# . - Physical and Chemical Analysis of Food Products

## Prof. Terenzio Bertuzzi

***Text under revision. Not yet approved by academic staff.***

COURSE AIMS AND INTENDED LEARNING OUTCOMES

The course aims to teach students how to evaluate the nutritional components and qualitative parameters of food, and identify possible cases of food fraud.

At the end of the course, students will know the most important physical and chemical analyses for food characterisation, in terms of the quantity, composition and quality of the food and nutritional components. They will be able to interpret a nutritional label and prepare a new one from scratch. They will be able to select the analyses to be carried out for the commercial characterisation of a product, and evaluate the correspondence of the parameters obtained with what is stated on the label.

In particular, at the end of the course students will possess the following knowledge and ability to understand:

* Basic knowledge of the chemical composition of foods
* Knowledge of a food's qualitative parameters and the related analyses
* Evaluation of the values reported on the food label
* Assessment of the requirements necessary to determine the purity and quality of a food

Furthermore, students will have developed the following skills:

* To interpret and evaluate analyses and their results, conduct the main analyses of food characterisation
* To evaluate the purpose of analyses and recognise those related to individual foods
* To perform instrumental laboratory procedures
* To interpret analytical results and compare them with the values provided for by the legislation

COURSE CONTENT

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| Topics | ECTS |
| Analysis and meaning of humidity and free water. | 0.5 |
| Analysis of protein content, ammoniacal and soluble nitrogen. Amino acid analysis: sample hydrolysis and chromatographic separation. | 1 |
| Fat analysis: overall content, composition and evaluation of the oxidative state. | 1 |
| Analysis of fibre, fibrous fractions and dietary fibre. | 1 |
| Analysis of ash and insoluble ash, determination of mineral elements. | 0.5 |
| Starch and sugar analysis. | 0.5 |
| Characteristics and evaluation methods of various foods (oils and fats, cereals and derivatives, milk, water, wine, products of animal origin). | 1.5 |
| Tutorials in the laboratory and in the classroom. | 2 |

READING LIST

P. Cabras-C. Tuberoso, *Analisi dei prodotti alimentari,* Piccin, Padua, 2014.

P. Cabras-A. Martelli, *Chimica degli alimenti,* Piccin, Padua, 2004.

TP Coultade, *La chimica degli alimenti,* Zanichelli, Bologna, 2005

TEACHING METHOD

The course is divided as follows:

Classroom lectures (6 ECTS, 48 hours);

Laboratory and classroom tutorials (2 credits, 24 hours, 6 laboratory tutorials of 3 hours each and 2 classroom tutorials of 3 hours each).

Frontal lectures will be conducted with the support of PDF presentations. The presentations in PDF used during the course will be made available to students on the Blackboard platform.

The laboratory activities consist of 6 tutorials lasting 3 hours each. The topics of the tutorials will cover the application of analytical techniques for the characterisation of various foods and beverages. In principle, the topics will be as follows: analysis of humidity by weight; protein analysis using the Kjeldahl method; starch analysis using enzymatic hydrolysis and colorimetric detection; fat analysis by Soxhlet extraction; analysis of simple sugars; weight analysis of the mineral fraction by incineration in a muffle furnace; characterisation of food fats by measurement of absorbent UV, analysis of peroxides by volume, analysis of fatty acid composition by gas chromatography; quantification of caffeine in beverages using HPLC with UV detection.

ASSESSMENT METHOD AND CRITERIA

The course envisages two interim tests: the first will cover the contents of the first part of the course (about 24 hours) and the second will cover the contents of the second part of the course. These tests will both be written; they will last two hours and will be based on eight to ten open-ended questions. In both tests there will be a question related to the students' laboratory experiences. The questions will be of equal weight and marked out of thirty; the final mark of the test will be the arithmetic average of the marks obtained across all of the questions. The interim tests are optional and are not compulsory for passing the exam. For those who have taken and passed the tests, the examination will focus on a brief discussion of the topics addressed in the interim tests.

For those who have not completed the interim tests, the exam can be carried out on the entire course programme, both in written and oral form, at the student's choice.

NOTES AND PREREQUISITES

During the course further reading indications will be provided.

The course includes a cycle of laboratory tutorials at which attendance will be checked.

Prior to these exercises, students are required to take a short course, scheduled during the general chemistry module, on the safety rules to be observed.

It is recommended that students possess a fair basic knowledge of General Chemistry, Organic Chemistry and Analytical Chemistry.

Information on office hours available on the teacher's personal page at http://docenti.unicatt.it/.