Micro-encapsulation Techniques for Flavor and Bioactives Training Course

Professional Development Training Course Outline

Category	Food processing and Technology	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Micro-encapsulation Techniques for Flavor and Bioactives Training Course provides a comprehensive understanding of modern encapsulation technologies applied in food, nutraceutical, and pharmaceutical systems. This program focuses on the science, formulation, and process optimization behind micro-encapsulation, enabling controlled release, stability enhancement, and flavor retention in complex product matrices. Participants will explore the principles of core-shell systems, coating materials, and encapsulation performance evaluation using advanced analytical tools.

This course bridges scientific fundamentals with practical applications to support innovation in flavor delivery and bioactive protection. Through case studies, formulation trials, and sensory evaluation, learners gain insights into emulsification, spray drying, coacervation, liposomal systems, and nano-encapsulation. The program is ideal for product developers, food technologists, and R&D professionals seeking to improve product performance, extend shelf life, and achieve market differentiation through advanced encapsulation strategies.

Programme Curriculum

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Course Objectives

1. Understand the fundamental principles of micro-encapsulation and controlled release systems.
2. Explore various encapsulation techniques such as spray drying, coacervation, and extrusion.
3. Analyze the role of wall materials in protection and release of actives.
4. Examine encapsulation efficiency and stability factors influencing product performance.
5. Apply encapsulation in the preservation of flavors, vitamins, and antioxidants.
6. Optimize process parameters for enhanced retention and bioavailability.
7. Evaluate particle morphology and release kinetics through analytical methods.
8. Integrate encapsulation for flavor masking and taste modification.
9. Utilize nano-encapsulation and liposome systems for targeted delivery.
10. Implement encapsulation in clean-label and natural ingredient formulations.
11. Assess scalability and cost-effectiveness of industrial encapsulation systems.
12. Apply quality control, safety, and regulatory principles in encapsulation processes.
13. Design and execute encapsulation experiments with measurable outcomes.

Organizational Benefits

- Improve flavor retention, stability, and controlled release in product formulations.
- Strengthen R&D capabilities in functional ingredient development.
- Reduce degradation and loss of bioactive compounds during processing and storage.
- Enhance product innovation through novel encapsulation technologies.
- Increase shelf life and sensory performance of consumer products.
- Achieve competitive advantage through advanced ingredient delivery systems.
- Support sustainability by minimizing waste and improving resource utilization.
- Build staff expertise in formulation design and encapsulation processes.
- Promote compliance with global quality and safety standards.
- Foster innovation and collaboration between R&D and production teams.

Target Audiences

1. Food technologists and R&D specialists
2. Flavor and fragrance scientists
3. Pharmaceutical and nutraceutical formulators
4. Dairy and beverage product developers
5. Functional food and supplement manufacturers
6. Chemical and process engineers
7. Quality assurance and product safety officers
8. Innovation and product development managers

Course Duration: 10 days

Course Modules

Module 1: Fundamentals of Micro-encapsulation

- Principles and purpose of encapsulation in food and nutraceuticals
- Classification of encapsulation systems and core materials
- Role of particle size and morphology in product performance
- Mechanisms of protection and controlled release
- Factors affecting encapsulation efficiency and yield
- Case Study: Stability improvement of flavor oils through encapsulation

Module 2: Wall Materials and Coating Agents

- Properties and selection of encapsulation wall materials
- Use of carbohydrates, proteins, and lipids as coating matrices
- Wall-core interaction and encapsulation stability
- Effect of processing on coating performance
- Functionalization of wall materials for targeted release
- Case Study: Comparative study of maltodextrin and gum arabic as encapsulating agents

Module 3: Spray Drying Encapsulation Technique

- Principles of atomization and drying kinetics
- Parameters influencing powder quality and yield
- Optimization of inlet temperature and feed concentration
- Encapsulation efficiency and powder morphology analysis
- Industrial spray drying systems and scalability
- Case Study: Spray drying of vanilla flavor for beverage applications

Module 4: Coacervation and Complex Formation

- Simple and complex coacervation principles
- Polymer interaction and phase separation behavior
- Factors influencing droplet size and wall thickness
- Coating uniformity and encapsulation performance
- Application of coacervation in aroma and bioactive delivery
- Case Study: Encapsulation of essential oils using complex coacervation

Module 5: Extrusion and Fluidized Bed Coating

- Melt extrusion for encapsulation of thermally stable actives
- Fluidized bed systems and film-forming mechanisms
- Particle coating and agglomeration control
- Influence of coating material and process temperature
- Industrial applications in flavor and nutrient encapsulation
- Case Study: Encapsulation of vitamins using fluidized bed coating

Module 6: Nano-encapsulation and Liposomal Systems

- Introduction to nano-encapsulation for enhanced bioavailability
- Liposome formation and encapsulation of hydrophilic and hydrophobic compounds
- Techniques for nanoparticle synthesis and characterization
- Controlled release and stability in nano-carriers
- Application of liposomes in functional foods and nutraceuticals

- Case Study: Nano-encapsulation of curcumin for antioxidant beverages

Module 7: Analytical Methods and Characterization

- Measurement of encapsulation efficiency and particle size distribution
- Microscopic techniques for morphology evaluation
- Release kinetics and dissolution testing
- Stability assessment under environmental stress conditions
- Analytical validation and performance testing
- Case Study: Evaluation of encapsulated caffeine release profiles

Module 8: Flavor Encapsulation Applications

- Encapsulation of volatile flavor compounds
- Controlled release during storage and reconstitution
- Impact of encapsulation on aroma intensity and longevity
- Use of encapsulated flavors in dry mixes and beverages
- Stability and sensory evaluation of encapsulated systems
- Case Study: Micro-encapsulation of citrus flavor for powdered drink mix

Module 9: Bioactive and Nutrient Delivery Systems

- Encapsulation of vitamins, probiotics, and antioxidants
- Controlled delivery in the digestive tract
- Improving bioavailability of sensitive compounds
- Compatibility of bioactives with food matrices
- Application in fortified and functional food products
- Case Study: Encapsulation of omega-3 fatty acids in functional dairy products

Module 10: Process Optimization and Scale-up

- Pilot-scale validation and process design
- Optimization of drying and mixing parameters
- Scaling from laboratory to industrial level
- Process validation and documentation
- Quality consistency across production batches
- Case Study: Scale-up challenges in encapsulated flavor production

Module 11: Release Mechanisms and Kinetics

- Diffusion, erosion, and enzymatic release models
- Impact of temperature, pH, and moisture on release profiles
- Mathematical modeling of release behavior
- Experimental validation of release kinetics
- Strategies to control burst release and prolong activity
- Case Study: Controlled release of encapsulated probiotics in yogurt

Module 12: Sensory and Functional Evaluation

- Assessing sensory attributes of encapsulated products
- Flavor retention and masking effectiveness
- Functional performance testing of encapsulated actives

- Consumer perception and acceptance testing
- Integration of sensory and instrumental data
- Case Study: Sensory comparison of encapsulated versus free flavors

Module 13: Shelf Life and Stability Studies

- Factors affecting encapsulated product stability
- Moisture and oxygen barrier properties
- Thermal and light degradation resistance
- Shelf life prediction and accelerated testing
- Storage and packaging recommendations
- Case Study: Shelf life improvement of encapsulated vitamins

Module 14: Industrial Applications and Case Studies

- Application of encapsulation in food and beverage systems
- Nutraceutical and pharmaceutical delivery systems
- Encapsulation in flavor masking and fortification
- Emerging technologies and market applications
- Cost-benefit and sustainability considerations
- Case Study: Industrial implementation of encapsulated caffeine in RTD drinks

Module 15: Project Work and Innovation Strategies

- Designing encapsulation experiments
- Data interpretation and reporting of results
- Innovation in material selection and processing
- Evaluation of new encapsulation technologies
- Presentation of project findings and feedback sessions
- Case Study: Development of a novel encapsulated flavor for a functional snack

Training Methodology

- Interactive lectures with technical presentations
- Practical demonstrations of encapsulation processes
- Group discussions and case-based analysis
- Laboratory-based formulation and evaluation exercises
- Industry-driven research and project assignments

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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