



Course Unit: 935033 – Food rheology

Year 3 Semester 6 ISCED Code: 721 ECTS: 5

Type of Course Unit: Compulsory Delivery Mode: Face-to-face Language of Instruction: Portuguese

COURSE COORDINATOR: Nuno Bartolomeu Mendes Godinho de Alvarernga

HOURS OF WORK

TOTAL HOURS	Contact Hours								Hours in autonomous work
	Theory	Theory and practice	Practical and laboratory work	Field work	Seminar	Internship	Tutorial guidance	Other	
125	16		40				16		53

Prerequisites (if applicable): Not applicable.

LEARNING OUTCOMES (knowledge, skills and competence)

Students' preparation for the basic operations in food physical properties (rheology). Includes acquisition and application of food science and technology knowledge on the food's physical and structural properties, namely in food quality control, product development, food plant layout development and correlations between rheological and sensory food properties.

CONTENTS

Lectures

Food rheological behaviour. Rheology: definitions and importance. Rheological tests. Fundamental rheological tests. Fundamental rheology. Rheology of macromolecules suspensions: relative viscosity, specific and reduced viscosity and intrinsic viscosity. Applied rheology: consistency and texture – fundamental food characteristic, sensory evaluation versus instrumental evaluation. The importance of glassy state in food quality and texture preservation. Application of rheology concepts (non-Newtonian fluid behaviour) in plant layout development: Bernoulli, equation and pumping fluids. Rheology of the Newtonian and non-Newtonian flow.

Laboratory practices and tutorial classes

Texturometer: food texture analysis. One cycle compression and puncture tests and texture profile analysis (TPA). Viscometer: liquid and pasty food's behaviour, in particular, its viscosity and flow rate.

Product development and analysis within a group of students.

DEMONSTRATION OF THE CONTENTS COHERENCE WITH THE COURSE UNIT'S LEARNING OUTCOMES

This course syllabus has 3 components: theoretical classes, practical classes and tutorial classes. All these different classes are interconnected. On theoretical classes are exposed the concepts, theoretical fundamentals and rheology definition, on laboratorial practices classes, the students familiarize with the equipments, in particular, with the texturometer and the viscometer. On tutorial classes, students combine the knowledge acquire in both theoretical and practical classes, as well as the skills achieved on product development. This product goal is innovation compared to similar in the market. The product will have to be characterized in rheological, physical, chemical and sensory properties, and it is given special relevance to consumer overall acceptability.

TEACHING METHODOLOGIES

The teaching methodologies are, mainly, lectures, laboratory classes which include theoretical-practical classes for problems resolution and lab classes, and tutorials classes which includes food products development in the plant.

DEMONSTRATION OF THE COHERENCE BETWEEN THE TEACHING METHODOLOGIES AND THE LEARNING OUTCOMES

This course has 3 types of classes, and all together contributes to the goals of this course. On theoretical classes, students are motivated to give study cases, besides the principal expositive nature of the classes. The issues are rheology importance in food industry, in particular, in food composition, quality control, product development, plant layout, etc. Measurement of food rheological properties: fundamental tests, empirical tests, imitative tests. Rheological behaviour characterization. Types of behaviour. Elastic solid, ideal or Hooke. Viscous liquid, ideal or Newton. Non-Newton fluids and time dependence. Viscoelastic behaviour. Food's glassy state importance.

On practical classes, with solid foods analysis on the texturometer, by compression or puncture tests, or with liquid or semi-liquid foods on the viscometer, by viscosity determination and calculations to define flow rate behaviour, the theoretical concepts are applied. Another goal to achieve by students is product development, which is attained in group in order to develop, produce, and analyze rheological, physic-chemical and sensory characteristics.

On tutorial classes, students' groups purpose an innovative product to develop (for instance a jelly without sugar). They ought to proceed to experimental assessment of that new product and also to a reference-product (for instance traditional jelly with sugar). Afterwards, all laboratory analysis ought to be done in order to characterize the new develop product.

EVALUATION METHODS

The evaluation is performed by a final quiz (40%). The evaluation of practical and tutorial classes is performed by a report based on the product development (30%) and its public presentation (30%).

MAIN BIBLIOGRAPHY

- Bourne, M. C. (1982). Food texture and viscosity - concept and measurement. New York: Academic Press (ed).
- Gunasekaren, S., & Ak, M. M. (2003). Cheese Rheology and Texture (CRC Press ed.). London: CRC Press.
- Huilgol, R.; Phan-Thien, N. (1997). Fluid mechanics of viscoelasticity. Elsevier.
- Prentice, J. (1992). Dairy rheology - a concise guide. VCH Publishers

Year of implementation: 2015/2016 | Date of approval by the Technical-Scientific Board: 2012-10-10