UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
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**No._____of _____** **USAMV form 0703030106**

# SUBJECT OUTLINE

## 1. Information on the programme

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|---|---|
| 1.1. Higher education institution | **University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca** |
| 1.2. Faculty | **Food Science and Technology** |
| 1.3. Department | **Food Engineering** |
| 1.4. Field of study | **Food Engineering** |
| 1.5.Cycle of study[1] | **Bachelor** |
| 1.6.Specialization/ Study programme | **Food Engineering (IPA)** |
| 1.7. Form of education | **Full time** |

## 2. Information on the discipline

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|---|---|---|---|---|---|---|---|---|
| 2.1. Name of the discipline | **Oil and margarine technology** | | | | | | | |
| 2.2. Course coordinator | **Vlad Mureșan, PhD, habil., Associate Professor** | | | | | | | |
| 2.3. Seminar/ laboratory/ project coordinator | **Georgiana Smaranda Marțiș, PhD, Assistant Professor** | | | | | | | |
| 2.4. Year of study | **III** | 2.5. Semester | **V** | 2.6. Type of evaluation | summative | 2.7. Discipline status | Content[2] | DS |
| | | | | | | | Compulsoriness[3] | DI |

## 3. Total estimated time (teaching hours per semester)

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| **3.1. Hours per week – full time programme** | 4 | out of which: 3.2. lecture | 2 | 3.3. seminar/ laboratory/ project | 2 |
| **3.4.Total number of hours in the curriculum** | 56 | Out of which: 3.5.lecture | 28 | 3.6.seminar/laboratory | 28 |
| **Distribution of the time allotted** | | | | | hours |
| **3.4.1. Study based on book, textbook, bibliography and notes** | | | | | 17 |
| **3.4.2. Additional documentation in the library, specialized electronic platforms and field** | | | | | 7 |
| **3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays** | | | | | 12 |
| **3.4.4.Tutorials** | | | | | 3 |
| **3.4.5.Examinations** | | | | | 5 |
| **3.4.6. Other activities** | | | | | |

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| **3.7. Total hours of individual study** | 44 |
| **3.8. Total hours per semester** | 100 |
| **3.9. Number of credits[4]** | 4 |

## 4. Prerequisites (if applicable)

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| 4.1. curriculum-related | Operations and equipment in the food industry; Transfer phenomena; Raw vegetable materials; Food chemistry; Mathematics; Food biochemistry. |
| 4.2. skills-related | The student should have knowledge of Food Industry unit operations and machines, as well as knowing the physical and chemical properties of lipids. |

## 5. Conditions (if applicable)

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| 5.1. for the lecture | Room with projector and internet connection.<br>The course is interactive; students can ask questions regarding the content of the statement. Academic discipline requires compliance of starting time and end of the course. There are not allowed any other activities during the lecture, mobile phones to be closed. |
| 5.2. for the seminar/ laboratory/ project | For practical works each student will carry out an application / technological computation / chemical analysis specific to Lipid technology. Academic discipline is imposed for the duration of works.<br>Specially designed laboratory (equipped with specific glassware, sink, drying oven, balance, refractometer, oil press); |

**6. Specific competences acquired**

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| Professional competences | C3.2. Explaining and interpreting the principles and methods used in technological processes in the food chain<br>C2.3. Application of basic engineering principles and methods for solving technological problems in the agri-food chain |
| Transversal competences | CT1 Apply strategies for perseverance, rigor , efficiency and responsibility in work , punctuality and personal accountability for its performance , creativity, common sense, analytical and critical thinking , problem solving, etc., based on principles, norms and values code of professional ethics from food industry; |

**7. Course objectives** (based on the list of competences acquired)

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| 7.1. Overall course objective | To acquire the knowledge concerning the raw materials, production technologies, equipment and facilities involved in sunflower oil production. |
| 7.2. Specific objectives | Knowledge of quality parameters of sunflower seed and sunflower oil finished product;<br>Knowledge of operations and operating principles of the equipment from oil factories;<br>Using and understanding the methods, analysis techniques, applications and technological computations from extraction technology (oil) field;<br>Interpretation of results obtained by analysing the raw materials, intermediate and finished products from oil industry. |

**8. Content**

| **8.1.LECTURE**<br>**Number of hours – 28** | Teaching methods | Notes |
|---|---|---|
| **1. Structure and composition of oils and fats**<br>1.1 Structures - simple lipids, complex derivatives<br>1.2 Physical properties. Chemical properties. | Lecture, explanation, conversation, debate | 1 Lecture |
| **2. Raw materials for oil production. Morphological structure of sunflower. Chemical composition.**<br>3. General technological scheme for obtaining oil from sunflower seeds | Lecture, explanation, conversation, debate | 1 Lecture |
| **4. Preparing oilseeds for crushing. Pre-cleaning. The drying. Storage. Cleaning. Dehulling. Obtaining industrial kernel** | Lecture, explanation, conversation, debate | 2 Lectures |
| **5. Crushing of oilseeds. Aim. Milling methods. Grinding rolls.**<br>**6. Roasting. The purpose of roasting. Optimal conditions for roasting. Physico-chemical changes during roasting. Roasting equipment. Features of roasted kernels.**<br>**7. Pressing. Aim. Conditions. Methods and apparatus. .** | Lecture, explanation, conversation, debate | 2 Lectures |
| **8. Extraction. Extraction theory. Solvents for vegetable oils. Extractive Schemes.**<br>8.1. Broken preparation for extraction.<br>8.2. The extraction. DeSmet extractor.<br>8.3. Micella distillation.<br>8.4. Recovery of solvents from the meal. De-solvent and | Lecture, explanation, conversation, debate | 3 Lectures |

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| drying the meal. Capacitors, Separators. | | |
| **9. Refining of crude oils. Neutralization schemes**<br>9.1. Degumming<br>9.2. Neutralization.<br>9.3. Washing.<br>9.4. Drying.<br>9.5. Decoloration.<br>9.6. Dewaxing.<br>9.7. Deodorizing | Lecture, explanation, conversation, debate | 3 Lectures |
| **10. The hydrogenation of vegetable oils. The hydrogenation process. Manufacture of margarine.** | Lecture, explanation, conversation, debate | 1 Lecture |
| **11. Valorising of by-products in the production of sunflower oil** | Lecture, explanation, conversation, debate | 1 Lecture |

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| **8.2. PRACTICAL WORK**<br>**Number of hours – 28** | | |
| 1. Presentation of the safety rules to be respected during the practical works. Training for pilot plant oil press and laboratory oven. Sampling for quality control. Packaging, labelling, shipping and storage of the laboratory samples. Technical assessment of the quality of raw materials used to produce vegetable oils. Organoleptic examination. Determination of impurities in oilseeds. Methods for analysis of oil crops. | Experiment , conversation, explanation | 1 Practical work |
| 2. Samples conditioning for laboratory analysis. Determination of water and volatile substances content (moisture content) of oil crops, of broken and meal. Determination of test weight. | Experiment , conversation, explanation | 1 Practical work |
| 3. Obtaining industrial crude oil by pressing sunflower seeds (oil press pilot station ). Calculation, total material balance, partly material balance, losses, efficiency. | Experiment , conversation, explanation | 1 Practical work |
| 4. Control analysis of the pressing operation. The determination of the fat content of sunflower seeds and broken (Soxhlet method). | Experiment , conversation, explanation | 1 Practical work |
| 5. Quality analysis of the crude and refined fats and oils: a comparison. Measurement of free fatty acid. Determination of peroxide value. | Experiment , conversation, explanation | 1 Practical work |
| 6. Quality analysis of refined fats and oils on the technological flow. Determination of the dissolved soap content. Determination of saponification index of fats. | Experiment , conversation, explanation | 1 Practical work |
| 7. Knowledge checking. | | 1 Practical work |
| 8. Applications from vegetable oils industry - technological calculations relating to operations preparatory to manufacture. | Debate, questioning, explanation | 2 Practical work - Applications |
| 9. Applications to the vegetable oil industry - technological calculations related to obtaining oil by extraction and pressing. | | 2 Practical works - Applications |

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| 10. Applications to the vegetable oil industry - technological calculations on oil refining and obtaining hydrogenated fats.<br><br>11. Knowledge assessing | | 2 Practical works – Applications<br><br>1 Practical work - Applications |

*Compulsory bibliography:*

1. Racolța Emil, 2014. Tehnologia uleiurilor vegetale și a margarinei (Curs didactic). Editura AcademicPres, Cluj-Napoca
2. Racolța Emil, Crina Muresan, 2002. Tehnologia uleiului si margarinei. Caiet de lucrari practice. Editura Academic Pres Cluj-Napoca.
3. Vintila Iuliana: Tehnologia si controlul calitatii uleiurilor si grasimilor vegetale, Vol.I. Materii oleaginoase si materii auxiliare. 2001, Ed. Fundatiei Universitatii "Dunarea de jos", Galati.

Morar, M.V.: Controlul calității uleiurilor si grăsimilor vegetale. Îndrumător de laborator, Ed. Todesco, Cluj, 2003

*Optional bibliography:*

1. Mureşan V (2019) Oleogelifierea – Tehnologii disponibile și aplicabilitate în produse alimentare, Editura MEGA, Cluj-Napoca. ISBN: 978-606-020-098-7
2. Mureşan V* et al. (2017) Processing Sunflower Seeds into Kernels, Hulls, and Paste, In: Sunflower Oil: Interactions, Applications and Research, Ed. Monwar Hossain, NOVA Science Publishers, New York. ISBN: 978-1-53611-889-6.
3. Banu C, Manualul inginerului din industria alimentara, Ed.Tehnicã, Bucureşti, 1999

**9. Corroborating the course content with the expectations of the epistemic community representatives, of the professional associations and of the relevant employers in the corresponding field**

Course content is consistent with the demands of specific national professional associations; the teaching staff regularly attend international fairs and undertake field visits on food industry specific establishments (sunflower oil and halva factories)

**10. Assessment**

| Type of activity | 10.1. Assessment criteria | 10.2. Assessment methods | 10.3. Percentage of the final grade |
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| **10.4. Lecture** | Knowledge acquired; level of understanding;<br>Solving specific problems related to sugar technology. | Exam | 50% |
| **10.5. Seminar/Laboratory** | Description of specific analytical methods specific to oil industry. | Continuous assessment of skills for realizing analytical methods specific to oil technology. | 20% |
| | Making a specific application for oil technology;<br>Technology specific calculations of oil operations by applying equations for total or partial material balance. | Continuous assessment of skills for realizing applications to oil technology. | 30% |
| **10.6. Minimum performance standards** | | | |
| Knowledge of quality indices of raw material and finished product.<br>Knowledge of technological general scheme for obtaining oil from sunflower seeds. | | | |

[1] Level of study- to be chosen one of the following - Bachelor/Post graduate/Doctoral

[2] Course regime (content) – for bachelor level it will be chosen one of the following - **DF** (fundamental subject), **DD** (subject in the domain), **DS** (specific subject), **DC** (complementary subject).

[3] Course regime (compulsory level) - to be chosen one of the following - **DI** (compulsory subject), **DO** (optional subject), **DFac** (facultative subject)

[4] One ECTS is equivalent with 25-30 de hours of study (didactical and individual study).

Filled in on
07.09.2021

Course coordinator
Vlad Mureșan, PhD, habil., Associate Professor

Laboratory work/seminar coordinator
Georgiana Smaranda Marțiș, PhD, Assistant Professor

Subject coordinator
Vlad Mureșan, PhD, habil., Associate Professor

Approved by the Department on
22.09.2021

Head of the Department
Sevastița Muste, PhD, habil., Professor

Approved by the Faculty Council on
28.09.2021

Dean
Elena Mudura, PhD, habil., Professor