General Information – Fall 2020

Analytical Methods in Biotechnology and Food Engineering, 064324

5th semester
Room 300
Sunday, 11:30-14:30

<u>Teaching Staff:</u>
Instructor: Prof. Ayelet Fishman, afishman@technion.ac.il, room 412.
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Office Hours: By appointment

Prerequisites: Food Chemistry
Co-requisites: Laboratory in Food Analysis

Credits: 3 points

Study hours per week: 3 lecture hours, 3 preparatory hours, 4 semester assignments

Course Goals and Description

The aim of this course is to present to students with basic knowledge of concepts and methods in chemical analytical techniques. The specific goals are:
1) To introduce the principles and importance of food/drug analysis and the requirements from analytical methods.
2) To introduce the agencies in Israel, US and the EU which are responsible for regulations and food/drug safety.
3) To introduce the basic principles of spectrophotometry, chromatography, mass spectrometry, immunology, and "wet" chemistry and their application in the food and biotechnology industries. The theory studied in class will be implemented in the accompanying laboratory.
4) To introduce common terminology related to food/drug analysis and food safety such as GMP, ISO, HACCP, national standards, labeling, and health claims.
5) To introduce the issues of food allergies, food additives, and food supplements from a regulatory perspective and methods for analysis.
6) To learn the use of Tzameret software developed by the Ministry of Health for the food science and nutrition community and its relevance to the food industry.

The course is based on lectures, one active computer lab, and active discussions in class are welcomed. Students are expected to read the respective chapters in the text books, as well as specific papers that will be provided in the course website. An accompanying lab

course will provide hands-on experience and better understanding of the theoretical topics delivered in class.

Learning Outcomes

On successful completion of this course, students should be able to:

1. Recognize and explain technical terminology related to the analysis and labeling of foods
2. Create a label for an actual food
3. Compare and classify analytical methods according to their application
4. Discuss the importance of accuracy and reproducibility in analysis
5. Distinguish between food additives and food supplements and summarize the regulatory requirements for each
6. Explain the theoretical basis for spectrophotometric measurements, chromatographic separations, mass spectrometry analyses, and immunochemical analyses of food and drug components
7. Apply knowledge gained from this course to independently search and evaluate other methods in food and biotechnology analysis
8. Apply knowledge gained from this course when conducting actual analysis of food or drug samples in the lab
9. Read and explain professional articles on analytical methods and assess their results in view of the studied topics in the course

Assignments and Grading Procedures

Homework – 3-4 compulsory assignments during the semester, 20%. We will not have a food fair this year due to COVID19. You will have a different assignment.
A compulsory tutorial on Tzameret will take place on **November 8**. It will be during class hours and will be in the computer farm. You can arrange for connection from home with a special software. Check here for instructions:
https://cis.technion.ac.il/central-services/communication/off-campus-connection/otp/
Homework assignments require the use of Tzameret in the computer hub in the Department or through connection from home.
Exams - final exam, 80%. You must pass the exam with a grade of 55 in order to pass the course.
Lectures - will be given on campus and will be synchronically provided via zoom.

- Students repeating the course for any reason are obliged to do all the assignments.

- There will be no change in the policy of grading, homework percentage, number of assignments if we are forced to have a digital exam. Exam 80%, Homework 20%. Exam must be passed.

Course Schedule (Topics, Assignments, Exams)

Semester begins on 23/10/20

Topic	Weeks	Content	Homework
Introduction Definitions, regulations and labeling	1-2	Course objectives, importance of food analysis, agencies responsible for regulations and food safety, definitions of GMP, ISO, HACCP. Zameret software.	
Qualitative terms for performing lab experiments	3	Requirements from analytical methods, primary standard, secondary standard	
Classical techniques (wet chemistry)	4-5	Titrations, polarimeter, gravimetric methods, uses in food	**#1 22/11/20, 11:30**
Spectroscopic methods	6-7	Electromagnetic radiation, interaction of light and matter, Beer-Lambert law, the spectrophotometer, fluorescence, IR analysis, uses in food and pharma	
Chromatographic methods (GC, HPLC) and instrumentation	7-9	Plate theory, rate theory, resolution, principles of gas chromatography, detectors and instrumentation, principles of liquid chromatography, detectors and instrumentation, uses	**#2 6/12/20, 11:30**
Food allergies, food additives, food supplements	10	Foods responsible for allergies, regulations and methods for analysis, classification of food additives and regulations, E numbers, what are food supplements and regulations for production and labeling	
Mass spectrometry	11-12	General concepts, ionization methods for gases and liquids, instrumentation, uses	**#3 3/1/21, 11:30**
Immunochemical methods	12	Basic concepts of immunology, precipitation methods, labeling methods (ELISA), uses	
NMR	13	Basic concepts and analysis	
Food Fair/summary	13	Standard 1145, Final project, Course summary and exam instructions.	**#4 24/1/21 11:30**

Course Requirements & Course Policies

There will be 4 homework assignments during the semester performed in pairs, requiring the use of Zameret software and the analysis of an article related to topics studied in

class. Homework will be fully graded. Failure to hand homework on time will result in "0" on the assignment. Copying is forbidden. Assignments that are identical will be graded as "0" and marked as "copied" and will result in 20 points deduction from the final grade. You can work together, consult with each other, but must write your own assignment in pairs.

Attendance in the course is encouraged but not a prerequisite.

Usage of any former slides, notes, or printed material is at your own risk and is not recommended. Slides and other materials change from year to year.

Text book(s) and/or other materials

Required text:
- Food Analysis: Theory and practice. 3rd Ed., Y. Pomeranz & C. E. Meloan, Chapman and Hall. 2000.
- Food Analysis, 3rd Ed. S. S. Nielsen, Aspen Publishers. 2003.

Background readings:
- Principles of Instrumental Analysis. 6th Ed., D.A. Skoog, F.J. Holler, S.R. Crouch, Thomson Brooks, 2007.

Academic Integrity

Any work submitted by a student in this course for academic credit will be the student's own work.

You are encouraged to study together and to discuss information and concepts covered in the lecture with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else.

During examinations, you must do your own work. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.