Department of …Food Technology….

College Agricultural Engineering Sciences

Salahaddin University-Erbil

Subject: Fats and Oils Technology

Course Book – (3rd Stage)

Lecturer's name

Theory: Assist. Prof. Dr. Nabil Hussain Rasul

Practical: MSc. Zeen Tahsin Essa

Academic Year: 2022/2023

Course Book

1. Course name	Fats and Oils Technology
2. Lecturer in charge	*Dr. Nabil Hussain Rasul **MSc. Zeen Tahsin Essa
3. Department/ College	Food Technology / Agricultural Engineering Sciences
4. Contact	e-mail: nabil.rasol@su.edu.krd zeenisa1985@gmail.com Tel: +9647504729357
5. Time (in hours) per week	Theory: 2 Practical: 6
6. Office hours	3 hours
7. Course code	AFT
8. Teacher's academic profile	*Bsc: in food technology in1991, Msc: in Food processing in 2003, phD. In Food Science 2009. **Bsc: in food technology in2007, Msc: in Food processing in 2014; have over 13 years experience in the food processing
9. Keywords	Fats , Oils , Extraction, Refining , Technology, oxidation

10. Course overview:

In this course the student must be know the methods to industrial, Know about the source of oils and fats, understand critical parameters involved in the extraction, refining, bleaching, and deodorization of fats and oils; define methods to modify fats and oils (hydrogenation, fractionation, blending, interesterification, emulsification, crystallization) for functional use in foods; understand handling and preservation of fats and oils for safety and quality; identify the cause and methods to determine chemical changes in fats and oils during storage, such as oxidation reactions.

Fat and Oil processing technology comprises the steps and procedures in the manufacture of processed fat products. Processed fat products, which include various different types and local/regional variations, are food of animal and plant origin.

11. Course objective:

To provide the general knowledge about the source of general types of fat and oils which is used in our daily life, providing chemical and physical properties of fats and oils, providing the extraction of fat by mechanical and chemical solvents and rendering process, also to provide the processing of mayonnaise , margarine and flavored fats.

12. Student's obligation

The student has to prove its presence in the lecture and that by taking the percentage of attendance by Lecturers and has quiz every lecture, working in lab production of food products and in the end the students have exam by monthly and finally.

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13. Forms of teaching

Lectures , papers, data show, white board, videos, pictures, Laboratory, Samples

14. Assessment scheme

Daily activity , quiz, Exam.
Theory;
Two (2) Examinations (5% each) total (5%)
Attendance & Participation (5%)
10 mark for exams+5 mark student activity like daily activity, quiz test report =15 mark + 50 final exam
Practical; 30 mark for exams +5 mark student activity like quiz, test report =35 mark

15. Student learning outcome:

words To give the student practical experimental experience thorough understanding of fat and oil technology methods and principles that are used commercially so that the student will be able to take part in operation- and development work with in the food technology field.

16. Course Reading List and References:

- Key references:

1. O'Brien, R. D. (2009). Fats and Oils (Formulating and Processing for Applications). Third edition. CRC Press is an imprint of Taylor & Francis Group, an Informa business. London – New York.

2. Bailey's . (2005) Industrial Oil and Fat Products, Sixth Edition, Six Volume Set.Edited by Fereidoon Shahidi. Copyright, John Wiley and Sons, Inc

- Useful references:

1.A. O. C. S. (1999). Official Methods and Recommended Practices of the American Oil
2. Recent advances in Chemistry and Technologies of Fats and Oils.

- Magazines and review (internet):
  1. European Journal of Lipid Science and Technology
  2. https://www.researchgate.net/ Introduction_to_Fats_and_Oils_Technolog.

17. The Topics:

Theoretical Topics

1. Fats and Oil Technology

Introduction
Fatty acids:
Saturated Fatty acids
Further classification of the PUFA
Essential - omega fatty acids
Fats and oils
Waxes
glycerol lipid
Steroids
Fat soluble vitamins

2.Types of Fats and Oils in Foods

Sources of Fats and Oils
Soybean oil
Cottonseed oil
Peanut oil
Corn oil
Sunflower oil
SAFFLO WER OIL
Canola oil
Olive oil
Palm oil
palm kernel
Coconut oil
Lard
Tallow
Milk Fat
Menhaden oil
SINGLE CELL OILS
Comparative properties of common cooking fats

3. Fats and Oils Processing

Seed preparation
Dehulling
Crushing
Cooking of oil seeds

4.Extraction

A.Rendering (Animal Fats)
Wet Rendering
Dry Rendering
Mechanical Oil Extraction
-cold pressing means no heat applied
- hot pressing - external heat is applied
B. Mechanical extractors are of two types:

Lecture's name
Dr.Nabil H. Rasul

2 hours

1.batch
2.continuous
C. Solvent Extraction
- organic solvent (hexane, isopropyl alchool)
- supercritical solvent (carbondioxide)
Solvent extractors are of two types:
1.batch
2.continuous

5. Refining

Degumming
Neutralisation
Winterisation
Bleaching
Deodorisation

6. Saponification

Interesterification
1. Random
2. Directed

7. Hydrogenation

The variables that can affect the results of the hydrogenation are
-temperature,
-degree of agitation,
-hydrogen pressure in the reactor,
- catalyst amount,
-type of catalyst,
- hydrogen gas purity,
-feedstock source, and feedstock quality

8. Products Prepared from Fats and Oils

A. Salad and Cooking Oils
B. Shortenings
Mechanism to produce Shortening
1.Blending
2. Hydrogenation
3. Esterification
4. Winterization (Fractionation)
Types of Artificial Shortening:
D. Cocoa Butter and Butter fat Alternatives (Hard Butters)
E. Margarine and Spreads
Types:
F. Butter

9. Frying:

methods of commercial frying
shallow frying
deep-fat frying

Changes in frying oil
hydrolysis,
oxidation
polymerisation.
Pyrolysis

10. Classification of Fats and Oils On the basis of applications

edible fat and non-edible fat
drying oils, non-drying oils, semi-drying oils
visible or invisible
carbon chain length

11. Functions of Fat in Food

1. Appearance
2. Emulsions
3. Flavor
4. Heat Transfer
5. Melting Point
6. Nutrition
7. Satiety
8. Shortening Power
9. Solubility
10. Texture

12. Physical Properties of Fats and Oils

Melting and freezing points
Thermal property
Density
Viscosity
Solubility
Refractive Index
Color Measurements
Polymorphism

13. Chemical Properties of Fats and Oils

Hydrolysis of fats and oils:
Oxidation of fats and oils
Polymerization of fats and oils

14. Fat Replacers

Fat-replacement ingredients can be categorized as follows:
(1) fat substitutes based on esters and ethers,
(2) fat replacers based on carbohydrates and proteins (also referred to as‘fat mimetics’)
(3) calorie-reduced structured lipids
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18. Practical Topics

Title of the Subject Lecturer's name

1- **Source of fats and Oils**
2- **Chemical properties of fats and oils**
3- **Physical properties of fats and oils**
4- **Fat and oil extraction**
5- **First exam**
6- **Rendering process**
7- **Mechanical extraction of fat and oils**
8- **Chemical extraction of fat and oils**
9- **Mayonnaise**
10- **Visiting factories**
11- **Margarine and flavoured fat**
12- **Visiting factories**
13- **Detection of adulteration of fats and oils**
14- **Qualitative Analysis of Oils and Fats**

Lecturer's name

Msc. Zeen T. Essa

ex: (3 hrs)

19. Examinations:

Sample of Questions

Q1// Write briefly about each of the followings:-

1. Olestra
2. Oil Hydrogenation.

Q2-A// Fill the blanks:-

1. …….. can replace all or some of the fat in such products as in salad dressings, puddings, spreads, ……., and dairy foods. They provide 4 kcal/g of food.
2. In deep-frying process. here heat transfer is a combination of …….. within the hot oil and …….. to the interior of the food.

Q2-B//What are the require treatments or procedure for:

1. Produce Shortening
2. Reactive natural bleaching clays.

Q3 -A// Write whether the following statements are True or False :-

1. In some cases active carbon is added in the course of bleaching to improve the removal of yellow and green pigments.

Q3-B// Explain : Fat replacers serve two purposes .

Q4-A// Choose the correct answer "A , B, C, or D" : -

It is a low-calorie and cholesterol-free fat substitute, is manufactured from whey protein concentrate by a patented microparticulation process

A. Jojoba Oil B. Sorbestrin C. Simplesse D. Salatrim

Q4-B//Enumerate:- Products Prepared from Fats and Oils .

Q5// Draw

1. Draw Curve for Oil Hydrogenation Reaction Energy Diagram.
2. Figure to describe Hilde Brandt Extractor(U-Tube Extractor).

Q6// Give the brief idea on the basis of these techniques with mentioning the most important applications of these techniques oils and fats industry ; a. Vertical cylindrical steel vessel

Q7// Write only two examples of each of the following: Types of Artificial Shortening:

Q8// differences between each of the following; shallow frying and Deep-fat frying

Q9 // Write the abbreviation in to terms of : PCI

Q10// What is the purpose of: Crud oil Neutralisation

20. Peer review

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.

(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).