type of activity	Lecture
Lecturer	Professor Amalia Aggeli (Aristotle University of Thessaloniki)
Short summary of content	Basic principles of Biomedical Engineering, impact, overview of products, perspectives & challenges
Bibliography	Biomedical Engineering: Bridging Medicine and Technology (Cambridge Texts in Biomedical Engineering) 2nd Edition, W. Mark Salzman, Cambridge University Press Publishers, 2015
Expected effect	The attendees will gain an overview of the field of Biomedical Engineering

Name of activity	Regenerative Medicine & Tissue Engineering
Number of working hours	2h
Type of activity	Lecture
Lecturer	Professor Amalia Aggeli (Aristotle University of Thessaloniki)
Short summary of content	Introduction to Regenerative Medicine & Tissue Engineering, cells & tissues, stem cell technology, tissue engineering: theory & applications.
Bibliography	Tissue Regeneration - From Basic Biology to Clinical Application, Edited Jamie Davies (Editor), Intech Publishers, 2015
Expected effect	The attendees will gain an overview of the fields of Regenerative Medicine and Tissue Engineering

Name of activity	Naturally occurring bioactive molecules in Regenerative Medicine
Number of working hours	1h
Type of activity	Lecture
Lecturer	Associate Professor Andreana N. Asimopoulou (Aristotle University of Thessaloniki)
Short summary of content	Nature constitutes a pool of medicines and other precious materials for thousands of years. The discovery and exploitation of bioactive molecules inspired by nature, as regenerative agents, will be resented. Additionally, the design and development of tissue engineering scaffolds for targeted tissue regeneration will be reviewed. Research activities of our research group on that field will be finally outlined.
Bibliography	No Bibliography needed
Expected effect	The lecture aims to provide an insight on the pipeline of drug discovery and development mainly exploiting natural products, on regenerative medicine and tissue engineering scaffolds, as well as to recognize how these feats have been accomplished in the discovery and development of an approved medicine.

Name of activity	**Biomedical signal processing with applications in cardiology**
Number of working hours	2h
Type of activity	Lecture
Lecturer	Assistant professor Ioanna Chouvarda (Aristotle University of Thessaloniki)
Short summary of content	The purpose of the lecture is to introduce the different types of cardiac signals with their properties. The main application areas are discussed along their challenges and opportunities.
Bibliography	No Bibliography needed
Expected effect	At the end of the lecture, the students will gain knowledge on cardiac system and signals, will obtain basic skills on cardiac signal analysis and and will be able to recognise the main ICT for health areas related to cardiology

Name of activity	**Introduction to Biomedical Engineering**
Number of working hours	3h
Type of activity	Lecture
Lecturer	Panagiotis Mpamidis, Nicolas Pallikarakis, Aris Dermitzakis, Panagiotis Malataras (ELEVIT Company Representatives)
Short summary of content	Summary: Biomedical Engineering can be defined as the application of engineering principles and design concepts to medicine and biology. Starting from this draft definition it is easily understood that biomedical engineering covers a wide spread spectrum of scientific areas and activities.
Bibliography	No Bibliography needed
Expected effect	The aim of this lecture is to provide an introduction to the biomedical engineering field, to describe briefly the main scientific areas covered under this term and to indicate some of the research and professional opportunities in the field.

Name of activity	**Ubiquitous Monitoring of daily and night activities: what, how and why**
Number of working hours	1h
Type of activity	Lecture
Lecturer	Professor Panagiotis Mpamidis (Aristotle University of Thessaloniki)
Short summary of content	Much has been recently said about Ubiquitous technologies and monitoring as well as wearable computing and mobile health. All these are technically feasible nowadays. What is the realistic use though? How can they add value to existing knowledge.In this lecture we explore daily and overnight recordings through the lens of value added for the users and the specialists.
Bibliography	No Bibliography needed
Expected effect	Attendants will become familiar with available technologies and algorithmic procedure followed in two funded project run at the Medical Physics Lab of AUTH, namely, SmokeFreeBrain and ANAPNEO projects.

Name of activity	**Visit at CERTH**
Number of working hours	1h
Type of activity	Research Institute Visit
Lecturer	Dr. Fotis E. Psomopoulos
Short summary of content	A short visit of the CERTH grounds, showing the four Institutes that comprise the Research Center; the Chemical Process and Energy Resources Institute (CPERI), the Information Technologies Institute (ITI), the Hellenic Institute of Transport (HIT) and the Institute of Applied Biosciences (INAB). The tour will end with a visit to the INAB building, including the Next Generation Sequencing as well as the wet-lab facilities.
Bibliography	No Bibliography needed
Expected effect	Students will be able to see how one of the top Research Centers in Greece is organized, as well as have some insights on the impact and significance of bioinformatics in the state-of-the-art research approaches.

Name of activity	Assessment of sleep quality using polysomnographs: The example of drug intervention "SmokeFreeBrain" to quit smoking
Number of working hours	4h
Type of activity	Laboratory Work
Lecturer	Dr. Christos Frantzidis, Dr. Haris Styliadis, Dr. Antonis Mpillis (Aristotle University of Thessaloniki)
Short summary of content	Participants will be informed about how they can assess the sleep architecture (stages, duration) and sleep quality within polysomnographic recordings. Pathological findings such as apneas and arousal cases will be recognized and analyzed as well and their meaning will be explained. Then there will be a demonstration on how to prepare a log in real time. During the preparation the participants will be interactively involved to familiarize themselves with the processes used. As soon as the registration is complete, the experimental person will be asked to lie down and sleep for 30-45 minutes in a quiet and dark environment, while the tour will continue with questions / queries and discussion elsewhere. After that, data from the experimental person will be taken, an automated analysis will be performed, so that the participants can see everything that has been discussed previously on a theoretical level.
Bibliography	1) Tonstad, S., Tønnesen, P., Hajek, P., Williams, K. E., Billing, C. B., Reeves, K. R., & Varenicline Phase 3 Study Group. (2006). Effect of maintenance therapy with varenicline on smoking cessation: a randomized controlled trial. Jama, 296(1), 64-71. 2) Frantzidis C, Gkivogkli PT, Karagianni M, Rosenzweig I, Papadeli CK and Bamidis PD (2016). Early steps towards the multi-parametric and computerized sleep scoring methodology for extreme environments. Front. Hum. Neurosci. Conference Abstract: SAN2016 Meeting. doi: 10.3389/conf.fnhum.2016.220.00095
Expected effect	Participants will gain knowledge about the sleep architecture, the characteristics used to assess the quality of sleep, and what happens in pathological conditions and how dangerous they are to our health. In addition to promoting knowledge, the tour aims to inform the participants, so that each of them offers to a relative / friendly person facing similar problems the possibility of free sleep study and medical assessment to improve the quality of their life.

Name of activity	**Visit to Signal Processing and Biomedical Technology Unit (SPBTU)**
Number of working hours	1h
Type of activity	Laboratory Work
Lecturer	Postdoctoral research associate Vasilios Charisis (Aristotle University of Thessaloniki)
Short summary of content	The students will learn about the current trends in biomedical signal capturing and processing along with state-of-the-art biomedical applications. More specifically, the visit to SPBTU entails talks about Electroencephalogram (EEG) capturing via lightweight portable device and processing, EEG-based applications BCI applications, wireless capsule endoscopy and early diagnosis of Parkinson's disease via mobile application, IoT and machine learning.
Bibliography	No Bibliography needed
Expected effect	After the visit to SPBTU, the students are expected to know about EEG capturing and processing, wireless capsule endoscopy and state-of-the-art applications for early Parkinson's disease detection.

Name of activity	**Bioinformatics: A Data Mining Approach**
Number of working hours	4h
Type of activity	Tutorial
Lecturer	Dr. Fotis E. Psomopoulos

Short summary of content	Viewing Data Mining from the Life Sciences perspective
	    1. Data Mining tasks in Life Sciences
	    2. Learn your input
	    3. Post-genome Biology: enter data
	    4. Biology as an Information Science: in Large Scale!
	    5. From Arrays to Data Mining
	    6. Analysis: What are the usual questions?
	Applications in Classification
	    1. Using cytology and tissue samples to classify cancer types based on molecular signatures
	    2. Ion channel identification and classification pipeline using SVM
	    3. Classification of white blood T-cells against colon cancer cells
	Applications in Clustering
	    1. Cell state hierarchy for differentiation between two cell states
	    2. Fuzzy clustering algorithm for breast cancer classification
	Text Mining
	Literature overview
	Practical Exercises

Bibliography	No Bibliography needed
Expected effect	Objective The tutorial aims to introduce students to the data analysis process in bioinformatics with a focus on data mining techniques. Within the context of the course the following concepts will be discussed and elaborated: data mining principles (data mining), prediction and characterization (classification), and grouping and aggregation (clustering). Finally, using Jupyter notebooks, the participants will have hands-on exercises on the application of select clustering algorithms in real-world biological data. Knowledge and Capacities Upon completion of the tutorial, students are expected to: a) Have a first understanding of the basic data mining methods and algorithms and the main application domains b) Apply well-known algorithms to a pilot problem c) Select the most efficient algorithm, based on problem requirements

Name of activity	Brain Connectivity Networks
Number of working hours	3h
Type of activity	Workshop
Lecturer	Professor Dimitris Kugiumtzis (Aristotle University of Thessaloniki)
Short summary of content	The connectivity analysis on multivariate time series will be presented with focus on direct and directed interdependencies among observed variables. Further, the connectivity analysis will be applied to electroencephalograms (EEG) to derive brain connectivity networks and case studies on epilepsy using transcranial magnetic stimulation will be presented. The workshop will end with a hands-on section about the connectivity analysis on multi-channel scalp EEG recordings.
Bibliography	1) Fornito A, Zalesky A and Bullmore ET (2016) "Fundamentals of Brain Network Analysis", Academic Press, Elsevier 2) Osorio I, Zaveri HP, Frei MG and Arthurs S (2011) "EPILEPSY the Intersection of Neurosciences, Biology, Mathematics, Engineering, and Physics", CRC Press, Boca Raton 3) Sayama H (2015) "Introduction to the Modeling and Analysis of Complex Systems", SUNY Textbooks, Geneseo 4) Kantz H and Schreiber T (2004) "Nonlinear Time Series Analysis", Cambridge University Press.
Expected effect	The participants will get to know the tools used to estimate the interdependencies between variables observed from time series (connectivity) and form connectivity networks that allow the study of the structure of complex systems, such as the brain. Further, they will get to apply these tools in practice (using Matlab scripts) on brain signals.

Name of activity	**Examination Preparations**
Number of working hours	2h
Type of activity	Other (Exam)
Lecturer	Dr. Fotis E. Psomopoulos
Short summary of content	Preparation for the final examination in the form of written exam.
Bibliography	All the lectures, laboratory visits, tutorials and workshops.
Expected effect	The participants will be given the chance to prepare for the final examination, and ask clarifications from the lecturer.

Name of activity	**Examination**
Number of working hours	2h
Type of activity	Other (Exam)
Lecturer	Dr. Fotis E. Psomopoulos
Short summary of content	Final examination in the form of written exam.
Bibliography	All the lectures, laboratory visits, tutorials and workshops.
Expected effect	Sum up of everything covered throughout the course.