



FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: Bachelor of Technology (Food Processing Technology)

Semester: IV

Course Code: 202070402

Course Title: Food Drying and Dehydration

Course Group: Professional Core Course

Course Objectives: To empower students with basic principles and practice of Food Drying and Dehydration

Teaching & Examination Scheme:

| Contact hours per week | | | Course Credits | Examination Marks (Maximum / Passing) | | | | |
|------------------------|----------|-----------|----------------|---------------------------------------|----------|----------|----------|--------|
| Lecture | Tutorial | Practical | | Theory | | J/V/P* | | Total |
| | | | | Internal | External | Internal | External | |
| 3 | 0 | 2 | 4 | 50/18 | 50/17 | 25/9 | 25/9 | 150/53 |

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

| Sr. | Contents | Hours |
|-----|---|-------|
| 1 | Introduction: Drying definition, Moisture removal and its need, Dehydration of food, Thermal properties related to drying of foods. | 05 |
| 2 | Food Moisture: Moisture content measurement, representation and determination, Equilibrium moisture content (EMC), its determination, methods, models and importance, Moisture sorption curves, Hysteresis phenomenon. | 08 |
| 3 | Drying theory and mechanisms: Drying process and principle, Drying rate periods – constant and falling rate periods and their calculation, Capillary and diffusion theory, Thin layer and deep bed drying, Dryer performance indices – overall thermal efficiency, specific energy consumption, coefficient of performance. | 08 |
| 4 | Classification and selection of dryers: Classification and selection | 05 |
| 5 | Types of dryers and their applications: Basic operation and application of the following dryers –Tray dryers, Vacuum dryers, Spray dryers, Fluidized bed dryers, Freeze dryers, Super-heated steam drying, Osmotic Dehydration, Drum dryer. | 07 |



| | | |
|---|--|----|
| 6 | Properties of dried products: Physical, Chemical and Microbiological characteristics of dehydrated foods | 06 |
| 7 | Emerging Trends in Drying Technologies: Novel drying techniques and Hybrid dryers | 06 |
| | Total | 45 |

List of Practicals / Tutorials:

| | |
|----|--|
| 1 | To measure thermal properties of food products. |
| 2 | EMC determination of grains |
| 3 | Determination of drying rate characteristics |
| 4 | Evaluate the performance of tray dryer |
| 5 | Evaluate dehydration and rehydration of food product |
| 6 | Evaluate spray drying performance |
| 7 | Study of solar drying |
| 8 | Study of the freeze drying process |
| 9 | Study of quality changes during drying of food materials |
| 10 | Study of LSU-type grain dryer |
| 11 | Evaluate the performance of vacuum dryer |

Reference Books:

| | |
|---|--|
| 1 | Unit operations of chemical engineering by McCabe and Smith. McGraw-Hill |
| 2 | Drying of Foods, Vegetables and Fruits (Volume 1), Sachin V. Jangam, Chung Lim Law and Arun S. Mujumdar. |
| 3 | Drying Technologies for Foods: Fundamentals and Applications, Prabhat K. Nema, Barjinder Pal Kaur, Arun S. Mujumdar, CRC Press, 2018 |
| 4 | Handbook of Industrial Drying, Edited By Arun S. Mujumdar, CRC Press, 2006 |
| 5 | Hand Book Of Food Dehydration & Drying, by Eiri Board, Published by Engineers India Research Institute (2008) |

Supplementary learning Materials:

| | |
|---|--|
| 1 | Food Drying and Dehydration: Technology and Effect on Food Properties, by Raquel Pinho Ferreira Guiné , Publisher: LAP Lambert Academic Publishing GmbH & Co. Germany, 2015 |
| 2 | http://www.aces.uiuc.edu/vista/html_pubs/DRYING/dryfood.html |
| 3 | http://nchfp.uga.edu/how/dry.html |
| 4 | http://www.britannica.com/EBchecked/topic/172410/drying-process |
| 5 | Advances in Food Dehydration, Edited By Cristina Ratti , 1 st Edition 2009 |

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Industrial/ Field visits



- Course Projects

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

| Distribution of Theory Marks in % | | | | | | R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating |
|-----------------------------------|-----|-----|-----|-----|-----|--|
| R | U | A | N | E | C | |
| 15% | 40% | 15% | 10% | 10% | 10% | |

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

| Sr. | Course Outcome Statements | %weightage |
|------|---|------------|
| CO-1 | Understand moisture content, moisture removal and its requirement. | 15 |
| CO-2 | Understand moisture content measurement and thermal properties related to drying. | 15 |
| CO-3 | Understand the drying mechanism for foods. | 20 |
| CO-4 | Select a suitable dryer meeting the requirement | 13 |
| CO-5 | Develop functional design of dryers. | 15 |
| CO-6 | Judge the quality of the dried product. | 10 |
| CO-7 | Understand novel and hybrid drying technology. | 12 |

Curriculum Revision:

| | |
|--------------------------------|-----------|
| Version: | 2 |
| Drafted on (Month-Year): | June-2022 |
| Last Reviewed on (Month-Year): | |
| Next Review on (Month-Year): | June-2025 |