



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2021/2022
MASTER'S DEGREE (MSC)	CHEMICAL ENGINEERING
INTEGRATED COURSE	FOOD INDUSTRY PROCESSES - INTEGRATED COURSE
CODE	21903
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	ING-IND/27, CHIM/07
HEAD PROFESSOR(S)	GALIA ALESSANDRO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	GALIA ALESSANDRO Professore Ordinario Univ. di PALERMO DISPENZA CLELIA Professore Ordinario Univ. di PALERMO
CREDITS	9
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	DISPENZA CLELIA Wednesday 12:00 13:00 Stanza 315 - III piano - Edificio 6 Friday 12:00 13:00 Stanza 315 - III piano - Edificio 6 GALIA ALESSANDRO Monday 15:00 16:00 Dipartimento Ingegneria -Ed. 6-I piano- Laboratorio di Tecnologie Chimiche ed Elettrochimiche-Studio prof. Galia

PREREQUISITES	Main concepts of General Chemistry, Organic Chemistry, Biochemistry and Microbiology. Fundamentals of Thermodynamics, Transport Phenomena, Unit Operations for Chemical and Biochemical Engineering, Plant design
LEARNING OUTCOMES	Conoscenza e capacita' di comprensione (knowledge and understanding): • Individuazione e risoluzione delle problematiche connesse con la realizzazione e gestione di processi industriali per la trasformazione di matrici alimentari e nutraceutiche. • Conoscenza dei trattamenti di conversione fisica, chimica e biochimica, aspetti tecnologici, economici, ambientali e di tutela della salute connessi alla realizzazione dei processi alimentari. • Familiarizzazione con una logica di filiera produttiva che partendo da una matrice di partenza la trasforma al fine di conferire le proprietà chimico-fisiche ed organolettiche desiderate per il consumo finale. La verifica viene fatta con la prova orale Conoscenza e capacita' di comprensione applicate (applying knowledge and understanding): • Gestire in modo critico le problematiche insite nella realizzazione di processi dell'industria alimentare nel rispetto dei criteri di sicurezza e di tutela ambientale. • Essere in grado di valutare comparativamente processi, o segmenti di processi produttivi in funzione dei criteri di sostenibilita', qualità e tutela della salute del consumatore. • Individuare quantita' e portate di materia ed energia attinenti alle varie fasi di un processo dell'industria alimentare. La verifica viene fatta con la prova orale Autonomia di giudizio (making judgements) • Viene stimolata riflettendo assieme agli studenti sulle modalita' con cui l'insieme delle conoscenze proprie della termodinamica e cinetica chimica e biochimica, dei fenomeni di trasporto, della chimica generale ed organica, della biochimica, della microbiologia, e delle operazioni unitarie dell'ingegneria chimica cospirano per rendere possibile la realizzazione industriale di processi di trasformazione di matrici alimentari. La verifica viene fatta con la prova orale Abilita' comunicative (communication skills) • Si cura la costruzione di una appropriata terminologia per la descrizione dei diversi processi sottolineando, ove possibile, le implicazioni delle differenze fra dizioni scientifiche e gergo industriale ed i limiti insiti nelle classificazioni scolastiche dei processi chimico-fisici. La verifica viene fatta con la prova orale Capacita' di apprendere (learning skills) L'approccio didattico utilizzato mira a sottolineare come l'apprendimento delle problematiche sia semplificato da una buona padronanza dei contenuti di base e caratterizzanti dell'ingegneria chimica e biochimica. Si privilegia un approccio critico all'apprendimento caratterizzato dalla definizione del problema e dei vincoli da rispettare nella sua soluzione (scientifici, tecnologici, economici, normativi) e una costruzione meditata della migliore strategia di risoluzione. La verifica viene fatta con la prova orale
ASSESSMENT METHODS	The exam is based on an oral talk between the student and the commission. The oral interview is managed to asses the knowledge and the ability of the students of analysing, formalising and solving problems related to food processing using proper language to describe all involved issues and detecting the role of knowledge translated in operative instrument. The quotation mark depends on the level of criticism exhibited by the student in her/his discussion of the main features of the studied processes also taking into account the chemical-physical features of the considered food matrix and the final properties required for its end-use utilization. The evaluation marks for the exam will be assigned according to the following criteria: 27-30 to students that can describe and defend critically the process conditions with no or just minor support of the teachers. 23-26 to the students that can discuss and defend critically the process structure and choices only with the assistance of the teachers. 18-22 to students that exhibit just an acritical knowledge of the process and that cannot explain at all the choices and the process structure even after inputs from the teachers. In the absence of any of the aforementioned properties the student has failed the exam.
TEACHING METHODS	Lessons performed by the teacher

**MODULE
FOOD INDUSTRY PROCESSES**

Prof. ALESSANDRO GALIA

SUGGESTED BIBLIOGRAPHY

Dennis R. Heldman, Richard W. Hartel, Principles of Food Processing, Aspen Publisher 1998, ISBN 0834212692.
R. Paul Singh, Dennis R. Heldman Introduction to Food Engineering, 5th Ed. 2014, ISBN 9780123985309.
Ullmann's Encyclopedia of Industrial Chemistry 7th Ed. (consultabile da rete intranet di ateneo: <https://servizisia.unipa.it/wiley/>).

AMBIT	50352-Ingegneria chimica
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54

EDUCATIONAL OBJECTIVES OF THE MODULE

To increase the ability of the student in the instrumental utilization of his/her knowledges in the fields of thermodynamics, chemical kinetics, transport phenomena, unit operations of chemical and biochemical engineering, to perform, to optimize and to manage industrial processes for the transformation and processing of food matrixes.

SYLLABUS

Hrs	Frontal teaching
7	Introduction to processes of food chemistry: boundary conditions, management strategy, fundamentals of lean manufacturing.
4	Degradation processes of food matrixes: thermal, chemical and microbiological phenomena
7	Methods for concentration of food matrixes: evaporation, type of apparatuses and energy efficiency strategy. Athermal processes: membrane processes, reverse osmosis, ultrafiltration, management of contactors
7	Microbial inactivation, kinetics of thermal processes and sterilization target. Thermal treatments: pasteurization and sterilization.
6	Cryogenics treatments: freezing and dipping. Fundamentals, applications and apparatuses.
8	Dehydration of food matrixes: state of water in food, phase diagram and glass transition temperature, rate of dehydration and controlling factors, effect on final quality and type of apparatuses. Freeze drying: primary and secondary drying, nucleation and growth, apparatuses.
5	Solid-liquid extraction processes, removal of caffeine from green coffee, comparison between traditional methods and supercritical extraction.
10	Analysis of food processes addressed to specific industrial production, development of new products and labelling.

MODULE
PRINCIPLES OF FOOD CHEMISTRY

Prof.ssa CLELIA DISPENZA

SUGGESTED BIBLIOGRAPHY

Materiale bibliografico fornito dal docente.

AMBIT	20911-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	48
COURSE ACTIVITY (Hrs)	27

EDUCATIONAL OBJECTIVES OF THE MODULE

The students should be able to:

- Explain chemical structure, properties and main reactions of food components during storage and processing of food and how they influence the quality and properties of these components;
- Explain the importance of water for stability and quality of foods;
- Give an overview of the main classes of compounds influencing texture, colour and flavour of food and how these affect other quality aspects of food;
- Be aware of sources of important classes of undesirables in food and conditions for pathogens growth, degradation, alteration, poisoning;
- Gain fundamental knowledge and tools to assess quality, nutritional value and safety aspects of food and food components.

SYLLABUS

Hrs	Frontal teaching
5	Description of chemical structure, physico-chemical and nutritional properties of main food components present in common Mediterranean diet foods: carbohydrates, proteins, lipids, water, colours/pigments, flavours, fragrances, vitamins and minerals.
5	Description of chemical composition, properties and quality of important foods of the Mediterranean diet: fruit, vegetables, meat/fish, bread/pasta, milk/cheese, uova.
10	Quality improving/degrading (bio)chemical reactions and physical transformations of foods in non-industrial environments: exemplifications.
2	Examples of chemical and natural preservatives (antioxidants, antibacterial, anti fungal): structure and mechanism of action.
5	Nutraceuticals: formulations of enriched foods and dietary supplements