

Department of Food Sciences



University of the Punjab, Lahore Course Outline

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| Program | B.Sc. (Hons.) Food Science & Technology | Course Code | FST-405 | Credit Hours | 3(2-1) |
| Course Title | TECHNOLOGY OF FATS AND OILS | | | | |
| Course Introduction | | | | | |
| Course Objectives | | | | | |
| The main objectives of this course are: | | | | | |
| <ol style="list-style-type: none">1. To provide the general knowledge on the agronomy, production and trade of the current domestic and offshore oilseeds (soybean, canola and palm).2. To provide the basics of the critical parameters involved in the extraction, refining, bleaching, deodorization of fats and oils and their modifications (blending, interesterification, emulsification, votation, fractionation and genetic manipulation) into functional shortenings and the subsequent handling and the preservation of their quality.3. To provide the basic chemistry of fats and oils with focus in the understanding of the relevance of their physicochemical and biochemical properties in their functions as ingredients in foods.4. To provide knowledge and understanding of the changes and reactions of fats and oils in the food system influencing the stability of the finished food.5. To provide the fundamentals of the metrics for assessing the quality of fats and oils that are relevant to the safety of their usage as ingredient in the food system.6. To provide the updated knowledge on the nutritional and health benefits of fats and oils focusing on the myths and realities of the ingredients.7. To provide hands on experience in the differentiation of the functionality of fats and oils as applied in the food system | | | | | |
| Learning Outcomes | | | | | |

After completing this course students should be able to:

1. Discuss dietary sources and nomenclature of triglycerides.
2. Elaborate various processing steps in oil processing industry.
3. Apply principles and techniques for the production of oil based value added products

THEORY

| Course Content | | Assignments/Readings |
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| Week 1 | Unit-I 1.1 Introduction to fat and oil 1.2 Importance, sources, production, uses | Richard D. O'Brien, 2009. Chapter 1,4 |
| | 1.3 Characteristics of oils and fats: physical, chemical | Richard D. O'Brien, 2009. Chapter 1,4 |
| Week 2 | Unit-II 2.1 Constituents of fat and Oil. 2.2 Fatty acids and glycerol's | Richard D. O'Brien, 2009. Chapter 1 |
| | 2.3 Oil bearing materials 2.4 Pre-treatment, storage | Richard D. O'Brien, 2009. Chapter 1 |
| Week 3 | Unit-III 3.1 Extraction methods 3.2 Rendering, expression, solvent extraction. | Richard D. O'Brien, 2009. Chapter 2 |
| | 3.3 Processing technology: Refining | Richard D. O'Brien, 2009. Chapter 2 |
| Week 4 | Unit-IV 4.1 Degumming | Richard D. O'Brien, 2009. Chapter 2 |
| | 4.2 Neutralization | Richard D. O'Brien, 2009. Chapter 2 |
| Week 5 | Unit-V 5.1 Bleaching procedure and bleaching agents | Richard D. O'Brien, 2009. Chapter 2 |
| | 5.2 Bleaching factors: earth, dose, time, temperature and moisture | Assignments |
| Week 6 | Unit-VI 6.1 Hydrogenation 6.2 Operating variables and hydrogenation systems. | Richard D. O'Brien, 2009. Chapter 2 |

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| | 6.3 Interesterification and esterification | Class Quiz |
| Week 7 | Unit-VII 7.1 Random, direct and enzymatic Interesterification | Richard D. O'Brien, 2009. Chapter 2 |
| | 7.2 Application of Interesterification | Richard D. O'Brien, 2009. Chapter 2 |
| Week 8 | Unit-VIII 8.1 Winterization | Richard D. O'Brien, 2009. Chapter 2 |
| | 8.2 Fractionization | Richard D. O'Brien, 2009. Chapter 2 |
| Week 9 | Unit-IX 9.1 Dewaxing | Richard D. O'Brien, 2009. Chapter 2 |
| | 9.2 Deodorization | Richard D. O'Brien, 2009. Chapter 2 |
| Week 10 | Unit-X 10.1 Stabilization of oil | Richard D. O'Brien, 2009. Chapter 2 |
| | 10.2 Spoilage: oxidative and hydrolytic rancidity | Assignment |
| Week 11 | Unit-XI 11.1 Prevention - use of antioxidants | Richard D. O'Brien, 2009. Chapter 13 |
| | 11.2 Emulsification and emulsifiers | Richard D. O'Brien, 2009. Chapter 13 |
| Week 12 | Unit-XII 12.1 Plasticization | Richard D. O'Brien, 2009. Chapter 2 |
| | 12.2 Flaking, powdered, breaded and packing of fat | Richard D. O'Brien, 2009. Chapter 2 |
| Week 13 | Unit-XIII 13.1 Specialty fat and oils | Richard D. O'Brien, 2009. Chapter 7 |
| | 13.2 Manufacturing of Frying oil | Richard D. O'Brien, 2009. Chapter 7 |
| Week 14 | Unit-XIV 14.1 Production and use of margarine in food industry | Richard D. O'Brien, 2009. Chapter 7, 5 |

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| | 14.2 Manufacturing and use of shortening in food industry | |
| Week 15 | Unit-XV 15.1 Production of HPO and HPKO 15.2 Application HPO and HPKO in food industry | Richard D. O'Brien, 2009. Chapter 7 |
| | 15.3 By products of fat and oils industry and its use | Richard D. O'Brien, 2009. Chapter 7 |
| Week 16 | Unit-XVI 16.1 Production of margarine 16.2 Industrial application of margarine | Presentations |
| | 16.3 Production of shortening 16.4 Industrial application shortening | Assignment |
| PRACTICAL | | |
| Course Content | | Assignments/Readings |
| Week 1 | Extraction of fat and oil | Richard D. O'Brien, 2009. Chapter 2 |
| Week 2 | Extraction of essential oil by solvent extraction method | Richard D. O'Brien, 2009. Chapter 3 |
| Week 3 | Determination of free fatty acids of fat and oil | Richard D. O'Brien, 2009. Chapter 3 |
| Week 4 | Estimation of saponification value of oil | Richard D. O'Brien, 2009. Chapter 3 |
| Week 5 | Cold test of fat and oil | Richard D. O'Brien, 2009. Chapter 3 |
| Week 6 | Determination of iodine value of fat and oil | Richard D. O'Brien, 2009. Chapter 3 |
| Week 7 | Determination of impurities in fat and oil | Richard D. O'Brien, 2009. Chapter 3 |
| Week 8 | Estimation of moisture contents in fat and oil | Richard D. O'Brien, 2009. Chapter 3 |

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| Week 9 | Estimation of specific gravity of fat and oil | Richard D. O'Brien, 2009. Chapter 3 |
| Week 10 | Determination of color of fat and oil | Richard D. O'Brien, 2009. Chapter 3 |
| Week 11 | Estimation of refractive index of fat | AOCS, 2020 |
| Week 12 | Measurement of peroxide value of oil | AOCS, 2020 |
| Week 13 | Measurement of smoke point of fat | AOCS, 2020 |
| Week 14 | Estimation of total polar contents (TPC) of frying oil | Research article reference |
| Week 15 | Measurements of fatty acids profile of olive oil by GC-MS | AOCS, 2020 |
| Week 16 | Visit to oil and fat industries | |

Textbooks and Reading Material

Books Recommended

1. AOCS. (2020). Official Methods and Recommended Practices of AOCS. (7th ed.). Am. Oil Chem. Soc., Illinois, USA.
2. Raie, M.Y. (2008). Oils, Fats and Waxes. National Book Foundation, Islamabad, Pakistan.
3. Akoh, C.C. & Min, D.B. (2008). Food Lipids: Chemistry, Nutrition and Biotechnology. (3rd ed.). CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.
4. Fereidoon, S. (2005). Edible Oil and Fat Products: Application Technology. John Wiley & Sons, Inc., New York, USA.
5. O'Brien, R.D. (2009). Fats and Oils: Formulating and Processing for Application. CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.

Teaching Learning Strategies

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assignments: Types and Number with Calendar

1. Oil seeds crops in Pakistan
2. Use of soybeans in the fat and oil processing industry

3. Comprehensive study on how can we reduce the Pakistan import bill of raw edible oil/seed
4. Laboratory apparatus, methods to evaluate the quality of fat and oil and its products

Assessment

| Sr. No. | Elements | Weightage | Details |
|----------------|----------------------|------------------|--|
| 1. | Midterm Assessment | 35% | Written Assessment at the mid-point of the semester. |
| 2. | Formative Assessment | 25% | Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc. |
| 3. | Final Assessment | 40% | Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc. |