MODULE HANDBOOK
MASTER IN FOOD SCIENCE AND TECHNOLOGY

FACULTY OF AGRICULTURAL TECHNOLOGY
UNIVERSITAS GADJAH MADA
2025

TABLE OF CONTENTS

CHAPTER I
COMPULSORY COURSES

1.1 Advanced Food Analysis

Module designation	This course covers advanced food analysis techniques applied in food and agricultural product research, including sample preparation, chromatographic and spectroscopic methods, and analytical method validation. Analytical method development and optimization are discussed using statistical and experimental design approaches, particularly for data evaluation and interpretation. In selected applications, spectroscopic data are analyzed using chemometric methods, including multivariate statistics and AI-assisted analysis, to support efficient and reliable food analysis. Learning activities are conducted through paper-based discussion and case studies to support research-oriented problem solving.
Module level, if applicable	Master
Code, if applicable	TPTP215013
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd/Even semester (1st semester)
Person responsible for the module	Dr.nat.techn. FMC. Sigit Setyabudi, S.T.P., M.P.
Lecturer	1. Dr.nat.techn. FMC. Sigit Setyabudi, S.T.P., M.P. 2. Andriati Ningrum, S.T.P., M.Agr., Ph.D. 3. Dr. Widiastuti Setyaningsih, S.T.P., M.Sc. 4. Prof. Dr. Endang Tri Wahyuni, M.Sc.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Interactive lectures, paper-based discussion, case studies, and problem-based learning (PBL)
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study

	per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester ECTS distribution: ● Theory: 1.85 ECTS ● Practical work: 1.85 ECTS Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 5: Able to take a scientific approach to solve problems through the measurement of appropriate variable, to collect valid data, to interprete the data, and relate it to research problem-solving Course Learning Outcome (CLO): 1. CLO 5.1: Able to take a scientific approach to solve problem through the measurement of appropriate variables 2. CLO 5.2: Understand the current method of analysis using instruments 3. CLO 5.3: Able to collect valid data from the experiments
Content	**1. Introduction to Advanced Food Analysis and Analytical Method Validation** Overview of the course scope, learning objectives, and relevance of advanced food analysis in research and industry. Introduction to analytical method development concepts and method validation principles, including analytical performance parameters and data reliability.

	2. **Sample Preparation and Extraction Techniques** Principles of sample preparation in food analysis, including extraction, clean-up, and matrix considerations affecting analytical reliability, with selected examples of green extraction and green analytical chemistry to reduce solvent use, energy consumption, and experimental waste. 3. **Case Study of Analytical Method Development** Critical discussion of selected case studies from scientific literature focusing on analytical workflows, data interpretation, and methodological considerations, statistical evaluation, and analytical efficiency, with consideration of sustainability aspects in food analysis. 4. **Fundamental Theory of Chromatographic Separation** Basic principles of chromatographic separation, including retention mechanisms, resolution, selectivity, efficiency, and factors influencing separation performance. 5. **Optimization of Chromatographic Separation** Optimization strategies for chromatographic separation using statistical and experimental design approaches, including factorial design, response surface methodology, and analysis of variance (ANOVA) for data evaluation. 6. **High-Performance Liquid Chromatography (HPLC)** Instrumentation, column types, mobile phases, detectors, and operational parameters of HPLC systems for food analysis. 7. **Applications of HPLC for Food Analysis** Applications of HPLC for qualitative and quantitative analysis of food components, contaminants, and bioactive compounds, including interpretation of chromatographic data. 8. **Gas Chromatography (GC)** Principles and instrumentation of gas chromatography, stationary phases, injection systems, and analytical considerations for volatile and semi-volatile compounds. 9. **Detectors in Gas Chromatography Systems** Types and principles of GC detectors and their selection for specific analytical purposes in food analysis. 10. **Applications of Gas Chromatography** Applications of GC in food quality, safety, and authenticity studies, with emphasis on analytical interpretation rather than instrument operation.

	11. Introduction Spectroscopy and Optical Instrumentation Fundamental concepts of spectroscopy and optical instrumentation, including interaction of electromagnetic radiation with matter and signal generation. **12. Flame Emission Spectroscopy (FES) and Atomic Absorption Spectroscopy (AAS)** Principles, instrumentation, and applications of FES and AAS for elemental analysis in food and agricultural products. **13. Infrared Spectroscopy (IR Spectroscopy) and Mass Spectroscopy (MS)** Principles and applications of IR spectroscopy and mass spectrometry for structural characterization and qualitative analysis in food systems, including selected examples of data interpretation.
Study and examination requirements and forms of examination	Discussion, Q&A (25%); Assignments (25%); Midterm Exam (25%); Final Exam (25%)
Media employed	PC, LCD, whiteboard, PPT, and Simaster
Reading list	**Standards and Guidelines** 1. ISO/IEC 17025:2017. General requirements for the competence of testing and calibration laboratories. International Organization for Standardization. 2. EURACHEM. The Fitness for Purpose of Analytical Methods – A Laboratory Guide to Method Validation and Related Topics. Latest edition. 3. EURACHEM/CITAC. Guide to Quality in Analytical Chemistry: An Aid to Accreditation **Method Validation - Core Textbook** 1. Konieczka, P., & Namieśnik, J. (2018). Quality Assurance and Quality Control in the Analytical Chemical Laboratory: A Practical Approach. CRC Press. 2. Konieczka, P. (Ed.). (2022). Analytical Method Validation and Instrument Performance Verification. CRC Press. **Core Textbooks - Advanced & Instrumental Food Analysis** 1. Santoso, U., Setyaningsih, W., Ningrum, A., et al. (2020). Analisis Pangan. Gadjah Mada University Press.

	2. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2014). Principles of Instrumental Analysis (6th ed.). Cengage Learning. 3. Miller, J. N., & Miller, J. C. (2018). Statistics and Chemometrics for Analytical Chemistry (7th ed.). Pearson. 4. Setyaningsih, W. (2023). Analytical Methods Used for Assessing the Quality of Food Products. In: Chemical and Functional Properties of Food Components (4th ed.), pp. 535–548. **Chemometrics & Statistical Data Analysis** 1. Brereton, R. G. (2015). Chemometrics: Data Analysis for the Laboratory and Chemical Plant. Wiley. 2. Bevilacqua, M., Bro, R., & Marini, F. (2020). Chemometrics in food chemistry: An overview. Chemometrics and Intelligent Laboratory Systems, 205, 104190. 3. Granato, D., Santos, J. S., Escher, G. B., et al. (2018). Chemometrics in food science and nutrition. Food Research International, 107, 458–471. **AI-Assisted & Spectroscopy-Based Food Analysis** 1. Cozzolino, D. (2020). The role of visible and infrared spectroscopy combined with chemometrics to measure food quality. Trends in Food Science & Technology, 99, 45–54. 2. Rodriguez-Saona, L. E., & Allendorf, M. E. (2019). Use of FTIR for rapid authentication and quality control. Annual Review of Food Science and Technology, 10, 287–311. 3. Panagou, E. Z., et al. (2014). Artificial intelligence in food analysis. Food Control, 40, 1–7. **Advanced Chromatographic & Spectroscopic Applications** 1. Dovidauskas, S., et al. (2020). Journal of Chromatography A, 1632, 461603. 2. Narukawa, T., et al. (2015). Analytical Sciences, 31, 521–527. 3. Pelillo, M., et al. (2004). Food Chemistry, 87, 465–470.
Last modified	August 5th, 2025

1.2 Independent Study

Module designation	This course provides guided independent learning for students to develop a research proposal in the field of food science and technology. Students conduct a critical literature review, formulate research problems and objectives, and design appropriate research methodologies. The learning process emphasizes research autonomy under supervision, scientific reasoning, and the justification of experimental design and statistical approaches. AI-assisted tools may be used as supporting instruments for literature management and research planning under ethical guidelines. Through structured presentations and discussions, this course prepares students for subsequent research-oriented courses and thesis work, contributing to relevant Sustainable Development Goals (SDGs) related to food systems.
Module level, if applicable	Master
Code, if applicable	TPTP215012
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd/Even semester (2nd semester)
Person responsible for the module	Dr. Widiastuti Setyaningsih, S.T.P., M.Sc.
Lecturer	1. Dr. Ir. Muhammad Nur Cahyanto, M.Sc. 2. Prof. Dr. Ir. Chusnul Hidayat 3. Dr. Widiastuti Setyaningsih, S.T.P., M.Sc. 4. Dr. Fiametta Ayu Purwandari, S.T.P., M.Sc.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 144 hours per semester, consisting of 180 minutes of lectures per week, 180 minutes of structured assignments per week, and 180 minutes of self-study

	per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 9 hours/week × 16 weeks/semester = 144 hours/semester = 144 hours/semester ÷ 26 hours/ECTS = 5.55 ECTS/semester Total Workload = 5.55 ECTS/semester ECTS distribution: ● Theory: 1.85 ECTS ● Practical work: 3.70 ECTS Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	3 credit points (equivalent to 5.55 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	Research Methodology, Advanced Food Analysis, and elective courses (14.8 ECTS)
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances 2. PLO 4: Able to gather information from scientific findings, develop a conceptual framework and formulate research problems 3. PLO 5: Able to take a scientific approach to solve problems through the measurement of appropriate variables, to collect valid data, to interpret the data, and relate it to research problem-solving Course Learning Outcome (CLO): 1. CLO 3.1: Mastering theoretical concepts in specific areas of food science and technology (food chemistry/food microbiology/food process engineering/food nutrition) 2. CLO 4.1: Able to gather information from previous findings published in scientific journals and develop a conceptual framework

	3. CLO 4.2: Able to formulate research problems 4. CLO 5.1: Able to take a scientific approach to solve problem though the measurement of appropriate variables
Content	1. Introduction 2. Explanation of Research Proposal Structure and Research Log Book 3. Guidance on Reviewing Research Proposal Development (Research background, research problem and objectives, theoretical framework and hypothesis) 4. Guidance on Reviewing Research Proposal Development (Research methods, experimental design)
Study and examination requirements and forms of examination	Research background (20%); Problem statement (20%); Literature study and hypothesis (10%); Methodology and design experiment (30%); Discussion (15%); Proposal writing redactional (5%)
Media employed	PC, LCD, whiteboard, PPT, Simaster, and Elok
Reading list	1. Montgomery, D. C. (2019). Design and Analysis of Experiments (10th ed.). Wiley. 2. Creswell, J. W., & Creswell, J. D. (2018). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). SAGE. 3. Committee on Publication Ethics (COPE). (2019). Core Practices. 4. Peer-reviewed scientific journals in the field of Science and Technology, Food Analysis, Food Microbiology, Bioprocess, Nutrition Journals related to Food Science and Technology, Food Analysis, Food Microbiology, Bioprocess, Nutrition
Last modified	August 5th, 2025

1.3 Research Methodology

Module designation	This course covers principles and systematic approaches to scientific research in food science and technology, including problem identification, literature review, research design, data collection, statistical analysis, and research ethics. Students are trained to formulate research problems, develop conceptual frameworks, and design experimental and non-experimental studies using appropriate statistical and experimental designs. Through critical literature review, appropriate research design, and responsible data analysis, students are trained to develop research proposals that address real-world societal challenges related to food systems.
Module level, if applicable	Master
Code, if applicable	TPTP215011
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd/Even semester (1st semester)
Person responsible for the module	Rachma Wikandari, S.T.P., M.Biotech., Ph.D.
Lecturer	1. Rachma Wikandari, S.T.P., M.Biotech., Ph.D. 2. Dr. Widiastuti Setyaningsih, S.T.P., M.Sc. 3. Dr. Dwi Larasatie Nur Fibri, S.T.P., M.Sc. 4. Wahyu Dwi Saputra, S.T.P., M.Agr.Sc., Ph.D. 5. Bambang Dwi Wijatniko, S.T.P., M.Agr.Sc, M.Sc., Ph.D.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Lectures, interactive discussions, paper-based learning, and project-based learning. Learning activities emphasize critical evaluation of scientific literature, formulation of research problems, design of experimental and non-experimental studies, and justification of statistical analysis plans. AI-assisted tools are used in a guided manner to support literature review, reference management, and research planning, while maintaining scientific reasoning and research ethics.

Workload (incl. contact hours, self-study hours)	The total workload is approximately 144 hours per semester, consisting of 180 minutes of lectures per week, 180 minutes of structured assignments per week, and 180 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 9 hours/week × 16 weeks/semester = 144 hours/semester = 144 hours/semester ÷ 26 hours/ECTS = 5.55 ECTS/semester Total Workload = 5.55 ECTS/semester ECTS distribution: ● Theory: 3.70 ECTS ● Practical work: 1.85 ECTS Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	3 credit points (equivalent to 5.55 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances 2. PLO 4: Able to gather information from scientific findings, develop a conceptual framework and formulate research problems 3. PLO 5: Able to take a scientific approach to solve problems through the measurement of appropriate variables, to collect valid data, to interpret the data, and relate it to research problem-solving Course Learning Outcome (CLO): 1. CLO 3.1: Mastering theoretical concepts in specific areas of food science and technology (food chemistry/food microbiology/food process engineering/food nutrition)

	2. CLO 4.1: Able to gather information from previous findings published in scientific journals and develop a conceptual framework 3. CLO 4.2: Able to formulate research problems 4. CLO 5.1: Able to take a scientific approach to solve problem though the measurement of appropriate variables
Content	**1. Introduction and Sources of Scientific Information** Principles of scientific inquiry, types of research in food science and technology, and sources of scientific information. Introduction to academic databases, peer-reviewed journals, citation ethics, and strategies for identifying credible and up-to-date scientific references. AI-assisted literature searching, screening, and mapping of research topics. **2. Writing the Background, Problem Formulation, and Research Objectives** Techniques for developing a strong research background based on scientific evidence, formulation of clear and researchable problems, and alignment of research objectives with research questions. AI-assisted identification of research gaps and refinement of problem statements. Translating research problems into testable variables and measurable outcomes. **3. Writing the Literature Review, Reference Management, and Hypothesis** Systematic approaches to reviewing scientific literature, synthesizing previous findings, identifying research gaps, and formulating hypotheses. AI-assisted reference management, literature summarization, and thematic clustering (used critically, not automatically). **4. Writing the Methods** Principles of research methodology, including selection of research design, sampling techniques, variable definition, data collection methods, ethical considerations, and alignment between objectives, methods, and data analysis. Matching research objectives with suitable statistical analyses and experimental designs. **5. Introduction to Experimental Design** Fundamental concepts of experimental design, including experimental units, factors, levels, replication, randomization, and control of variability.

	Statistics context: Principles of variance, experimental error, and assumptions for statistical testing. 6. **Completely Randomized Design (CRD)** Principles, assumptions, applications, and data analysis of CRD in experimental research. Statistics context: Analysis of variance (ANOVA), interpretation of significance, and model assumptions. 7. **Randomized Block Design (RBD)** Concepts and applications of RBD to reduce experimental variability through blocking. Statistics context: ANOVA for RBD, interpretation of treatment and block effects. 8. **Latin Square Design and Split-Plot Design** Design principles for experiments involving multiple sources of variability and hierarchical structures. Statistics context: ANOVA models for Latin Square and Split-Plot designs, interpretation of main and interaction effects. 9. **Fractional Factorial Design, Box-Behnken Design, and Central Composite Design** Advanced experimental designs for multifactor studies and optimization. Statistics context: Response Surface Methodology (RSM), model fitting, ANOVA, significance testing, and interpretation of response surfaces. AI support (selected): AI-assisted visualization and interpretation of multivariate experimental data. 10. **Qualitative Research, Survey and Data Presentation** Principles of qualitative research and survey methods, questionnaire design, data validation, ethical considerations, and effective data presentation using tables, graphs, and figures. 11. **Student Proposal Presentation** Presentation and critical discussion of student research proposals, focusing on clarity of problem formulation, methodological soundness, feasibility, and scientific relevance. Justification of experimental design and statistical analysis plans.

Study and examination requirements and forms of examination	Discussion, Q&A (20%); Proposal writing (20%); Proposal Presentation (20%); Midterm Exam (20%); Final Exam (20%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	1. Creswell, J. W., & Creswell, J. D. (2018). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). SAGE. 2. Machi, L. A., & McEvoy, B. T. (2020). The Literature Review: Six Steps to Success (3rd ed.). Corwin. 3. Montgomery, D. C. (2019). Design and Analysis of Experiments (10th ed.). Wiley. 4. National Academies of Sciences, Engineering, and Medicine. (2017). Fostering Integrity in Research. National Academies Press. 5. Committee on Publication Ethics (COPE). (2019). Core Practices. 6. Perkel, J. M. (2023). Six tips for using AI in literature review. Nature, 613, 423–425. 7. van Eck, N. J., & Waltman, L. (2020). VOSviewer manual & bibliometric mapping. Scientometrics. 8. Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). Internet, Phone, Mail, and Mixed-Mode Surveys. Wiley.
Last modified	August 5th, 2025

1.4 Scientific Communication I

Module designation	Scientific communication I is a graduate-level course designed to develop students' competencies in communicating food science research and scientific knowledge effectively, ethically, and critically through written, visual, and oral formats. The course covers scientific writing, manuscript structure, publication ethics, scientific posters, and oral presentation techniques, with reference to international standards in food science publishing. This course contributes to SDG 4 - Quality education by implementing scientific literacy and effective knowledge dissemination and SDG 17 - Partnerships for the goals by using science communication for collaboration and impact. The course applies a project-based case study approach using students' bachelor theses as real research cases. Students transform their undergraduate theses into scientific manuscripts and posters, which are presented and critically discussed in class through structured peer review and problem-solving activities.
Module level, if applicable	Master
Code, if applicable	TPTP215014
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd/Even semester (1st semester)
Person responsible for the module	Rachma Wikandari, S.T.P., M.Biotech., Ph.D.
Lecturer	1. Rachma Wikandari, S.T.P., M.Biotech., Ph.D. 2. Prof. Dr. Ir. Supriyadi, M.Sc. 3. Prof. Dr. Ir. Eni Harmayani, M.Sc 4. Dr. Fiametta Ayu Purwandari, S.T.P., M.Sc.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Lecture, Interactive Discussion, and Oral Presentation Practice by Student

Workload (incl. contact hours, self-study hours)	The total workload is approximately 48 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 3 hours/week × 16 weeks/semester = 48 hours/semester = 48 hours/semester ÷ 26 hours/ECTS = 1.85 ECTS/semester Total Workload = 1.85 ECTS/semester ECTS distribution: ● Theory: 0 ECTS ● Practical work: 1.85 ECTS Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	1 credit point (equivalent to 1.85 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 6: Able to communicate the scientific findings in scientific conferences or scientific journals Course Learning Outcome (CLO): 1. CLO 6.1: Able to communicate the scientific findings in scientific conferences
Content	1. Introduction, Types of Scientific Articles, and Publication Ethics 2. Writing Research Articles: Structure, Abstract, and Introduction 3. Writing Research Articles: Research Methodology 4. Writing Research Articles: Research Findings, Discussion, and Conclusion 5. Scientific Poster Creation 6. Presentation of Scientific Article Drafts

	7. Presentation Techniques: Types of Oral Presentations and Presentation Media 8. Presentation Techniques: Effective Presentation Methods 9. Practice in Oral Presentation
Study and examination requirements and forms of examination	Proposal writing (25%); Proposal Presentation (25%); Midterm Exam (25%); Final Exam (15%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	1. Lövei, G. L. (2021). Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker. England: Open Book Publishers. 2. The Routledge Handbook of Scientific Communication. (2021). United Kingdom: Taylor & Francis. 3. Bottomley, J. (2021). Academic Writing for International Students of Science. United Kingdom: Taylor & Francis. 4. Helping Scientists to Communicate Well for All Considered: Strategic Science Communication in an Age of Environmental and Health Crises. (2022). (n.p.): Frontiers Media SA. 5. Gastel, B., Day, R. A. (2022). How to Write and Publish a Scientific Paper. Indonesia: ABC-CLIO. 6. Janse, D. (2021). Science Poster Design Guide: A Practical Guide for Designing Science Posters and Visuals. Netherlands: Eleven International Publishing.
Last modified	August 5th, 2025

1.5 Scientific Communication II

Module designation	This course provides structured mentoring in scientific manuscript preparation based on students' research results. The course covers the organization and writing of scientific articles, journal selection strategies, publication ethics, and response to peer-review. Emphasis is placed on clear scientific argumentation, ethical publication practices, and effective communication of research findings in national and international scientific journals.
Module level, if applicable	Master
Code, if applicable	TPTP216011
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd/Even semester (4th semester)
Person responsible for the module	Dr. Ir. Muhammad Nur Cahyanto, M.Sc.
Lecturer	1. Prof. Dr. Ir. Chusnul Hidayat 2. Dr. Ir. Muhammad Nur Cahyanto, M.Sc. 3. Dr. Widiastuti Setyaningsih, S.T.P., M.Sc. 4. Rachma Wikandari, S.T.P., M.Biotech., Ph.D.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, dan Case Study
Workload (incl. contact hours, self-study hours)	The total workload is approximately 48 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 3 hours/week × 16 weeks/semester = 48 hours/semester = 48 hours/semester ÷ 26 hours/ECTS

	= 1.85 ECTS/semester Total Workload = 1.85 ECTS/semester ECTS distribution: ● Theory: 0 ECTS ● Practical work: 1.85 ECTS Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	1 credit point (equivalent to 1.85 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances 2. PLO 4: Able to gather information from scientific findings, develop a conceptual framework and formulate research problems 3. PLO 5: Able to take a scientific approach to solve problems through the measurement of appropriate variables, to collect valid data, to interpret the data, and relate it to research problem-solving 4. PLO 6: Able to communicate the scientific findings in scientific conferences or scientific journals Course Learning Outcome (CLO): 1. CLO 3.1: Mastering theoretical concepts in specific areas of food science and technology (food chemistry/food microbiology/food process engineering/food nutrition) 2. CLO 4.1: Able to gather information from previous findings published in scientific journals and develop a conceptual framework 3. CLO 4.2: Able to formulate research problems 4. CLO 5.1: Able to take a scientific approach to solve problem though the measurement of appropriate variables 5. CLO 5.4: Able to interpret data and relate it to research problem solving

	6. CLO 6.2: Able to publish the research findings in scientific journal
Content	**1. Introduction** ● Explanation of the syllabus ● Overview of program regulations related to student publications ● Explanation of course implementation and evaluation methods **2. Preparation for Manuscript Writing** ● Understanding Manuscript Structure ● Choosing a Journal ● Crafting the Title and Abstract ● Writing the Introduction ● Detailing the Research Methods ● Presenting Results **3. Understanding Publication Ethics** ● Authorship Criteria ● Avoiding Plagiarism ● Data Integrity ● Conflict of Interest ● Multiple Submissions ● Peer Review **4. Responding to Reviewer Comments** ● Reviewing Comments Thoroughly ● Organizing Responses ● Using a Respectful and Professional Tone ● Providing Clear Justifications ● Highlighting Changes ● Addressing Every Comment ● Revising the Manuscript Accordingly **5. Mentoring fine-tuning Student Manuscript Draft Writing**
Study and examination requirements and forms of examination	Assignments (50%); Presentation (50%)
Media employed	Presentation, Q&A, Case Study, Elok, and Simaster
Reading list	1. International Committee of Medical Journal Editors (ICMJE). (2023). Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work.

	2. Peraturan Menteri Pendidikan Nasional Nomor 17 Tahun 2010 tentang Pencegahan dan Penanggulangan Plagiat di Perguruan Tinggi. 3. Wager, E., & Kleinert, S. (2019). Responsible Research Publication: International Standards for Authors (Updated guidelines). 4. Bolaños, F., Salatino, A., Osborne, F., & Motta, E. (2024). Artificial Intelligence for Literature Reviews: Opportunities and Challenges. arXiv. 5. Meliante, L. A. (2025). Evaluation of AI tools versus the PRISMA method for systematic reviews. JMIR AI.
Last modified	August 5th, 2025

1.6 Thesis (Regular)

Module designation	This course facilitates structured and supervised independent research in the field of food science and technology. Students progressively develop research competence through stepwise stages, including proposal preparation, data collection, statistical analysis, interpretation, thesis writing, and defense. The research process emphasizes methodological appropriateness, analytical rigor, and academic integrity, with AI-assisted tools used as supporting instruments for literature management and data processing under supervision. Through guided research practice, this course develops Master-level competence in scientific problem solving and contributes to sustainable food systems and relevant Sustainable Development Goals (SDGs).
Module level, if applicable	Master
Code, if applicable	TPTP216092
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd/even semester (3rd and 4th semester)
Person responsible for the module	Dr. Ir. Muhammad Nur Cahyanto, M.Sc.
Lecturer	Dr. Ir. Muhammad Nur Cahyanto, M.Sc.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Experiment, Presentation, and Discussion
Workload (incl. contact hours, self-study hours)	The thesis workload is 8 hours per day, 5 days per week, over 22 weeks in a semester Workload calculation for one semester = 8 hours/day × 5 days/week × 22 weeks/semester = 880 hours/semester = 880 hours ÷ 26 hours/ ECTS = 33.8 ECTS/semester

	The thesis is conducted over **2 semesters** Total Workload = 33.8 ECTS/semester × 2 semesters = 67.6 ECTS Notes: ● 1 semester consists of 22 weeks of full-time study ● 1 ECTS is equivalent to 25 – 30 hours of work, with 26 hours set as the minimum standard.
Credit points	12 credit points (33.8 ECTS/semester)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 1: Pancasila minded and have awareness of the interest of the nation 2. PLO 2: Having responsibility, confidence, emotional maturity, ethics, and awareness of being a lifelong learner 3. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances 4. PLO 4: Able to gather information from scientific findings, develop a conceptual framework and formulate research problems 5. PLO 5: Able to take a scientific approach to solve problems through the measurement of appropriate variables, to collect valid data, to interpret the data, and relate it to research problem-solving 6. PLO 6: Able to communicate the scientific findings in scientific conferences or scientific journals Course Learning Outcome (CLO): 1. CLO 1.1.: Pancasila minded and have awareness of the interest of the nation 2. CLO 2.1: Having responsibility, confidence, emotional maturity, ethics, and awareness of being a lifelong learner 3. CLO 3.1: Mastering theoretical concepts in specific areas of food science and technology (food chemistry/food microbiology/food process engineering/food nutrition)

	4. CLO 3.2: Understand the current development in food science and technology from recent scientific publications 5. CLO 4.1: Able to gather information from previous findings published in scientific journals and develop a conceptual framework 6. CLO 4.2: Able to formulate research problems 7. CLO 5.1: Able to take a scientific approach to solve problem though the measurement of appropriate variables 8. CLO 5.2: Understand the current method of analysis using instruments 9. CLO 5.3: Able to collect valid data from the experiments 10. CLO 5.4: Able to interpret data and relate it to research problem solving 11. CLO 6.1: Able to communicate the scientific findings in scientific conferences 12. CLO 6.2: Able to publish the research findings in scientific journal
Content	1. Preparation of research proposal 2. Proposal Examination 3. Conducting research 4. Research Monitoring and Evaluation 5. Thesis Writing: Tabulation (recap), interpreting data, methods, and application of statistical data analysis 6. Writing a publication and submitting it 7. Thesis examination
Study and examination requirements and forms of examination	Attitude Skills (5%); Thesis Defense (45%); Thesis Proposal Seminar (10%); Thesis Research Implementation (40%)
Media employed	PC, LCD, whiteboard, PPT
Reading list	1. Montgomery, D. C. (2019). Design and Analysis of Experiments (10th ed.). Wiley. 2. Creswell, J. W., & Creswell, J. D. (2018). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). SAGE. 3. Committee on Publication Ethics (COPE). (2019). Core Practices. 4. Peer-reviewed scientific journals in the field of food science and technology and other relevant supporting disciplines.
Last modified	August 5th, 2025

1.7 Thesis (By Research)

Module designation	This course facilitates research-intensive, independent study conducted within an established research framework under close academic supervision. Students engage directly in ongoing or collaborative research activities, from problem formulation and experimental or analytical design to data collection, statistical analysis, interpretation, and dissemination of results. AI-assisted tools may be used as supporting instruments for literature management, data processing, and analytical interpretation in accordance with ethical guidelines. Through research-driven and data-based inquiry, this course develops Master-level competence in producing original, scientifically rigorous, and publishable research, contributing to sustainable food systems and relevant Sustainable Development Goals (SDGs).
Module level, if applicable	Master
Code, if applicable	TPTP216092
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd/Even semester (2^{nd}, 3^{rd} and 4^{th} semester)
Person responsible for the module	Dr. Ir. Muhammad Nur Cahyanto, M.Sc.
Lecturer	Dr. Ir. Muhammad Nur Cahyanto, M.Sc.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2^{nd} semester
Type of teaching methods, contact hours	Experiment, Presentation, and Discussion
Workload (incl. contact hours, self-study hours)	The thesis workload is 8 hours per day, 5 days per week, over 22 weeks in a semester Workload calculation for one semester = 8 hours/day × 5 days/week × 22 weeks/semester = 880 hours/semester = 880 hours ÷ 26 hours/ ECTS = 33.8 ECTS/semester

	The thesis is conducted over **3 semesters** Total Workload = 33.8 ECTS/semester × 3 semesters = 101.4 ECTS Notes: ● 1 semester consists of 22 weeks of full-time study ● 1 ECTS is equivalent to 25 – 30 hours of work, with 26 hours set as the minimum standard.
Credit points	30 credit points (33.8 ECTS/semester)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 1: Pancasila minded and have awareness of the interest of the nation 2. PLO 2: Having responsibility, confidence, emotional maturity, ethics, and awareness of being a lifelong learner 3. PLO 4: Able to gather information from scientific findings, develop a conceptual framework and formulate research problems 4. PLO 5: Able to take a scientific approach to solve problems through the measurement of appropriate variables, to collect valid data, to interpret the data, and relate it to research problem-solving 5. PLO 6: Able to communicate the scientific findings in scientific conferences or scientific journals Course Learning Outcome (CLO): 1. CLO 1.1.: Pancasila minded and have awareness of the interest of the nation 2. CLO 2.1: Having responsibility, confidence, emotional maturity, ethics, and awareness of being a lifelong learner 3. CLO 4.1: Able to gather information from previous findings published in scientific journals and develop a conceptual framework 4. CLO 4.2: Able to formulate research problems 5. CLO 5.1: Able to take a scientific approach to solve problem though the measurement of appropriate variables

	6. CLO 5.2: Understand the current method of analysis using instruments 7. CLO 5.3: Able to collect valid data from the experiments 8. CLO 5.4: Able to interpret data and relate it to research problem solving 9. CLO 6.1: Able to communicate the scientific findings in scientific conferences 10. CLO 6.2: Able to publish the research findings in scientific journal
Content	1. Preparation of research proposal 2. Proposal Examination 3. Conducting research 4. Research Monitoring and Evaluation 5. Thesis Writing: Tabulation (recap), interpreting data, methods, and application of statistical data analysis 6. Writing a publication and submitting it 7. Thesis examination
Study and examination requirements and forms of examination	Attitude Skills (5%); Thesis Defense (45%); Thesis Proposal Seminar (10%); Thesis Research Implementation (40%)
Media employed	PC, LCD, whiteboard, PPT
Reading list	1. Montgomery, D. C. (2019). Design and Analysis of Experiments (10th ed.). Wiley. 2. Creswell, J. W., & Creswell, J. D. (2018). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). SAGE. 3. Committee on Publication Ethics (COPE). (2019). Core Practices. 4. Peer-reviewed scientific journals in the field of food science and technology and other relevant supporting disciplines.
Last modified	August 5th, 2025

CHAPTER II
ELECTIVE COURSES

2.1 Protein Chemistry and Technology

Module designation	This course discusses the problems and challenges in protein chemistry and technology, especially aspects of functional properties and modifications, extraction and isolation techniques. The course also emphasizes the developments in the field of protein chemistry and technology, which support SDGs 9 regarding the innovation in the field of food technology. The course also involves case-based learning, where students critically analyze recent publications (≥2020) to define problems in protein extraction, modification, and functionality, and formulate scientific-based solutions which will be discussed during the presentation section. Artificial intelligence (AI) is introduced to support literature exploration and trend mapping, while basic statistical approaches are applied to evaluate, interpret, and draw conclusions from experimental data reported in the referenced studies. The total student workload corresponds to 3.7 ECTS.
Module level, if applicable	Master
Code, if applicable	TPTP215121
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd semester (1st or 2nd semester)
Person responsible for the module	Andriati Ningrum, S.T.P., M.Agr., Ph.D.
Lecturer	1. Andriati Ningrum, S.T.P., M.Agr., Ph.D. 2. Dr. rer.nat. Lucia Dhiantika Witasari, S.Farm., Apt., M.Biotech. 3. Dr. Arima Diah Setiowati, S.T.P., M.Sc.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester

Type of teaching methods, contact hours	Problem/Case based learning, Q&A, Discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2: Understand the current development in food science and technology from recent scientific publications
Content	1. Introduction to Protein 2. Physicochemical Characterization of Protein 3. Plant and Animal Based Protein 4. Functional Characterization of Protein (1) 5. Functional Characterization of Protein (2) 6. Nutrigenomics 7. Proteomics 8. Student Presentation regarding Chemistry and Technology of Protein Topics

Study and examination requirements and forms of examination	Presentation (30%); Midterm Exam (35%); Final Exam (35%)
Media employed	PC, LCD, whiteboard, PPT, Google Classroom, and Simaster
Reading list	**Scientific Journal:** 1. Kumar M., et al. 2022. Functional characterization of plant-based protein to determine its quality for food applications, Food Hydrocolloids, Volume 123. https://doi.org/10.1016/j.foodhyd.2021.106986. 2. Other scientific journals (Indexed by Scopus, WoS, SINTA, etc) **Books:** 1. Almeida, P. 2025. Proteins: Concepts in Biochemistry (2nd ed.). Garland Science. https://doi.org/10.1201/9781003404170 2. Damodaran, S. 2017. Food Proteins and Their Applications. United Kingdom: CRC Press. 3. Udenigwe C. (editor). 2021. Food Proteins and Peptides: Emerging Biofunctions, Food and Biomaterial Applications, The Royal Society of Chemistry. 4. Poluri, K.M. et al. 2021. Protein-Protein Interactions: Principles and Techniques. Springer Singapore. https://doi.org/10.1007/978-981-16-1594-8. 5. Steemburgo, T. et al. 2024. Nutrigenetics and Nutrigenomics. in Precision Nutrition Book. Academic Press. 6. Suni C.K., Meda V., and Palanimuthu V. 2025. Plant-Based Proteins Processing: Emerging Trends and Applications. Academic Press. The other (older) fundamental books list could be accessed in this link: http://ugm.id/ProteinChemAndTech
Last modified	August 5th, 2025

2.2 Carbohydrate Chemistry and Technology

Module designation	The course also introduces data interpretation approaches, including AI-assisted literature exploration, to help students critically evaluate recent scientific publications on carbohydrate chemistry and technology. These approaches are used to support understanding of structure–function relationships and current technological advances. This course carries a total workload equivalent to 3.7 ECTS. The learning outcomes contribute to the achievement of the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) through innovation in food ingredients and functionality, SDG 9 (Industry, Innovation and Infrastructure) through advancement of carbohydrate processing technologies, and SDG 12 (Responsible Consumption and Production) through efficient utilization and valorization of carbohydrate-based food resources.
Module level, if applicable	Master
Code, if applicable	TPTP215122
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd semester (1st or 2nd semester)
Person responsible for the module	Prof. Dr. Yudi Pranoto, S.T.P., M.P.
Lecturer	1. Prof. Dr. Yudi Pranoto, S.T.P., M.P. 2. Prof. Dr. Ir. Umar Santoso, M.Sc. 3. Prof. Dr. Ir. Djagal Wiseso Marseno, M.Agr. 4. Dr. Lulum Leliana, S.T.P.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, Discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes

	of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2: Understand the current development in food science and technology from recent scientific publications
Content	1. Introduction: Chemistry of Mono-, Di-, Oligo-, and Polysaccharides 2. Characteristics, properties, and modification of starch 3. Cellulose: Chemical Structure and Extraction Technology 4. Cellulose: Processing Technology, Characteristics, Functional Properties, Application 5. Marine Carbohydrates: Chemistry, Extraction Technology, Derivatization, Characterization and Function, Applications 6. Marine Carbohydrates: Chemistry, Extraction Technology, Derivatization, Characterization and Function, Applications 7. Marine Carbohydrates: Chemistry, Extraction Technology, Derivatization, Characterization and Function, Applications

	8. Glucomannan: Chemistry, Extraction Technology, Derivatization, Characterization and Function, Applications 9. Inulin (FOS): Chemistry, Extraction Technology, Derivatization, Characterization and Function, Applications 10. Pectin: Chemistry, Extraction Technology, Derivatization, Characterization and Function, Applications 11. Chitin/chitosan: Chemistry, Extraction Technology, Derivatization, Characterization and Function, Applications 12. Seminar
Study and examination requirements and forms of examination	Presentation (20%); Midterm Exam (40%); Final Exam (40%)
Media employed	PC, LCD, whiteboard, PPT, Elok and Simaster.
Reading list	1. Bangar, S. P., Sunooj, K. V., Siroha, A. K., 2024. Starch: Structure, Properties, and Modifications for Food Applications. CRC Press, Boca Raton, USA. 2. BeMiller, J.N., 2018. Carbohydrate Chemistry for Food Scientists, Third Edition. Elsevier, Minnesota, USA. 3. Phillips, G. O. and Williams, P. A., 2020. Handbook of Hydrocolloids, Third Edition. Woodhead Publishing Ltd., Abington, UK. 4. Stephen, A. M., Phillips, G. O., 2016. Food Polysaccharides and Their Applications, 2nd Edition. CRC Press, Boca Raton, USA. 5. Recent peer-reviewed articles related to chemistry and technology of carbohydrates.
Last modified	August 5th, 2025

2.3 Lipid Chemistry and Technology

Module designation	This course explores the chemistry, structure, and physicochemical properties of lipids, including fats and oils from conventional and emerging sources. Topics include lipid extraction and purification, refining processes, quality assessment, oxidation and stability, lipid modification technologies (fractionation, hydrogenation, and interesterification), and the role of lipids in food quality, nutrition, and health. The course also addresses structured and functional lipids, alternative and sustainable lipid sources, lipid-based delivery systems, and recent technological advances such as oleogels, solid lipid nanoparticles, and lipidomics. To support understanding of current advances in lipid science and technology, the course introduces AI-assisted literature exploration to enable students to critically evaluate recent scientific publications. These approaches are used to interpret analytical data, compare processing technologies, and understand structure–function relationships in lipid systems. This course has a total workload equivalent to 3.7 ECTS. The learning outcomes contribute to the achievement of the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) through improved lipid quality and functionality in food systems, SDG 3 (Good Health and Well-being) through nutrition- and health-related lipid research, SDG 9 (Industry, Innovation and Infrastructure) through advances in lipid processing and delivery technologies, and SDG 12 (Responsible Consumption and Production) through sustainable lipid sourcing and waste valorization.
Module level, if applicable	Master
Code, if applicable	TPTP215123
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd semester (1st or 2nd semester)
Person responsible for the module	Dr. Arima Diah Setiowati, S.T.P., M.Sc.
Lecturer	1. Dr. Arima Diah Setiowati, S.T.P., M.Sc. 2. Prof. Dr. Ir. Sri Raharjo, M.Sc.

	3. Dr.nat.techn. Aulia Ardhi, S.T.P., M.Sc. 4. Dr. Lulum Leliana, S.T.P.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2.: Understand the current development in food science and technology from recent scientific publications

Content	**1. Structure, chemical properties, and physical properties of lipids** **2. Lipids in Diet and Health:** ● Cardiovascular disease, obesity, metabolic syndrome ● Regulations (FDA/EFSA guidelines on trans fats and labeling) **3. Lipid Extraction and Purification (Conventional vs. green extraction methods) and refining processes** **4. Quality Assessment of Edible Oils:** ● Refining Processes (degumming, neutralization, bleaching, deodorization) ● Detection of adulteration (DSC, DNA-based methods, NIR) **5. Lipid Oxidation and Stability:** ● Mechanisms (auto-oxidation, photo-oxidation, enzymatic oxidation) ● Oxidation triggers (oxygen, light, metals, enzymes) ● Antioxidants: natural (tocopherols, polyphenols) and synthetic (BHA, BHT) **6. Lipid Quality Deterioration. Analytical techniques for lipid quality, e.g.:** ● Chromatographic methods (HPLC, GC-MS for fatty acid profiling) ● Spectroscopic techniques (FTIR, NMR, Raman spectroscopy) ● Thermal analysis (DSC for melting/crystallization behavior) ● Oxidative stability tests (Peroxide Value, TBARS, Rancimat) **7. Lipid Modification: Fractionation and hydrogenation** **8. Lipid Modification: Interesterification** **9. Structured and Functional Lipids** ● Medium-chain triglycerides (MCTs), omega-3 enriched oils ● Phospholipids and their emulsifying properties **10. Role of Lipids in Food Quality:** ● Texture, flavor, and mouthfeel (e.g., chocolate, margarine, fried foods)

	• Lipid-protein and lipid-carbohydrate interactions **11. Alternative and Sustainable Lipid Sources** • Plant-based oils (algal oil, avocado oil, insect fats) • Waste valorization (by-products from oilseed processing) **12. Lipid-Based Delivery Systems** • Nanoemulsions, liposomes, lipid particles (SLN, NLC, MLC) • Encapsulation of bioactive compounds (vitamin E, beta-carotene, polyphenols) **13. Current Trends in Lipid Technology** • Cultured fats, precision fermentation for lipid production • Lipidomics and personalized nutrition
Study and examination requirements and forms of examination	Presentation (40%); Midterm Exam (30%); Final Exam (30%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster.
Reading list	1. Akoh, C. C., 2017. Food Lipids: Chemistry, Nutrition, and Biotechnology, Fourth Edition. CRC Press, Boca Raton, USA. 2. Balan, V., 2019. Microbial Lipid Production: Methods and Protocols. Humana Press, New York, USA. 3. Gunstone, F. D., 2011. Vegetable Oils in Food Technology: Composition, Properties and Uses. Blackwell Publishing Ltd., West Sussex, UK. 4. Gunstone, F.D., F.B. Padley, 1997. Lipid Technologies and Applications. Marcel Dekker Inc. New York, USA.. 5. Pathak, A., Singh, S. P. 2025. Next-Generation Drug Delivery Systems. Humana Press, New York, USA. 6. Shahidi, F., 2020. Bailey's Industrial Oil and Fat Products, 7 Volume Set, 7th Edition. John Wiley & Son, Inc. New York, USA. 7. Relevant scientific literature sourced from peer-reviewed journals such as the Journal of the American Oil Chemists' Society (JAOCS), INFORM, Lipids, Food Chemistry, and the Journal of Agricultural and Food Chemistry, as well as other related international journals in lipid science and technology.
Last modified	August 5th, 2025

2.4 Waste Management

Module designation	This course discusses the potential of waste as an environmental pollutant and scientific approaches to prevent and manage waste-related pollution. Topics include fundamental concepts of waste management, aerobic and anaerobic waste treatment, waste utilization through composting, biogas and biorefinery approaches, and physical, chemical, and biological treatment of wastewater, as well as recent developments in science and technology in waste management. The course is delivered through project-based and problem-oriented learning, emphasizing critical reviews of recent scientific publications (≥2020) in the field of waste management. Students analyze environmental problems related to waste generation and treatment, evaluate technological performance based on published data, and propose scientifically based solutions. Artificial intelligence (AI)-assisted tools are used to support literature analysis and trend identification, while basic statistical approaches are applied to interpret and compare quantitative data reported in the reviewed studies. This course contributes to SDG 6 (Clean Water and Sanitation), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). The total student workload for this course is 3.7 ECTS.
Module level, if applicable	Master
Code, if applicable	TPTP215124
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd semester (1st and 2nd semester)
Person responsible for the module	Dr. Ir. Muhammad Nur Cahyanto, M.Sc.
Lecturer	1. Dr. Ir. Muhammad Nur Cahyanto, M.Sc. 2. Dr. Ria Millati, S.T., M.T.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester

Type of teaching methods, contact hours	Presentation, Q&A, Discussion, Project-based Learning
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2: Understand the current development in food science and technology from recent scientific publications
Content	1. Introduction; Concepts of Waste Management 2. Aerobic Waste Treatment 3. Anaerobic Waste Treatment 4. Waste Utilization (Composting, SCP) 5. Waste Utilization (Biogas) 6. Biorefinery and Physicochemical Waste Utilization 7. Physical Treatment of Wastewater 8. Chemical Treatment of Wastewater

	9. Development in science and technology in waste management
Study and examination requirements and forms of examination	Presentation (40%); Midterm Exam (30%); Final Exam (30%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	**Scientific journals:** 1. Journal Waste Management, Q1 2. Journal Waste and Biomass Valorization, Q2 3. Journal Waste Management and Research, Q2 **Books:** 1. Advanced Composite Materials for Wastewater Treatment. (2025). Norzita Ngadi, R.a. Ilyas, … S.m. Sapuan. Elsevier. 2. Antibiofouling Membranes for Water and Wastewater Treatment: Principles and Applications. (2024). Zhiwei Wang, Ruobin Dai and Xuesong Li. Elsevier 3. Bio Refinery of Wastewater Treatment: Way to Generate Waste to Value. (2024). Maulin P. Shah and Angana Sarkar. Elsevier. 4. Biotechnologies for Wastewater Treatment and Resource Recovery: Current Trends and Future Scope. (2024). Arun Lal Srivastav, Inga Zinicovscaia and Liliana Cepoi. Elsevier. 5. Biomass, Biofuels, Biochemicals: Microbial Fermentation of Biowastes. (2022). shok Pandey, Yen Wah Tong, … Jingxin Zhang. Elsevier.
Last modified	August 5th, 2025

2.5 Nutrition I: Macronutrients

Module designation	This course examines current problems and challenges related to macronutrients, with emphasis on the metabolism of proteins, lipids, and carbohydrates and their implications for human health. Topics include digestion and metabolism of macronutrients, dietary fiber and resistant starch (covering their physicochemical properties, fermentation, and physiological roles), glycemic response, and metabolic disorders associated with macronutrient imbalance. The course also discusses recent scientific developments in macronutrient research and technology through analysis of contemporary studies. This course carries a total workload equivalent to 3.7 ECTS. The learning outcomes contribute to the achievement of the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) through improved nutritional quality and dietary strategies, SDG 3 (Good Health and Well-being) through understanding of macronutrient metabolism and metabolic disorders, and SDG 12 (Responsible Consumption and Production) through informed dietary choices and sustainable food systems.
Module level, if applicable	Master
Code, if applicable	TPTP215125
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd semester (1st or 2nd semester)
Person responsible for the module	Yunika Mayangsari, S.Si., M.Biotech., Ph.D.
Lecturer	1. Yunika Mayangsari, S.Si., M.Biotech., Ph.D. 2. Dr. Dwi Larasatie Nur Fibri, S.T.P., M.Sc. 3. Dr. Zaki Utama, S.TP., M.P. 4. Bambang Dwi Wijatniko, M.Agr.Sc., M.Sc., Ph.D.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester

Type of teaching methods, contact hours	Presentation, Q&A, Discussion, Project-based Learning
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2: Understand the current development in food science and technology from recent scientific publications
Content	1. Introduction: Protein Digestion and Metabolism 2. Protein: Metabolic Disorders 3. Protein Presentation 4. Lipids: Digestion and Metabolism 5. Lipids: Metabolic Disorders 6. Lipid Presentation 7. Carbohydrate Digestion and Glycemic Index 8. Carbohydrates: Metabolism and Metabolic Disorders 9. Dietary Fiber: Physiology, Fermentation, and Metabolism

	10. Resistant Starch and Oligosaccharides: Physiology, Fermentation, and Metabolism 11. Carbohydrate Presentation
Study and examination requirements and forms of examination	Assignments (20%); Presentation (20%); Quiz (10%); Midterm Exam (25%); Final Exam (25%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	1. Assmann, G., 1982. lipid metabolism and atherosclerosis. Central Laboratory of Medical Faculty, University of Munster, and Institute for Arteriosclerosis Research at the University of Munster, Federal Republic of Germany. 2. Biliaders, C. G., Izydorczyk, M. S., 2006. Functional Food Carbohydrates. CRC Press, Boca Raton, USA. 3. Brody, T., 1993. Nutritional Biochemistry. Academic Press, Toronto. 4. Burtis, G., Davis, J and Martin, S., 1988. Applied nutrition and diet therapy. W.B. Saunders Co., Philadelphia. 5. Cui, S. W., 2005. Food carbohydrates. CRC Press, Boca Raton, USA. 6. Cummings, J. H., Rombeau, J. L., Sakata, T. 2005. Physiological and Clinical Aspects of Short-Chain Fatty Acids. Cambridge University Press, Cambridge, UK. 7. Gropper, S. S., Smith, J. L., Carr, T. P., 2018. Advanced Nutrition and Human Metabolism, 7th ed. Cengage Learning, Boston, USA. 8. Marsono, Y., 2004. Serat pangan dalam perspektif ilmu gizi. Pidato Pengukuhan Guru Besar, majelis Guru besar UGM, yogyakarta. 9. Moffatt, R. J., Stamford, B., 2005. Lipid Metabolism and Health. CRC Press, Boca Raton, USA. 10. Preuss, H. G., Bagchi, D., 2020. Dietary Sugar, Salt, and Fat in Human Health. Academic Press, Elsevier, UK. 11. Rolfes, S. R., Pinna, K., Whitney, E., 2018. Understanding normal and clinical nutrition, 11th ed. Cengage Learning, Boston, USA. 12. Sabine, J.R., 1977. Cholesterol. Marcel Dekker, Inc. New York. 13. Shi, Y., Maningat, C. C., 2013. Resistant Starch: Sources, Applications and Health Benefits. John Wiley & Sons, Ltd., New York, USA. 14. Spiller, G. A., 2001. Handbook of dietary fiber in human nutrition 3rd ed., CRC Press LLC, Boca Raton, USA.

	15. The British Nutrition Foundation, 1990. Complex Carbohydrates in Foods. The report of the British Nutrition Foundation's Task Force. Chapman and Hall, London.
Last modified	August 5th, 2025

2.6 Experimental Nutrition

Module designation	Experimental Nutrition is a graduate-level course that provides students with a comprehensive understanding of experimental approaches in nutrition science, focusing on nutrient bioavailability, gastrointestinal physiology, intestinal barrier function, and cellular–molecular mechanisms of nutrient absorption and metabolism. The course emphasizes critical analysis of experimental evidence of recent peer-reviewed experimental nutrition papers (>2020), integration of classical nutrition concepts with modern research methodologies, and interpretation of data from in vivo, ex vivo, and in vitro experimental nutrition studies. Learning activities are conducted primarily through lectures, guided discussions, and structured paper-based case studies followed by student oral presentation, preparing students to design and evaluate experimental nutrition research at the master's level. This course contribute to SDG 4 - Quality education through research-based and critical learning, SDG 2 – Zero hunger by incorporating scientific basis of nutrient bioavailability and diet quality, SDG 3 - Good health and well being by mechanistic understanding of nutrition–health relationships. The course potentially contributes to SDG 9 - Industry, Innovation and Infrastructure by understanding an evidence-based nutrition research and innovation. The use of AI includes AI assisted-literature research and comparison with previous findings.
Module level, if applicable	Master
Code, if applicable	TPTP215126
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd semester (1st or 2nd semester)
Person responsible for the module	Dr. Ir. Priyanto Triwitono, M.P.
Lecturer	1. Dr. Ir. Priyanto Triwitono, M.P. 2. Yunika Mayangsari, S.Si., M.Biotech., Ph.D 3. Wahyu Dwi Saputra, S.T.P., M.Agr.Sc., Ph.D. 4. Dr. Zaki Utama, S.T.P., M.P.

Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, dan Case Study
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 5: Able to take a scientific approach to solve problems through the measurement of appropriate variables, to collect valid data, to interpret the data, and relate it to research problem-solving Course Learning Outcome (CLO): 1. CLO 5.1.: Able to take a scientific approach to solve problem though the measurement of appropriate variables 2. CLO 5.3.: Able to collect valid data from the experiments
Content	1. Introduction: Nutrients: Types, Functions, Needs 2. Gastrointestinal physiology

	3. Carbohydrate Bioavailability 4. Protein Bioavailability 5. Lipid bioavailability – SOPE (Sorbitol Oleat Polyester) 6. Student presentation 7. Intestinal Barrier 1 8. Intestinal Barrier 2 (and related diseases) 9. Cell line and Molecular Experimental Analysis 10. Vitamin Bioavailability 11. Mineral Bioavailability 12. Student presentation
Study and examination requirements and forms of examination	Presentation (30%); Midterm Exam (35%); Final Exam (30%)
Media employed	Elok, and Simaster
Reading list	1. Malik, D., Narayanasamy, N., Pratyusha, V. A., Thakur, J., Sinha, N. (2023). Textbook of Nutritional Biochemistry. Germany: Springer Nature Singapore. 2. Hau, J., Schapiro, S. J (Ed). (2021). Handbook of Laboratory Animal Science: Essential Principles and Practices. United States: CRC Press. 3. Dopico, A. M., Bukiya, A. N (Ed). (2022). Cholesterol: From Chemistry and Biophysics to the Clinic. Netherlands: Academic Press. 4. Grundy, M. M., Wilde, P. J. (2021). Bioaccessibility and Digestibility of Lipids from Food. Germany: Springer International Publishing. 5. Carbonaro, M., & Nucara, A. (2022). Legume proteins and peptides as compounds in nutraceuticals: a structural basis for dietary health effects. *Nutrients*, *14*(6), 1188. 6. Turner, J. R. (2009). Intestinal mucosal barrier function in health and disease. *Nature reviews immunology*, *9*(11), 799-809. 7. Brodkorb, A., Egger, L., Alminger, M., Alvito, P., Assunção, R., Ballance, S., ... & Recio, I. (2019). INFOGEST static in vitro simulation of gastrointestinal food digestion. *Nature protocols*, *14*(4), 991-1014. 8. Smith, M. E., Morton, D. G. (2011). The Digestive System: Systems of the Body Series. United Kingdom: Churchill Livingstone. **Recommended Journals for Case Studies** ● American Journal of Clinical Nutrition ● Advances in Nutrition

	• Journal of Nutrition • Nutrients • The Lancet Global Health • Food & Function
Last modified	August 5th, 2025

2.7 Experimental Nutrition - Laboratory Practice

Module designation	Experimental Nutrition - Laboratory practice is a laboratory-based course designed to equip graduate students with advanced competencies in designing, conducting, analyzing, and critically evaluating experimental nutrition studies using animal and in vitro models. The course integrates experimental design, ethical considerations, diet formulation, animal handling, sampling techniques, data analysis, and scientific reporting, with strong emphasis on problem-based learning and recent research advances. Statistics for experimental nutrition is implemented in this practical work such as experimental design, and advanced statistical analysis (ANOVA, mixed models, or multivariate analysis). This course contributes to SDG 4 - Quality education by implementing scientific literacy and effective knowledge dissemination and potentially contributes to SDG - 2 Zero hunger by assessing nutrition quality and evidence-based dietary interventions, SDG - 3 Good health and well-being for health-promoting nutrition strategies, SDG - 9 Industry, innovation, and infrastructure through data-driven nutrition research, and translational science, as well as SDG - 12 Responsible consumption and production by learning animal use ethics. The use of AI includes AI assisted-literature research and comparison with previous findings. Advance statistical analysis is implemented to evaluate the data generated through practical laboratory work.
Module level, if applicable	Master
Code, if applicable	TPTP215127
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd semester (1st or 2nd semester)
Person responsible for the module	Dr. Ir. Priyanto Triwitono, M.P.
Lecturer	1. Dr. Ir. Priyanto Triwitono, M.P.

	2. Yunika Mayangsari, S.Si., M.Biotech., Ph.D 3. Wahyu Dwi Saputra, S.T.P., M.Agr.Sc., Ph.D. 4. Dr. Zaki Utama, S.T.P., M.P.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, dan Case Study
Workload (incl. contact hours, self-study hours)	The total workload is 96 hours per semester, consisting of 75 hours practical labwork, and 21 hours for assistance, discussion, and report. Workload calculation for one semester: ● Workload for practical work: = 75 hours ÷ 26 hours/ECTS = 2.9 ECTS/semester ● Workload for assistance, discussion, and report: = 21 hours ÷ 26 hours/ECTS = 0.8 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 5: Able to take a scientific approach to solve problems through the measurement of appropriate variables, to collect valid data, to interpret the data, and relate it to research problem-solving Course Learning Outcome (CLO): 1. CLO 5.1.: Able to take a scientific approach to solve problem though the measurement of appropriate variables

	2. CLO 5.3.: Able to collect valid data from the experiments
Content	1. Introduction 2. Research Design with Laboratory Animals/Ethical Clearance 3. Selection of Laboratory Animals 4. Research Management with Experimental Animals 5. Diet and Experimental Animal Diet Formulation 6. Anesthesia and Specimen Sampling 7. Practicum Plan 8. Practicum: Group Arrangement, Practicum Design 9. Practicum: Formulation and preparation of diet/feed 10. Experimental Animal Maintenance and Preliminary Analysis 11. Final Analysis 12. Final Lab Results Discussion 13. Report Writing 14. Report Submission
Study and examination requirements and forms of examination	Laboratory activities (15%); Final/Practical exam (15%); Midterm Exam (70%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	1. Kumar, S., Rajput, M. K., Yadav, P.K. (2021). Book Chapter: Laboratory Animal Nutrition in Essentials of Laboratory Animal Science: Principles and Practices. Ed: Nagarajan, P., Gudde, R., Srinivasan, R. Springer Nature Singapore. https://doi.org/10.1007/978-981-16-0987-9 2. Baker, D.H.. (2008). Animal Models in Nutrition Research., The Journal of Nutrition, 138: 391-396. 3. Bogdanske, J. J., Hubbard-Van Stelle, S., Rankin Riley, M., Schiffman, B. M. (2021). Laboratory Mouse and Laboratory Rat Procedural Techniques: Manuals and DVDs. United States: Taylor & Francis. 4. Hau, J., Schapiro, S. J (Ed). (2021). Handbook of Laboratory Animal Science: Essential Principles and Practices. United States: CRC Press. 5. Percie du Sert N, Hurst V, Ahluwalia A, Alam S, Avey MT, Baker M, et al. (2020) The ARRIVE guidelines 2.0: Updated guidelines for reporting animal research. PLoS Biol 18(7): e3000410. https://doi.org/10.1371/journal.pbio.3000410
Last modified	August 5th, 2025

2.8 Probiotics and Prebiotics

Module designation	This course covers the concepts of probiotics and prebiotics, including probiotic strain requirements, screening and evaluation methods, health effects, and applications in food systems, as well as prebiotic types, characteristics, and their interactions with gut microbiota. The course also discusses in vitro and in vivo approaches for assessing probiotic functionality, factors influencing gut microbiota, and recent developments in science and technology related to probiotics and prebiotics. The course is delivered through project-based and problem-oriented learning, emphasizing critical reviews of recent scientific publications (≥2020). Students analyze current scientific and regulatory issues in probiotics and prebiotics, evaluate experimental evidence reported in the literature, and propose scientifically based solutions. Artificial intelligence (AI)-assisted tools are used to support literature analysis and trend identification, while basic statistical approaches are applied to interpret and compare quantitative data from reviewed studies. This course contributes to SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-Being), and SDG 12 (Responsible Consumption and Production). The total student workload for this course is 3.7 ECTS.
Module level, if applicable	Master
Code, if applicable	TPTP215128
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd semester (1st or 2nd semester)
Person responsible for the module	Prof. Dr. Ir. Tyas Utami, M.Sc.
Lecturer	1. Prof. Dr. Ir. Tyas Utami, M.Sc. 2. Prof. Dr. Ir. Eni Harmayani, M.Sc. 3. Dian Anggraini Suroto, S.T.P., M.P., M.Eng., Ph.D.
Language	Indonesian

Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, dan Discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2: Understand the current development in food science and technology from recent scientific publications
Content	1. Introduction: Course Syllabus, Scope Evaluation, Assignment; Probiotic and Gut; Microbiota Overview 2. Health Benefits of Prebiotics and Prebiotics application in the food industry 3. Probiotic Strain Requirements and In Vitro Studies for Probiotic Strain Screening

	4. In Vivo Studies for Evaluating the Health Benefits of Probiotics 5. Prebiotics: Overview of Prebiotics and the Gut Microbiota 6. Types and Characteristics of Prebiotics 7. Applications of Prebiotics in Food 8. Student presentations related to Probiotics / Prebiotics
Study and examination requirements and forms of examination	Assignments (10%); Presentation (10%); Quiz (16%); Midterm Exam (32%); Final Exam (32%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	**Books:** 1. Advances in Probiotic Delivery Systems: Strategies for Enhanced Viability, Targeted Delivery and Efficacy. (2025). Tanmay Sarkar, Ayan Chatterjee and Anirudha Dutta. Elsevier 2. Probiotics and Prebiotics in Foods: Challenges, Innovations, and Advances. (2021). Adriano Gomes da Cruz, C. Senaka Ranadheera, ... Amir Mortazavian. Elsevier 3. The Gut-Brain Axis: Dietary, Probiotic, and Prebiotic Interventions on the Microbiota. (2023). Niall Hyland and Catherine Stanton. Elsevier. 4. Advances in Probiotics: Microorganisms in Food and Health. (2021). Dharumadurai Dhanasekaran and Alwarappan Sankaranarayanan. Elsevier. 5. Probiotics for Human Nutrition in Health and Disease. (2022). Evandro Leite De Souza, José Luiz De Brito Alves and Vincenzina Fusco. Elsevier. **Journal (reviews):** 1. Guarner, F., et al. 2023. Probiotics and Prebiotics. World Gastroenterology Organisation Global Guidelines 2. Salminen, S., et al. 2021 . The International Scientific Association for Probiotics and Prebiotics (ISAPP) Consensus statement on the definition and scope of postbiotics. Nat Rev. Gastroenterol Hepatol. 18, 196-208. 3. Peraturan BPOM No 17 Tahun 2021 Tentang Pedoman Penilain Produk Suplemen Kesehatan mengandung Probiotik. 4. Journals related to the field of Probiotics and Prebiotics
Last modified	August 5th, 2025

2.9 Post Harvest Physiology

Module designation	This module discusses the problems and challenges in postharvest physiology, especially: a. Postharvest Biology (Ethylene Production; Compositional Changes Biological Factors Involved in deterioration: Growth and Development; Climacteric and Non-Climacteric; Transpiration Physiological Breakdown; Physical damage; Pathological Breakdown) b. Storage Condition (Temperature Management; Relative Humidity Control; Supplement to Temperature and RH Control; CAS, MAS) c. Postharvest Technology e.g. Packaging (Bioactive Packaging; Minimally Processed) d. Future Trends in Postharvest Handling e. Environmental Factors Influencing Deterioration (Temperature; Relative Humidity; Atmospheric Composition; Ethylene; Light; Other Factors) and, f. Presentation of the latest research results in the field of postharvest physiology The course applies case-based learning through critical analysis of recent problems based on scientific publications (≥2020) in postharvest physiology; and proposed solutions which are discussed during presentation sections. Students analyze current postharvest problems and technologies, supported by AI-assisted literature exploration. The total student workload corresponds to 3.7 ECTS. This course supports the achievement of SDG 2 (Zero Hunger) and SDG 12 (Responsible Consumption and Production) through postharvest technologies and management strategies aimed at reducing food losses and maintaining food quality and safety.
Module level, if applicable	Master
Code, if applicable	TPTP215129
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Odd semester (1st or 2nd semester)

Person responsible for the module	Andriati Ningrum, S.T.P., M.Agr., Ph.D.
Lecturer	1. Andriati Ningrum, S.T.P., M.Agr., Ph.D. 2. Prof. Dr. Ir. Djagal Wiseso Marseno, M.Agr. 3. Prof. Dr. Ir. Umar Santoso, M.Sc. 4. Dr. Lulum Leliana, S.T.P.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Problem/Case based learning, Q&A, Discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO):

	1. CLO 3.2: Understand the current development in food science and technology from recent scientific publications
Content	1. Introduction of Physiology of Postharvest 2. Postharvest Biology (Biological Factors Involved in deterioration: Respiration) 3. Postharvest Biology (Ethylene Production; Compositional Changes). 4. Postharvest Biology (Biological Factors Involved in deterioration: Growth and Development; Climacteric and Non-Climacteric; Transpiration 5. Physiological Breakdown; Physical damage; Pathological Breakdown 6. Postharvest Technology (1): Storage (Temperature Management; Relative Humidity Control; Supplement to Temperature and RH Control; CAS, MAS) 7. Postharvest Technology (2): Packaging (Bioactive Packaging; Minimally Processed); Future Trends in Postharvest Handling) 8. Environmental Factors Influencing Deterioration (Temperature; Relative Humidity; Atmospheric Composition; Ethylene; Light; Other Factors) 9. Physicochemical Characterization of Perishable Product such as Fruits, Vegetables 10. Student Presentation regarding Postharvest Physiology Topics
Study and examination requirements and forms of examination	Assignments (10%); Presentation (10%); Quiz (16%); Midterm Exam (32%); Final Exam (32%)
Media employed	PC, LCD, whiteboard, PPT, Google Classroom, and Simaster
Reading list	**Scientific Journal:** Scientific Journal (Indexed by Scopus, WoS, SINTA, etc) **Book:** 1. Bankablia, N. 2024. Recent Advances in Postharvest Technologies, Volume 1: Advanced and Novel Technologies. Springer Nature. 2. Karahmanoglu, I. 2023. Postharvest Physiology and Handling of Horticultural Crops. CRC Press. 3. Alam, T. (editor). 2022. Packaging and Storage of Fruits and Vegetables: Emerging Trends. CRC Press.

	4. Ashraf, M.A. et al. 2025. Innovative Technologies in Postharvest Management of Fruits and Vegetables: A Review. European Food Research and Technology. 5. Elhadi M Yahia and Armando Carrillo-Lopez. (2019). Postharvest Physiology and Biochemistry of Fruits and Vegetables.
Last modified	August 5th, 2025

2.10 Food Flavor

Module designation	This course covers fundamental and applied aspects of food flavor, including taste, aroma, and trigeminal sensations, as well as the chemical and biochemical basis of flavor compounds in food systems. The course discusses the classification and characteristics of flavor compounds, flavor biogenesis, processing-induced flavor development, extraction and analytical methods, umami and kokumi compounds, and flavor characteristics of spices and plant-based ingredients. The course applies project-based learning through critical reviews of recent scientific publications (≥2020), supported by AI-assisted literature analysis and basic statistical evaluation of reported data. This course supports current developments in food flavor science and contributes to SDG 2 (Zero Hunger), SDG 9 (Industry, Innovation and Infrastructure), and SDG 12 (Responsible Consumption and Production). The total student workload for this course is 3.7 ECTS.
Module level, if applicable	Master
Code, if applicable	TPTP215230
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Even semester (1st or 2nd semester)
Person responsible for the module	Prof. Dr. Ir. Supriyadi, M.Sc.
Lecturer	1. Prof. Dr. Ir. Supriyadi, M.Sc. 2. Prof. Dr. Ir. Umar Santoso, M.Sc. 3. Dr. Manikharda, S.T.P., M.Agr.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q &A, Discussion, Project-based Learning

Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2: Understand the current development in food science and technology from recent scientific publications
Content	1. Introduction: definition, classification and compounds that cause flavor 2. Taste, Aroma, Trigeminal Sensation 3. Process Flavoring 4. Biogenesis of flavor compounds 5. Extraction, analysis of flavor compounds 6. Umami, kokumi and Oleogustus 7. Spices flavor 8. Recent scientific development in the field of flavor

Study and examination requirements and forms of examination	Presentation (50%); Midterm Exam (25%); Final Exam (25%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	**Books:** 1. Flavor: From Food to Behaviors, Wellbeing and Health (2nd Edition) (2022). Elisabeth Guichard, Christian Salles. Woodhead Publishing (Elsevier). 2. Flavor Chemistry and Technology (3rd edition) (2021). Reineccius, G. Boca-Raton. CRC Press. 3. Flavor for All (2020). James Briscione, Brooke Parkhurst. HarperCollins. 4. Flavor Perception (2nd edition) (2018). Andrew J. Taylor and Deborah D. Roberts (editors). Blackwell Publishing. 5. Multisensory Flavor Perception: From Fundamental Neuroscience Through to the Marketplace (2016). Betina Piqueras-fiszman and Charles Spence. Woodhead Publishing (Elsevier). 6. Flavour Development, Analysis and Perception in Food and Beverages (2015). Woodhead Publishing (Elsevier). **Articles related to taste and flavor from the International Scientific Journal for examples:** 1. J. Food Science 2. Food Chemistry 3. Bioscience Biotechnology and Biochemistry 4. Chemical Senses 5. Journal of Agricultural and Food Chemistry 6. others
Last modified	February 3rd, 2025

2.11 Nutrition II: Micronutrients

Module designation	Micronutrients is a graduate-level course that provides an advanced understanding of vitamins (water-soluble and fat-soluble) and minerals, focusing on their physiological roles, metabolism, bioavailability, interactions, deficiency and toxicity, and implications for human health. The course integrates classical micronutrient concepts with recent scientific evidence from nutrition, metabolism, and food science research. This course contributes to SDG 4 – Quality education by implementing evidence-based nutrition learning. In addition, this course potentially contributes to SDS 2 – Zero hunger by ensuring micronutrient adequacy and hidden hunger, SDG – 3 Good health and well-being by preventing micronutrient deficiencies and toxicity. The course is delivered through lectures, guided discussions, and paper-based case studies. Students critically review recent peer-reviewed publications (>2020) analyzing current challenges in micronutrient research, such as bioavailability, nutrient–nutrient interactions, and population-level deficiencies. Through this approach, students develop problem-solving skills by evaluating research findings and presentation in the classroom. The use of AI includes AI-assisted literature search and trend identification in the micronutrient research, and to summarize and compare findings across studies.
Module level, if applicable	Master
Code, if applicable	TPTP215231
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Even semester (1st or 2nd semester)
Person responsible for the module	Dr. Ir. Priyanto Triwitono, M.P.
Lecturer	1. Dr. Ir. Priyanto Triwitono, M.P. 2. Wahyu Dwi Saputra, S.T.P., M.Agr.Sc. Ph.D. 3. Dr. Fiametta Ayu Purwandari, S.T.P., M.Sc. 4. Dr. Dwi Larasatie Nur Fibri, S.T.P., M.Sc. 5. Bambang Dwi Wijatniko, S.T.P., M.Agr.Sc. M.Sc., Ph.D.

Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, Case Study
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2: Understand the current development in food science and technology from recent scientific publications
Content	1. Introduction 2. Water-soluble vitamin 3. Fat-soluble vitamins 4. Macrominerals (NA, Cl, K, Ca, P, Mg, S)

	5. Microminerals (Se, Mo, Co, Mn, Chromium, Arsen); (Fe, Cu, Zn, I, F, other trace minerals) 6. Presentation (Water soluble vitamin, Fat Soluble Vitamin, Macrominerals, Microminerals
Study and examination requirements and forms of examination	Midterm Exam (50%); Final Exam (50%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	1. Tucker, K. L., Duggan, C. P., Jensen, G. L., & Peterson, K. E. (2024). Modern Nutrition in Health and Disease. Jones & Bartlett Learning. 2. Gropper, S. S., Smith, J. L., & Carr, T. P. (2021). Advanced Nutrition and Human Metabolism. Cengage Learning. 3. Gerald F. Combs Jr., James P. McClung. (2022). 1. The Vitamins Fundamental Aspects in Nutrition and Health. Amsterdam: Elsevier/Academic Press. 4. Bailey RL, West KP Jr, Black RE. The epidemiology of global micronutrient deficiencies. Ann Nutr Metab. 2015;66 Suppl 2:22-33. doi: 10.1159/000371618. Epub 2015 Jun 2. PMID: 26045325. Recommended journals for case studies: ● American Journal of Clinical Nutrition ● Advances in Nutrition ● Journal of Nutrition ● Nutrients ● The Lancet Global Health ● Food & Function
Last modified	February 3rd, 2025

2.12 Enzyme Chemistry and Technology

Module designation	The course covers key aspects of enzyme chemistry and technology, including: chemistry and functionality of enzymes, enzyme kinetics, modification of physical properties, enzyme production, enzyme applications in industry, and the development of science and technology in the field of enzyme chemistry and technology. Learning activities emphasize case-based solving of current enzymatic application and challenges through analysis of recent scientific publications (≥2020) in enzyme chemistry and technology and discussing the result during the presentation sections. AI is implemented in literature screening. The total student workload corresponds to 2 credits (SKS), equivalent to 3.7 ECTS. This course supports the achievement of SDG 9 (Industry, Innovation and Infrastructure) and SDG 12 (Responsible Consumption and Production) by fostering innovation through enzyme-based process design, optimization, and sustainable applications in industrial and food processing systems.
Module level, if applicable	Master
Code, if applicable	TPTP215232
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Even Semester (1st or 2nd semester)
Person responsible for the module	Dr. rer.nat. Lucia Dhiantika Witasari, S.Farm., Apt., M.Biotech.
Lecturer	1. Dr. rer.nat. Lucia Dhiantika Witasari, S.Farm., Apt., M.Biotech. 2. Prof. Dr. Ir. Retno Indrati, M.Sc 3. Prof. Dr. Ir. Tyas Utami, M.Sc. 4. Dr. Andika Sidar, S.T.P., M.Biotech.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester

Type of teaching methods, contact hours	Presentation, Q&A, Case Study
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2.: Understand the current development in food science and technology from recent scientific publications
Content	1. **Scope of Enzyme Chemistry and Technology**: SAP (Study Activity Plan), Course assessment system, limitations, historical background, and enzyme nomenclature. 2. **Structure and Active Site**: Enzyme protein structure, active site, coenzymes, and cofactors. 3. **Characteristics and Mechanisms of Enzymatic Reactions**: Biocatalysts, activation energy, enzyme-substrate complex formation, catalytic efficiency.

	4. **Factors Affecting Enzymatic Reactions**: Environmental factors, activators, and inhibitors. 5. **Kinetics of Single-Substrate Enzymatic Reactions**: Kinetic parameters, measurement methods, and applications. 6. **Kinetics of Multi-Substrate Enzymatic Reactions**: Ping-pong Bi-bi, Random-Order, Compulsory Order mechanisms. 7. **Enzyme Production and Extraction**: Enzyme sources, production, and extraction processes. 8. **Enzyme Purification and Characterization**: Methods, matrix types, and properties of immobilized enzymes. **9. Student Seminar**
Study and examination requirements and forms of examination	Assignments (10%); Presentation (30%); Midterm Exam (30%); Final Exam (30%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	1. Jaeger, K.-E., Liese, A., & Syldatk, C. (Eds.). 2024. Introduction to Enzyme Technology. Springer Nature 2. Punekar, N. 2025. Enzymes: Catalysis, Kinetics and Mechanisms. Springer Singapore. 3. Sunna, A., and Daniellou, R. Novel Enzyme and Whole-Cell Biocatalysts. (2020). Switzerland: MDPI AG. 4. Kumar, A., Dhiman, S., Krishan, B. et al. 2024. Microbial enzymes and major applications in the food industry: a concise review. Food Prod Process and Nutr 6, 85. 5. Thatoi, H.N., Mohapatra, P.K.D., Mohapatra, S., Mondal, K.C. (eds.). 2020. Microbial Fermentation and Enzyme Technology. CRC Press, Boca Raton, Florida. 6. Kuddus, M., Aguilar, C.N. (eds.). 2021. Value-Addition in Food Products and Processing Through Enzyme Technology. Elsevier Academic Press, London, United Kingdom; San Diego, California. 7. Rai, A.K., Sirohi, R., Vandenberghe, L.P.S., Binod, P. (eds.). 2023. Microbial Enzymes in Production of Functional Foods and Nutraceuticals. CRC Press, Boca Raton, Florida. 8. Tripathi, A.D., Khosravi-Darani, K., Srivastava, S.K. (eds.). 2022. Novel Food Grade Enzymes: Applications in Food Processing and Preservation Industries. Springer, Singapore

	Other (older) fundamental books can be accessed through this link: http://ugm.id/EnzymeChemTechReferences
Last Modified	February 3rd, 2025

2.13 Food Microbiological Process

Module designation	This course covers microbiological processes in food systems, focusing on the biodegradation of carbohydrates, proteins, and lipids, as well as the microbial biosynthesis of organic acids, amino acids, primary and secondary metabolites, vitamins, antimicrobials, and toxins. The course discusses metabolic pathways, regulatory mechanisms, and factors influencing microbial activity, alongside recent developments in science and technology in food microbiology. The course is delivered through project-based and problem-oriented learning, emphasizing critical reviews of recent scientific publications (≥2020) related to food microbiological processes. Students analyze contemporary research findings on microbial metabolism and process performance, evaluate reported data, and propose scientifically based solutions to problems identified in the literature. Artificial intelligence (AI)-assisted tools are used to support literature exploration and trend identification, while basic statistical approaches are applied to interpret, compare, and evaluate quantitative data presented in the reviewed studies. This course supports students' understanding of current developments in food microbiological processes and contributes to SDG 2 (Zero Hunger), SDG 9 (Industry, Innovation and Infrastructure), and SDG 12 (Responsible Consumption and Production). The total student workload for this course is 3.7 ECTS.
Module level, if applicable	Master
Code, if applicable	TPTP215233
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Even semester (1st or 2nd semester)
Person responsible for the module	Dian Anggraini Suroto, S.T.P., M.P., M.Eng. Ph.D.
Lecturer	1. Dian Anggraini Suroto, S.T.P., M.P., M.Eng. Ph.D. 2. Prof. Dr. Ir. Retno Indrati, M.Sc. 3. Rachma Wikandari, S.T.P., M.Biotech, Ph.D. 4. Dr. Andika Sidar, S.T.P., M.Biotech.

Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2.: Understand the current development in food science and technology from recent scientific publications
Content	**1. Introduction (SAP explanation, lecture grading system)** ● Scope of Food Microbiology Processes ● The role of microbes in the industry (biosynthesis) ● Destructive microbes (biodegradation)

	● Metabolic regulation **2. Biodegradation of proteins and lipids** ● Pathways used ● Possible products produced **3. Biodegradation of proteins and lipids** ● Pathways used ● Possible products produced **4. Organic acid biosynthesis** ● Pathways used ● Possible products ● Influencing factors ● Microbes involved **5. Amino acid biosynthesis** ● Pathways/reactions of formation ● Influencing factors ● Microbes involved **6. Overview of primary and secondary metabolite biosynthesis** **7. Overview of primary and secondary metabolite biosynthesis (continued)** ● Pathway engineering for high product yield **8. Student Seminar** ● Presentation and discussion of current journals regarding the processes carried out by microbes in producing products
Study and examination requirements and forms of examination	Presentation (30%); Midterm Exam (35%); Final Exam (35%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	**Books:** 1. Brewing Microbiology: Managing Microbes, Ensuring Quality and Valorising Waste. (2025). Annie E. Hill. Woodhead Publishing. 2. Bacterial Enzymes as Targets for Drug Discovery: Meeting the Challenges of Antibiotic Resistance. (2024). Munishwar Nath Gupta, Punit Kaur and Priyanka Sharma. 3. Biotechnology of Microbial Enzymes: Production, Biocatalysis, and Industrial Applications. (2023). Goutam Brahmachari. Academic Press.

	4. Application of Biofilms in Applied Microbiology. (2023). Maulin P. Shah. Academic Press. **Articles:** 1. Food Microbiology 2. International Journal of Food Microbiology 3. Journal of Applied Microbiology 4. Applied Microbiology and Biotechnology 5. Frontiers in Microbiology 6. Microbial Biotechnology 7. Bioresource Technology 8. Journal of Industrial Microbiology & Biotechnology
Last modified	February 3rd, 2025

2.14 Thermal Process in Food Preservation

Module designation	This course examines the principles and applications of thermal processing for food preservation, with emphasis on the behavior and destruction kinetics of spoilage and pathogenic microorganisms in packaged foods. Core topics include thermobacteriology, microbial growth and inactivation, thermal resistance parameters (D-, Z-, Q_{10}-, and activation energy values), heat penetration and distribution in various food matrices and packaging geometries, determination of the coldest point, and evaluation of thermal process adequacy using graphical and mathematical methods. Case studies on canned and pouch foods are used to link theory with industrial practice and food safety regulations. Statistical interpretation and AI-assisted literature exploration are introduced as supportive approaches for analyzing microbial inactivation data, interpreting thermal process calculations, and critically evaluating recent scientific publications on thermal food preservation. These approaches emphasize understanding process variability, safety margins, and technological advances, without requiring advanced computational or programming skills. This course has a total student workload equivalent to 3.7 ECTS. The learning outcomes contribute to the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) through improved food safety and shelf-life extension, SDG 9 (Industry, Innovation and Infrastructure) through advancement of thermal processing technologies, and SDG 12 (Responsible Consumption and Production) through reduction of food losses and safe, efficient preservation practices.
Module level, if applicable	Master
Code, if applicable	TPTP215234
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Even semester (1^{st} or 2^{nd} semester)
Person responsible for the module	Prof. Dr. Ir. Chusnul Hidayat
Lecturer	1. Prof. Dr. Ir. Chusnul Hidayat

	2. Dian Anggraini Suroto, S.T.P., M.P., M.Eng., Ph.D. 3. Dr. Ir. Muhammad Nur Cahyanto, M.Sc. 4. Dr. Inasanti Pandan Wangi, S.T. 5. Bambang Dwi Wijatniko, S.T.P., M.Agr.Sc, M.Sc., Ph.D.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2: Understand the current development in food science and technology from recent scientific publications

Content	**1. Thermobacteriology** ● Bacterial growth curves ● Classification of food based on acidity ● Damage-causing microorganism ● Logarithmic order of bacterial mortality **2. Kinetics of bacterial destruction (thermal resistance)** ● Thermal destruction curves: D value, Z value, and Q10 ● Effects of factors on thermal resistance **3. Kinetics of bacterial destruction (thermal resistance)** ● Problem Solving: Determination of D and Z values ● Case study: Poisoning of Sterile Food caused by microbiology factors and food sterilization regulation **4. Continuous Sterilization** ● Theory of continuous sterilization ● Retort system comprehensiveness ● Problem-Solving: continuous sterilization of food canes (retort system) **5. Case study: Sterilization for Canned food (Sterilization condition, temperature control)** **6. Head Distribution and Penetration and Evaluation of Thermal Process Using Improved General Method and Mathematical Method** **7. Problem Solving: Evaluation of Thermal Process using mathematical method** **8. Case Study: Sterilization for Canned Food (Seaming)** **9. Case Study: Sterilization for Canned Food (Crisis Point of Poisoning Pouch during sterilization)**
Study and examination requirements and forms of examination	Midterm Exam (50%); Final Exam (20%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	1. Holdsworth, D., Simpson, R. 2016. Thermal Processing of Packaged Foods, Third Edition. Springer, London, UK.

	2. Ramaswamy, H. S., Marcotte, M. 2005. Food Processing: Principles and Applications. CRC Press, Boca Raton, USA. 3. Stumbo, C.R., 1973. Thermobacteriology in Food Processing. Academic Press, New York, USA. 4. Toledo, R. T., Singh, R. K., Kong, F., 2018. Fundamentals of Food Processing Engineering, Fourth Edition. Springer International Publishing AG, Cham, Switzerland.
Last modified	February 3rd, 2025

2.15 Fermentation and Bioseparation

Module designation	This course discusses issues and challenges in fermentation and bioseparation, covering aspects of fermentation medium formulation, microbial management and inoculum development, kinetics of microbial growth and fermentation processes, bioreactor configuration and scale-up, aeration and oxygen transfer, process control, and fundamental principles of bioseparation and their applications in the fermentation industry. The course also addresses recent advances in science and technology related to fermentation processes and downstream processing. The course is conducted through project-based and problem-oriented learning, emphasizing critical reviews of recent scientific publications (≥2020) in the fields of fermentation and bioseparation. Students examine contemporary research findings, analyze reported process performance and bioseparation strategies, and propose scientifically based solutions to problems identified in the literature. Artificial intelligence (AI)-assisted tools are used to support literature exploration and trend identification, while basic statistical approaches are applied to interpret and compare quantitative data reported in the reviewed studies. This course supports students' understanding of current developments in fermentation and bioseparation and their application in industrial contexts, and contributes to the achievement of SDG 2 (Zero Hunger), SDG 9 (Industry, Innovation and Infrastructure), and SDG 12 (Responsible Consumption and Production). The total student workload for this course is 3.7 ECTS.
Module level, if applicable	Master
Code, if applicable	TPTP215235
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Even semester (1st or 2nd semester)
Person responsible for the module	Prof. Dr. Ir. Tyas Utami, M.Sc.
Lecturer	1. Prof. Dr. Ir. Tyas Utami, M.Sc. 2. Dr. Ir. Muhammad Nur Cahyanto, M.Sc.

	3. Dian Anggraini Suroto, S.T.P., M.P., M.Eng., Ph.D.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, Discussion, Project-based Learning
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2: Understand the current development in food science and technology from recent scientific publications
Content	**1. Introduction** ● Explanation of Syllabus and Assignment

	2. Fermentation Medium ● Components of the fermentation medium ● Formulation of the fermentation medium **3. Microbial Breeding** **4. Kinetic of Microbial Growth and Fermentation** ● Batch, continuous, and fed-batch fermentation processes ● Determination of fermentor volume in batch fermentation processes ● Scale-up of batch fermentation processes ● Relationship between biomass concentration, substrate concentration, and productivity with dilution rate in continuous fermentation ● Determination of the optimum dilution rate ● Fermentor configuration and specifications **5. Aeration** ● Oxygen requirements ● Oxygen supply ● Determination of KLa (oxygen transfer coefficient) **6. Process Control** ● Glucose effect ● Application of respiratory quotient in process control **7. Downstream Processing** ● Cell disruption ● Protein precipitation ● Solid-liquid separation ● Liquid-liquid separation ● Chromatography **8. Technological Advances in Fermentation and Bioseparation**
Study and examination requirements and forms of examination	Assignments (20%); Presentation (20%); Midterm Exam (30%); Final Exam (30%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	**Books:** 1. Current Development in Biotechnology and Bioengineering (2nd Edition), (2025), Ashok Pandey, Christian Larroche, … Reeta Rani Singhania. Elsevier.

	2. Innovations in Fermentation and Phytopharmaceutical Technologies. (2022), Hrudayanath Thatoi, Sonali Mohapatra and Swagat Kumar Das. Elsevier. 3. From Traditional to Modern: Progress of Mold and Yeasts in Fermented-Food Production, (2022), Wanping Chen, Jae-Hyuk Yu, Kap-Hoon Han., Frontiers in Microbiology. 4. Liquid Biphasic System: Fundamentals and Applications in Bioseparation Technology, (2021), Pau Loke Show, Sze Ying Lee, and Kit Wayne Chew. Elsevier. 5. Bioprocess Engineering: Basic Concepts (3rd ed.), 2017, Shuler, M.L., Kargi, F., & DeLisa, M.P., Prentice Hall. **Articles:** 1. Biotechnology and Bioengineering 2. Journal of Biotechnology 3. Biochemical Engineering Journal 4. Bioresource Technology 5. Separation and Purification Technology
Last modified	February 3rd, 2025

2.16 Packaging and Shelf Life

Module designation	This course covers : the different types of degradation that can occur to food products, including physical, chemical, microbiological, and biochemical deterioration, the necessity of packaging, and various packaging methods for fresh, animal, and dry products, as well as current advancements in food packaging and shelf-life extension technologies. It also explores environmentally friendly, active, and intelligent packaging systems, their correlation with food quality and shelf life. The course incorporates problem-based case studies through critical reviews of recent scientific publications (≥2020) in food packaging and shelf life. Students analyze current developments in sustainable packaging as well as active and intelligent packaging systems, evaluate their performance in preventing food quality deterioration and extending shelf life, and demonstrate their analysis through presentations. Artificial intelligence (AI) tools are introduced to support literature exploration, trend identification, and problem mapping. The total student workload corresponds to 3.7 ECTS. This course supports the achievement of SDG 12 (Responsible Consumption and Production) and SDG 2 (Zero Hunger) through sustainable food packaging strategies aimed at reducing food losses and extending shelf life.
Module level, if applicable	Master
Code, if applicable	TPTP215236
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Even semester (1st or 2nd semester)
Person responsible for the module	Dr. Arima Diah Setiowati, S.T.P., M.Sc.
Lecturer	1. Dr. Arima Diah Setiowati, S.T.P., M.Sc. 2. Prof. Dr. Yudi Pranoto, S.T.P., MP. 3. Prof. Dr. Ir. Supriyadi, M.Sc. 4. Dr. Qurrotul A'yun, S.T.P., M.Sc. 5. Andriati Ningrum, S.T.P., M.Agr., Ph.D.

Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Case-based Method
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2: Understand the current development in food science and technology from recent scientific publications
Content	**1. Food Quality Degradation I** **2. Food Quality Degradation II** **3. Introduction of Food Packaging**

	● Understanding the concept of Food packaging and its correlation to shelf life. **4. Food Packaging I** ● Biodegradable ● Bioactive Packaging **5. Food Packaging II** ● Intelligent Packaging **6. Shelf life I** **7. Shelf life II** **8. Problem Solving, Presentation and Discussion**
Study and examination requirements and forms of examination	Presentation (40%); Midterm Exam (30%); Final Exam (30%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	**Journal:** 1. Journal of Food Science 2. Food packaging and Shelf Life 3. Chemical Engineering Journal 4. Journal of Agricultural and Food Chemistry 5. Food Research International **Scientific paper:** 1. Xu, H., Chen, L., McClements, D. J., Hu, Y., Cheng, H., Qiu, C., Ji, H., Sun, C., Tian, Y., Miao, M., & Jin, Z. (2022). Progress in the development of photoactivated materials for smart and active food packaging: Photoluminescence and photocatalysis approaches. Chemical Engineering Journal, 432, 134301. https://doi.org/10.1016/j.cej.2021.134301 2. Sobhan, A., Kasiviswanathan, M., Lin, W., & Muthukumarappan, K. (2021). Biosensors and biopolymer-based nanocomposites for smart food packaging: Challenges and opportunities. Food Packaging and Shelf Life, 30, 100745. https://doi.org/10.1016/j.fpsl.2021.100745 3. Alizadeh-Sani, M., Mohammadian, E., Rhim, J.-W., & Jafari, S. M. (2020). pH-sensitive (halochromic) smart packaging films based on natural food colorants for the monitoring of food quality and safety. Trends in Food Science & Technology, 105, 93–144. https://doi.org/10.1016/j.tifs.2020.08.014

	4. Mukurumbira, A. R., Shellie, R. A., Keast, R., Palombo, E. A., & Jadhav, S. R. (2022). Encapsulation of essential oils and their application in antimicrobial active packaging. Food Control, 136, 108883. https://doi.org/10.1016/j.foodcont.2022.108883 5. Cai, J., Lu, W., Kan, Q., Chen, X., Cao, Y., & Xiao, J. (2021). Volatile composition changes of fruits in a biopolymer-coated polyethylene active packaging: Effects of modified atmosphere and packaging-shaped bacterial community. Food Research International, 152, 110843. https://doi.org/10.1016/j.foodres.2021.110843 6. Settier-Ramírez, L., López-Carballo, G., Hernández-Muñoz, P., Tinitana-Bayas, R., & Gávara, R. (2022). Assessing the environmental consequences of shelf life extension: Conventional versus active packaging for pastry cream. Journal of Cleaner Production, 333, 130159. https://doi.org/10.1016/j.jclepro.2021.130159 7. Mugwagwa, L. R., & Chimphango, A. F. A. (2022). Physicochemical properties and potential application of hemicellulose/pectin/nanocellulose biocomposites as active packaging for fatty foods. Food Packaging and Shelf Life, 31, 100795. https://doi.org/10.1016/j.fpsl.2021.100795 8. Liang, Z., Veronica, V., Huang, J., Zhang, P., & Fang, Z. (2022). Combined effects of plant food processing by-products and high oxygen modified atmosphere packaging on the storage stability of beef patties. Food Control, 133, 108586. https://doi.org/10.1016/j.foodcont.2021.108586 **Books:** 1. Food Packaging: Materials, Techniques and Environmental Issue. 2022. Saha, N.C., Ghosh, A.K., Grag, M., Sadhu, S.D. Springer Singapore. 2. Active packaging for various food applications.2021. Selvamuthukumaran. CRC Press. 3. Food Packaging: Principles and Practices. 2016. Gordon L Robertson. CRC Press 4. Sustainable Food Packaging. 2020. Athanassiou, A. John Willey & Sons.
Last modified	February 3rd, 2025

2.17 Emulsion and Surfactant

Module designation	This course covers fundamental and applied aspects of emulsion and surfactant systems in food products, including the following topics: Characteristics and physical and chemical properties of emulsions in food products. Factors affecting emulsion stability. Ingredients for emulsions, preparation of emulsion formulas, and emulsification techniques. Variety and characteristics of surfactants in food products. Ingredients for surfactants and manufacturing techniques of surfactants for food products. Concept of hydrophilic-lipophilic balance (HLB) and hydrophilic-lipophilic difference (HLD) and emulsion stability. Variety of emulsions and their applications in food and beverage products. Developments in emulsion and surfactant technology. The course incorporates problem-based case studies through critical reviews of recent scientific publications (≥2020), where students analyze current problems in emulsion and surfactant development and propose scientifically grounded solutions of which are presented during the presentation sections. Artificial intelligence (AI) tools are introduced to support literature exploration and trend analysis. The total student workload is 3.7 ECTS. This course supports the achievement of SDG 9 and SDG 12 through innovation-driven emulsion and surfactant technologies for sustainable food processing.
Module level, if applicable	Master
Code, if applicable	TPTP215237
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Even semester (1st or 2nd semester)
Person responsible for the module	Dr. Arima Diah Setiowati, S.T.P., M.Sc.
Lecturer	1. Dr. Arima Diah Setiowati, S.T.P., M.Sc. 2. Prof. Dr. Ir. Sri Raharjo, M.Sc. 3. Prof. Dr. Ir. Chusnul Hidayat 4. Dr. Qurrotul A'yun, S.T.P., M.Sc.

Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, Discussion, Project-based Learning
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2.: Understand the current development in food science and technology from recent scientific publications
Content	1. Characteristics and physical and chemical properties of emulsions in food products

	2. Concept of hydrophilic-lipophilic balance (HLB) and hydrophilic lipophilic difference (HLD) and emulsion stability. 3. Ternary phase diagram 4. Ingredients for emulsions, emulsion characteristic, making emulsion formulas, and nanoemulsion 5. Variety and characteristics of surfactants in food products 6. Ingredients for surfactants and manufacturing techniques of surfactants for food products. 7. Variety of emulsions, their application in food and beverage products, and their development. 8. Modification of biopolymer for emulsion stabilizer (starch based) 9. Modification of biopolymer for emulsion stabilizer (hydrocolloid based) 10. Modification of biopolymer for emulsion stabilizer (protein based) 11. Double emulsion formulation and stabilization 12. Double emulsion characterization 13. Pickering emulsion
Study and examination requirements and forms of examination	Assignments (10%); Presentation (40%); Midterm Exam (25%); Final Exam (25%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	1. Ahmed and Nollet. 2022. Nanoemulsions in Food Technology: Development, Characterization, and Applications. CRC Press. 2. Sobel, R. 2022. Microencapsulation in the food industry: a practical implication guide. Academic Press 3. Schroen et al. 2024. From theoretical aspects to practical food Pickering emulsions: Formation, stabilization, and complexities linked to the use of colloidal food particles. Advance in Colloid and Interface Science. 4. Tan and McClements. 2021. Application and advanced emulsion technology in the food industry: a review and critical evaluation. 5. Grumezescu, A. M. 2016. Emulsions. Academic Press. 6. McClements, D.J. 2015. Food emulsions: principles, practices, and techniques, Third Edition. CRC Press.
Last modified	February 3rd, 2025

2.18 Quality Management System

Module designation	Principles of quality management and key elements of quality management systems, including ISO 9001, ISO 17025, and ISO 22000 standards. Documentation systems, audit planning, and the interrelationship between ISO standards and other quality standards. The stages of implementing quality management systems and their development within the food/agricultural product industry.
Module level, if applicable	Master
Code, if applicable	TPTP215238
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Even semester (1st or 2nd semester)
Person responsible for the module	Dr. Dwi Larasatie Nur Fibri, S.T.P., M.Sc.
Lecturer	1. Dr. Dwi Larasatie Nur Fibri, S.T.P., M.Sc. 2. Prof. Dr. Ir. Sri Raharjo, M.Sc. 3. Prof. Dr. Ir. Retno Indrati, M.Sc. 4. Bambang Dwi Wijatniko, S.T.P., M.Agr.Sc, M.Sc., Ph.D.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, Discussion, Case-based Learning
Workload (incl. contact hours, self-study hours)	The total workload is approximately 144 hours per semester, consisting of 180 minutes of lectures per week, 180 minutes of structured assignments per week, and 180 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 9 hours/week × 16 weeks/semester = 144 hours/semester = 144 hours/semester ÷ 26 hours/ECTS = 5.55 ECTS/semester

	Total Workload = 5.55 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	3 credit points (equivalent to 5.55 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 3: Mastering theoretical concepts in specific areas of food science and technology and understand its recent advances Course Learning Outcome (CLO): 1. CLO 3.2.: Understand the current development in food science and technology from recent scientific publications
Content	1. Introduction: Syllabus, Assessment Method for Each Course Learning Outcomes, scoring systems. Vocabulary QMS (ISO 9000) 2. Principles of Quality Management Systems (ISO 9001: 2015) 3. ISO 9001:2015 standards 4. Documentation systems (ISO 10013) 5. Quality system audits (ISO 19011) 6. Assignment and discussion: Quality System Audit 7. Quality Management system certification 8. Food Safety Management Systems 9. Case-based presentation
Study and examination requirements and forms of examination	Presentation (30%); Midterm Exam (40%); Final Exam (30%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	1. International Organization for Standardization. (2015). ISO 9001:2015 - Quality management systems - Requirements.

	2. International Organization for Standardization. (2017). ISO/IEC 17025:2017 - General requirements for the competence of testing and calibration laboratories. 3. International Organization for Standardization. (2018). ISO 22000:2018 - Food safety management systems - Requirements for any organization in the food chain. 4. Wallace, C. A., Sperber, W. H., & Mortimore, S. E. (2018). Food Safety for the 21st Century: Managing HACCP and Food Safety throughout the Global Supply Chain. Wiley. 5. Oakland, J. S. (2019). Total Quality Management and Operational Excellence (5th ed.). Routledge. 6. Articles in scientific journal: Food Control
Last modified	February 3rd, 2025

BAB III
MATRICULATION COURSES

3.1 Unit Operation

Module designation	Unit Operation II is a module that discusses the application of process basics, including preparation of raw materials, size reduction, mixing and homogenization, and mechanical and diffusional separation and purification. The use and application of AI in assignment is in accordance with the department policy.
Module level, if applicable	Master
Code, if applicable	TPTP215001
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	1st and 2nd semester
Person responsible for the module	Prof. Dr. Ria Millati, S.T., M.T.
Lecturer	1. Prof. Dr. Ria Millati, S.T., M.T. 2. Dr. Rini Yanti, S.T.P., M.P. 3. Dr. Qurrotul A'yun, S.T.P., M.Sc. 4. Dr. Inasanti Pandan Wangi, S.T.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester

	= 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO P4: Be able to use the principles of food engineering Course Learning Outcome (CLO): 1. CLO P4.21.: Able to understand the development of science in the field of unit operations from the latest research results 2. CLO P4.21: Able to describe the principles of food engineering 3. CLO P4.21.: Able to explain and apply the principles of mass transfer 4. CLO P4.25.: Able to explain and apply the principles of raw material preparation including size reduction, sieving, sorting, grading, and mixing 5. CLO P4.25.: Able to explain and apply the principles of diffusional separation and purification including distillation, adsorption, and extraction
Content	1. Introduction 2. Liquid–liquid mixing 3. Solid–liquid mixing 4. Size reduction and sieve analysis 5. Sorting and grading 6. Sedimentation 7. Centrifugation 8. Filtration and membrane separation 9. Liquid–liquid extraction 10. Solid–liquid extraction 11. Adsorption and adsorption equilibrium models 12. Batch distillation 13. Continuous distillation (single-stage binary mixtures)

Study and examination requirements and forms of examination	Assignments (20%); Midterm Exam (50%); Final Exam (50%)
Media employed	PC, LCD, whiteboard, PPT, Simaster, and Elok
Reading list	1. Geankoplis, C.J., 1985, "Transport Processes and Unit Operation", Prentice Hall, Inc., Singapore 2. Singh, R.P and Heldman,D.R. 2001. Introduction to Food Engineering, Fourth Edition, Academic Press. Food Science and Technology, International Series. 3. Earle, R. L. 1983. Unit Operations in Food Processing, 2nd Edition, Pergamon Press, NY. 4. Toledo, R.T. 1981. Fundamental of Food Process Engineering. AVI. Pbl. Westport, Connecticut Woodhead Publishing. 5. Fellows, P. 2000. Processing Technology: Principle and Practice. Woodhead Publishing.
Last modified	February 3rd, 2025

3.2 Food Microbiology

Module designation	This compulsory course discusses beneficial microbes, microbial interactions with food, factors influencing microbial growth, food spoilage, foodborne pathogens and their physiology, the impact of food processing on microbial behavior, and various methods of microbial control. The use and application of AI in assignment is in accordance with the department policy.
Module level, if applicable	Master
Code, if applicable	TPTP215002
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	1st semester
Person responsible for the module	Dian Anggraini Suroto, S.T.P., M.P., M.Eng., Ph.D.
Lecturer	1. Prof. Dr. Ir. Retno Indrati, M.Sc. 2. Dian Anggraini Suroto, S.T.P., M.P., M.Eng., Ph.D. 3. Prof. Dr. Ir. Eni Harmayani, M.Sc.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Lectures, Discussions, and Assignments
Workload (incl. contact hours, self-study hours)	The total workload is approximately 144 hours per semester, consisting of 180 minutes of lectures per week, 180 minutes of structured assignments per week, and 180 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 9 hours/week × 16 weeks/semester = 144 hours/semester = 144 hours/semester ÷ 26 hours/ECTS = 5.55 ECTS/semester

	Total Workload = 5.55 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	3 credit points (equivalent to 5.55 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO 2: Able to explain microbes in food, whether beneficial, pathogenic or destructive, as well as the influence of the food system on growth, survival and control Course Learning Outcome (CLO): 1. CLO P2.9.: Able to identify beneficial, pathogenic and destructive microbes in food and understand the factors that influence their growth 2. CLO P2.9.1.: Able to explain the interactions of microbes with food, both beneficial and detrimental 3. CLO P2.9.2.: Be able to explain the factors that influence microbial growth 4. CLO P2.10.: Be able to discuss the role of environmental factors (e.g. water activity, pH, temperature) on microbial growth and death 5. CLO P2.10.1.: Able to explain various ways to control destructive microbes and pathogens in food 6. CLO P2.13.: Be able to describe the factors that play a role in controlling or killing pathogens 7. CLO P2.13.1.: Able to describe the types and physiology of pathogenic microbes in food
Content	1. Introduction to Course Syllabus 2. Microbial interactions with food 3. Effect of processing on microbial growth 4. Intrinsic, extrinsic, and implicit factors affecting microbial growth 5. Food spoilage by molds 6. Food spoilage by bacteria and yeasts 7. Physiology of pathogenic microorganisms 8. Types of foodborne pathogens 9. Microbial control by heat treatment

	10. Microbial control by water activity (aw) regulation 11. Microbial control by pH adjustment 12. Use of organic acids for microbial control 13. Microbial control by irradiation 14. Hurdle concept 15. Assignment discussion
Study and examination requirements and forms of examination	Presentation (Project results/case study result/PBL results) (20%); Report (Project results/case study result/PBL results) (30%); Midterm Exam (Project results/case study result/PBL results) (5%); Final (Exam Project results/case study result/PBL results) (5%); Midterm Exam (Cognitive) (20%); Final Exam (Cognitive) (20%)
Media employed	PC, LCD, whiteboard, PPT, Elok, and Simaster
Reading list	1. Bibek R. and Bhunia, A, 2014. Fundamental Food Microbiology 5th ed. CRC Press. Boca Raton. 2. J.H. Sillikeretal.,1980. Microbial Ecology of Foods.Vol.1. Factors Affecting Life and Death of Microorganisms. Academic Press. NewYork. 3. James M. Jay, 1970. Modern Food Microbiology. D.Van Nostrand Company. NewYork. 4. Nickerson, J.T. dan Sinskey, J.A. 1974. Microbiology of Foods and Food Processing. Elsevier Publishing Company. NewYork. 5. John de Vries, 1997. Food Safety and Toxicity, CRC Press, Tokyo 6. Canovas, GV. B and Gould, G.W.2000. Innovation in Food Processing, Food Preservation Series, Technomic Publisher, Holland 7. Stumbo, CR, 1949. Further consideration relating to evaluation of thermal processes foods. Food Technol.3,126-131 8. Stumbo, C.R., 1949. Thermo bacteriology as applied to food processing. Advance in Food Research, 2 (42) 9. Mazur, P.,1977. The role of intracellular freezing in the death of cells cooled at supra optimal rates. Cryobiology 14, 251-272. 10. Pitt, J.I., Ho Cing, A.D., Miscampbell, B.F., Dharmaputra, O.S., Sardjono, Rahayu, E.S., and Kuswanto, K.R., 1998. The Mycoflora of Food Commodities from Indonesia. J. of Mycology, No 1 (1): 41-60 11. Rockland,L.B., and Beuchat,L.R., 1987. Water activity: Theory and Application to Foods. Marcel Dekker, Inc. New York and Basel

	12. Anonim. 2004. Bacteria Associated with Food borne Diseases. Scientific Status Summary. Institute of Food Technologists, USA 13. Jay,J.M. 2000.Modern Food Microbiology. 6th Ed. An Aspen Publication Aspen Publishers, Inc. Gaithersburg, Maryland 14. Fan,X., B.A.Niemira,C.J. Doona,F.E. Feeherry, dan R.B. Gravani.2009. Microbial Safety of Fresh Produce. Black well Publishing and the Institute of Food Technologists. Iowa, USA 15. Groisman,E.A. 2001. Principles of Bacterial Pathogenesis. Academic Press. San Diego, USA 16. Levin,R.E. 2010. Rapid detection and characterization of food borne pathogens by molecular techniques. CRC Press, USA 17. Murrell,K.D. and B.Fried. 2007. Food-Borne Parasitic Zoonoses: Fish and Plant- Borne Parasites. Springer, USA
Last modified	July 31st, 2024

3.3 Food and Agricultural Product Analysis – Laboratory Practice

Module designation	This course covers solution preparation and standardization, sample preparation, proximate and minor component analysis, gravimetric and volumetric methods, and the use of chromatography and spectrophotometry for quantitative determination of food components. The use and application of AI in assignment is in accordance with the department policy.
Module level, if applicable	Master
Code, if applicable	TPTP215003
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	1st and 2nd semester
Person responsible for the module	Dr.nat.techn. FMC. Sigit Setyabudi, S.T.P., M.P.
Lecturer	1. Dr.nat.techn. FMC. Sigit Setyabudi, S.T.P., M.P. 2. Dr. Manikharda, S.T.P., M.Agr.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS = 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester

	Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO P1: Able to explain the structure and properties of food / agricultural product components (carbohydrates, proteins, lipids, water, other components, and food additives) and chemical changes during processing. Course Learning Outcome (CLO): 1. CLO P1.4.: Be able to demonstrate laboratory techniques commonly used in basic and applied food chemistry 2. CLO P1.5.: Be able to demonstrate practical proficiency in food/agricultural product analysis laboratories
Content	1. Introduction (course overview and objectives) 2. Sampling Techniques (principles and methods of sampling) 3. Data Handling (data processing, validation, and interpretation) 4. Lipid Analysis (methods for fat and oil determination) 5. Protein Analysis (qualitative and quantitative protein analysis methods) 6. Carbohydrate Analysis (sugars, starch, and fiber analysis) 7. Total Phenolic and Vitamin C Analysis (spectrophotometric and chemical methods)
Study and examination requirements and forms of examination	Laboratory Practice (65%); Report (15%); Initial Test (15%); Final Exam (10%)
Media employed	PC, LCD, whiteboard, PPT, and ELok
Reading list	1. Horwitz, W. (Editor), 2005, Official Methods of Analysis of AOAC International, 18th Ed., AOAC International 2. Nollet, L.M.L. (Editor), 2004, Handbook of Food Analysis Vol. 1,2,3, 2nd Ed., Marcel Dekker, New York 3. Nollet, L.M.L. (Editor), 2000, Food Analysis by HPLC, 2nd Ed., Marcel Dekker, New York

	4. Otles, S. (Editor), 2005, Methods of Analysis of Food Components and Additives, CRC Press, Boca Raton 5. Herlich, K. 1990. Official methods of analysis of the AOAC 15th ed. AOAC, Inc., Arlington, Virginia. 6. Sudarmadji, S., Haryono, B., dan Suhardi. 1984. Prosedur Analisa Bahan Makanan dan Pertanian. Liberty, Yogyakarta. 7. Tim Pengasuh Praktikum APHP I, 2021. Petunjuk Praktikum Analisis Pangan dan Hasil Pertanian. Departemen TPHP, FTP, UGM.
Last modified	February 3rd, 2025

3.4 Process Technology – Laboratory Practice

Module designation	Design and realization of defined product concept, process design and optimization. Application of business analysis, process verification at optimum conditions to produce product prototypes as required. Validation of product prototypes with packaging, marketing, and industry profiling. The use and application of AI in assignment is in accordance with the department policy.
Module level, if applicable	Master
Code, if applicable	TPTP215004
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	1st and 2nd semester
Person responsible for the module	Dr. Ir. Supriyadi, M.Sc.
Lecturer	1. Dr. Ir. Supriyadi, M.Sc. 2. Dr. Rini Yanti, S.T.P., M.P. 3. Dr. Arima Diah Setiowati, S.T.P., M.Sc. 4. Dr. Qurrotal A'yun, S.T.P., M.Sc. 5. Dr. Inasanti Pandanwangi, S.T.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 96 hours per semester, consisting of 120 minutes of lectures per week, 120 minutes of structured assignments per week, and 120 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 6 hours/week × 16 weeks/semester = 96 hours/semester = 96 hours/semester ÷ 26 hours/ECTS

	= 3.7 ECTS/semester Total Workload = 3.7 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	2 credit points (equivalent to 3.7 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO KK2: Be able to design sustainable food processing units and agricultural products 2. PLO P4: Be able to use the principles of food engineering, food preservation and processing, packaging materials and methods, cleaning and sanitation, and water and waste management Course Learning Outcome (CLO): 1. CLO KK2.1.: Able to design and develop new products 2. CLO KK2.2.: Able to design and develop food processing and agricultural product 3. CLO P4.5: Able to use engineering principles and operating units in raw material preparation, separation, and purification to produce food products on a laboratory or pilot plane scale
Content	1. Introduction of the laboratory practice 2. Drying process 3. Cooling and freezing process 4. Distillation process 5. Extraction process 6. Frying process 7. Fermentation process 8. Sterilization and pasteurization process 9. Baking process 10. Practicum result seminar
Study and examination requirements and forms of examination	Assignment (20%); Presentation and discussion (25%); Group performance (30%); Practicum report (25%)
Media employed	PC, LCD, whiteboard, and PPT

Reading list	1. George D. Saravacos and Athanasios E. Kostaropoulos, 2002. Handbook of Food Processing Equipment. Kluwer Academic, New York 2. R. Paul Singh and Dennis R Heldman, 2001. Introduction to Food Engineering. Third Edition. Academic Press, London 3. Dennis R. Heldman and Richard W. Hartel., 1995. Principles of Food Processing. Chapman & Hall, New York 4. James G. Brennan, 2006. Food Processing Handbook. WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany 5. Zeki Berk, 2009. Food Process Engineering and Technology. Elsevier Inc., Amsterdam.
Last modified	February 3rd, 2025

3.5 Biochemistry

Module designation	Biochemistry is a matriculation module discussing the chemical reactions that underlie life phenomena. This module provides basic knowledge about the structure and the role of water, acid-base reactions, and macromolecules, which consist of proteins, enzymes, carbohydrates, and lipids. Furthermore, it also elucidates the bioenergetics and the concept of macromolecule metabolism, including glycolysis, gluconeogenesis, Krebs cycle, electron transfer, photosynthesis, pentose phosphate pathway, protein degradation, synthesis, and degradation of lipids. The use and application of AI in assignment is in accordance with the department policy.
Module level, if applicable	Master
Code, if applicable	TPTP215005
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	1st and 2nd semester
Person responsible for the module	Yunika Mayangsari, S.Si., M.Biotech., Ph.D.
Lecturer	1. Yunika Mayangsari, S.Si., M.Biotech., Ph.D. 2. Wahyu Dwi Saputra, S.T.P., M.Agr.Sc., Ph.D. 3. Dr. Andika Sidar, S.T.P., M.Sc. 4. Dr. Lulum Leliana, S.T.P.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 144 hours per semester, consisting of 180 minutes of lectures per week, 180 minutes of structured assignments per week, and 180 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations.

	Workload calculation for one semester = 9 hours/week × 16 weeks/semester = 144 hours/semester = 144 hours/semester ÷ 26 hours/ECTS = 5.55 ECTS/semester Total Workload = 5.55 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	3 credit points (equivalent to 5.55 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO P8: The student is capable of evaluating nutritional changes during processing and preservation. Moreover, the student is able to comprehensively understand the metabolisms of nutrition and bioactive compounds. Course Learning Outcome (CLO): 1. CLO P8.41.: Be able to explain the biochemical reaction, fundamentals of food nutrition, and the relation between food consumption and nutritional status and health 2. CLO P8.41.1.: Able to explain various structures and biomolecule functions (protein, carbohydrate, lipid, enzyme) and its interactions in water, acids, and bases 3. CLO P8.41.2.: Able to explain the concept of metabolism and macromolecular bioenergetics
Content	1. Scope, fundamentals, references, assessment, and learning methods – Atom & Water 2. Chemical Bonding & Acid–Base Properties 3. Protein Structure 4. Protein Metabolism: Amino Acids, Peptides, and Proteins 5. Protein Functions 6. Enzymes 7. Protein Degradation 8. Glycolysis 9. Glycolysis and TCA Cycle 10. Tricarboxylic Acid (TCA) Cycle 11. Bioenergetics 12. Lipid Structure

	13. Lipid Metabolism: Synthesis and Degradation 14. Carbohydrates 15. Photosynthesis 16. Electron Transport System (ETS) 17. HMP Shunt and Gluconeogenesis
Study and examination requirements and forms of examination	Presentation (55%); Midterm Exam (50%); Final Exam (50%)
Media employed	PC, LCD, whiteboard, PPT, Simaster, and ELok
Reading list	1. Lehninger, A., 2004. Principles of Biochemistry. Fourth Edition. Worth Publisher Inc., New York. 2. Berg, J.M., Tymoczko, J.L. and Stryer, L. Biochemistry. Fifth Edition. W.H. Freeman and Company. 3. Other reading lists given by lecturers (Journal, Handout, etc.)
Last modified	January 31st, 2025

3.6 Nutrition

Module designation	Studying the relationship between nutrition and health, which includes the function of food intake in meeting nutritional needs for growth, maintenance and maintaining optimal health. The material studied includes the digestive system, nutritional physiology, metabolism of nutrients (carbohydrates, lipids, proteins, vitamins, minerals and water) and their effects on health; as well as energy and disease disorders due to nutrients. The use and application of AI in assignment is in accordance with the department policy.
Module level, if applicable	Master
Code, if applicable	TPTP215006
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	1st semester
Person responsible for the module	Wahyu Dwi Saputra, S.T.P., M.Agr.Sc., Ph.D.
Lecturer	1. Wahyu Dwi Saputra, S.T.P., M.Agr.Sc., Ph.D. 2. Dr. Ir. Priyanto Triwitono, M.P. 3. Dr. Fiametta Ayu Purwandari, M.Sc. 4. Dr. Bambang Dwi Wijatniko, S.T.P., M.Sc., M.Agr.Sc. 5. Dr. Zaki Utama, S.T.P., M.P.
Language	Indonesian
Relation to curriculum	Master of Science in Food Science and Technology, compulsory, 2nd semester
Type of teaching methods, contact hours	Presentation, Q&A, discussion
Workload (incl. contact hours, self-study hours)	The total workload is approximately 144 hours per semester, consisting of 180 minutes of lectures per week, 180 minutes of structured assignments per week, and 180 minutes of self-study per week, for a total of 16 weeks including mid-term and final examinations. Workload calculation for one semester = 9 hours/week × 16 weeks/semester

	= 144 hours/semester = 144 hours/semester ÷ 26 hours/ECTS = 5.55 ECTS/semester Total Workload = 5.55 ECTS/semester Notes: 1 ECTS is equivalent to 25-30 hours of work, with 26 hours set as the minimum standard.
Credit points	3 credit points (equivalent to 5.55 ECTS)
Requirements according to the examination regulations	The students are allowed to have examinations only if they have at least 75% attendance in the class (Attendance at a minimum of 10 out of the 14 lecture sessions is required)
Recommended prerequisites	-
Module objectives/intended learning outcomes	Program Learning Outcome (PLO): 1. PLO P8: Able to evaluate changes in nutrients during processing, storage and metabolism of nutrients and bioactive components Course Learning Outcome (CLO): 1. CLO P8.41.: Explain biochemical processes, basic concepts of nutritional science and the relationship between food consumption and nutritional status and health 2. CLO P8.42.: Explain the process of digestion and metabolism of nutrients
Content	1. **Scope of Nutrition Science** (definition of nutrition science; relationship with other sciences; nutrition issues in Indonesia) 2. **Proteins** (types, sources, and functions; digestion and absorption; metabolism and metabolic disorders; protein quality and assessment methods; protein deficiency and its consequences) 3. **Carbohydrates** (types, sources, and functions; digestion and absorption; glycemic response and glycemic index; carbohydrate metabolism and metabolic disorders; properties and metabolism of dietary fiber and prebiotics) 4. **Minerals** (definition of macro- and micro-minerals; types, sources, and functions; electrolyte balance and antioxidant roles; mineral digestion and absorption; relationship between minerals and health disorders) 5. **Water** (structure of water; water as a nutrient; functions and distribution in the body; water requirements and calculations)

	6. **Energy** (definition, types, and sources of energy; measurement and energy requirements; basal metabolic rate and physical activity; energy balance, deficiency, and excess; energy needs for athletes) 7. **Lipids** (types and sources; presence and function of lipids in food and the human body; digestion, absorption, and transport of lipids; lipoproteins; lipid metabolism disorders; diseases related to dyslipidemia) 8. **Water-Soluble Vitamins** (types and sources; functions; absorption and metabolism; deficiency conditions and the role of vitamins in preventing degenerative diseases) 9. **Fat-Soluble Vitamins** (types and sources; functions; absorption; deficiency conditions and the role of vitamins in preventing degenerative diseases) 10. **Physiology of Nutrition** (definition of physiology; digestive system; absorption and transport of nutrients) 11. **Recommended Dietary Allowances (RDA)**
Study and examination requirements and forms of examination	Presentation (20%); Midterm Exam (40%); Final Exam (40%)
Media employed	PC, LCD, whiteboard, PPT, and Elok
Reading list	1. Burtis, G.; J. Davis; and S. Martin, 1988. Applied Nutrition and Diet Therapy. W.B. Saunders Company. 2. Christian, J.L. and J.L. Greger, 1985. Nutrition for Living. The Benjamin/Cummings Publishing Company, Inc. 3. Guthrie, H.A., 1983. Introductory Nutrition. The C.V. Mosby Company. 4. Lloyd, L.E.; B.E. Mcdonald; and E.W. Crampton, 1985. Fundamentals of Nutrition. 5. Suitor, C.J.W. and M.F. Crowley, 1984. Nutrition: Principles and Application. 6. Lavizzo-Mourey, Risa J. 1987. Dehydration in the elderly: a short review. Journal of The National Medical Association, Vol 79 No.10: 1033-1038 7. Kleiner, Susan M. 1999. Water: an essential but overlooked nutrient. Journal of American Dietetic Association Vol 99 No.2: 200-206 8. Budi Iman Santoso, Hardinsyah, Parlindungan Siregar and Sudung D Pardede., 2012. Water for Health. Centra Communication Publisher
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