

## Faculty of Biological, Agronomic and Environmental Engineering

### BRAL2103 Food chemistry

[52.5h+37.5h exercises] 7.5 credits

**Teacher(s):** Sonia Collin  
**Language:** French  
**Level:** Second cycle

#### Aims

The lessons are intended for Bio-Engineers and BRAS3DS students. They are aimed at developing knowledge of organoleptic and nutritional impact of food transformations, from raw materials to final products.

#### Main themes

The course is structured in 5 parts addressing respectively :

A- Major food constituents : physico-chemical attributes, chemical reactivity, functional properties, transformation processes. In particular, 4 chemical families will be covered : carbohydrates and related Maillard reactions, lipids and related chemical and enzymatic oxidative degradations (role of polyphenols and other antioxidants), proteins and water (water activity monitoring).

B- Analytical methods applied to major food constituents covered in part A.

C- Minor food constituents : chemical structure, reactivity and functional properties of sweeteners, cyclodextrins, hydrocolloids, emulsifiers, fat mimics, colourings, flavours and contaminants (dioxins, PCB, mycotoxins, nitrosamines, acrylamide..).

D- Analytical methods applied to minor food constituents covered in part C.

E- Special focus on beer ingredients : special malt flavours, dimethylsulfide and other sulphur aroma, hop chemistry (bitter substances and flavour), foam structure, malt and hop polyphenols, ageing. Through practical training, typical brewery jargon will be described.

#### Content and teaching methods

Through five blocks, the course highlights the physicochemistry of food ingredients.

A- Major food constituents :

-carbohydrates : structure of mono and disaccharides, caramelisation and Maillard reactions;

-lipids : structure, polymorphism and intersolubility, chemical and enzymatic oxidations, structure and mechanisms of antioxidants (polyphenols,..);

-proteins of milk, gelatin and cereals;

-definition and monitoring of water activity.

B- Analytical methods applied to major food constituents covered in part A : Soxhlet and FAME for lipids, antioxidant activity, HPLC of sugars, nitrogen fractions.

C- Minor food constituents : structure and efficiency of most sweeteners, structure and properties of cyclodextrins, hydrocolloids, emulsifiers, fat mimics, colourings, flavours and contaminants (dioxins, PCB, mycotoxins, nitrosamines, acrylamide..).

D- Analytical methods applied to minor food constituents covered in part C : some examples for contaminants, flavours, vitamins, ..

E- Special focus on beer ingredients : flavours, colour and reduction power of special malts, synthetic pathways of dimethylsulfide and other sulphur aroma, hop chemistry (bitter substances and flavour), foam structure, malt and hop polyphenols through the brewing process, off-flavours through beer ageing. Through practical training will be learnt how to produce and analyze a beer.

**Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)**

Precursory courses Organic chemistry, analytical chemistry, analytical techniques, biochemistry

Evaluation Exam in written form appraising acquisition of theory and the capability to investigate complex chemical systems

Support Syllabus