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SCHOOL OF FOOD AND WINE STUDIES
DEPARTMENT OF DIETETICS AND NUTRITION
COURSE TITLE: THE SCIENCE OF COOKING: AN INTRODUCTION TO MOLECULAR CUISINE
COURSE CODE: FWDNSC430
3 semester credits

1. DESCRIPTION

Forty years after the first appearance of Molecular Gastronomy, Chefs 'approach to food has dramatically changed. Gastronomists and food historians talk about the last great food revolution of our times; the movement that changed the way we perceive food and started to stimulate new questions and give interesting answers to those that want to enhance their food knowledge. Since then, cooking has taken a great step forward, opening paths once impossible to even think about.
This course is aimed at non-scientific students who wish to approach the world of scientific application toward cooking and want to improve their knowledge of cooking techniques. A scientist and a Chef will alternate teaching the course giving both technical information and practical suggestions. Students will learn cutting edge techniques to create new textures and amazing effects.

2. OBJECTIVES

Upon successful completion of the course, students will be able to:

- Comprehend the scientific foundations of cooking and their impact on the evolution of cuisine, ingredients, and flavor perception.
- Demonstrate confidence in analyzing and predicting food reactions during cooking and processing from a scientific perspective.
- Interpret the effects of various cooking methods on the chemical and physical properties of food.
- Explain the scientific mechanisms underlying taste perception and satiety.
- Safely and effectively apply liquid nitrogen in culinary preparations.
- Utilize natural hydrocolloids and additives to engineer innovative textures.
- Master the principles and applications of spherification in contemporary gastronomy.
- Design and execute dishes using molecular gastronomy techniques grounded in scientific methodology.
- Recognize cooking as an applied science, encompassing the evolution of culinary methods and styles.
- Employ advanced and experimental techniques to develop novel textures, aromas, and flavor experiences.

3. REQUIREMENTS

Two semesters of Culinary Arts coursework or equivalent.

4. METHOD

This course consists of lectures, class discussions, projects, and interaction with the local community. Mediums for instruction used will include, but are not limited to, interactive and hands-on activities which challenge thought processes, integrate relevant academic sources, may include multimedia

references, propose creative problem-solving, and other appropriate forms of delivery as deemed appropriate to the course's purpose.

5. TEXTBOOK – FURTHER READINGS – RESOURCES

TEXTBOOK (Copy available at the university library):

The Science of Cooking - Barham, Peter - Springer, 2001
On Food and Cooking - Harold McGee - Hodder & Stoughton
The textbook is mandatory for course participation and completion. Where applicable additional materials may be provided by the instructor.

FURTHER READINGS

Molecular gastronomy - Exploring the science of flavor - Herve This - CUP
Molecular Gastronomy - Jose Sanchez
The curious cook - Harold McGee - San Francisco North Point Press
Cooked: A Natural History of Transformation - Michael Pollan
The Fat Duck Cookbook - Heston Blumenthal
In Search of Perfection - Heston Blumenthal
Bar Chef & Molecular Gastronomist - Dario Comini - Bibliotheca Culinaria
El Bulli - Ferran and Albert Adrià

LIBRARY

Course participants may access the campus library. Please consult the library site for resources such as collections, borrowing, scanning and wifi connection, and research:
https://www.auf-florence.org/Library/the-library/

6. COURSE MATERIALS

1. All students are strictly required to attend class wearing a clean uniform: the jacket provided by the institution, black pants, apron (color depending on the CA level), safety footwear, a white Chef's hat, and a set of knives. Students with long hair should tie hair back before wearing the hat. Students are not allowed to wear rings, earrings or any other visible piercings, bracelets, watches, and nail polish during lab hours. Students who are not dressed properly will not be allowed in class.
2. All students must attend class fully prepared and on time. Late students will not be accepted.
3. Carefully wash hands at the beginning of each class, before food is handled.
4. During professional cooking classes only small food tastings are allowed as the main purpose of these courses is to develop technical skills. Students are not allowed to take food out of the kitchen.
5. Students are also required to participate in a polite and responsible way. Students are not allowed to sit on the working stations. Students who disturb lessons or are disrespectful to the instructor or the other students will be asked to leave the class. Serious infractions will be evaluated by the Academic Office.
6. Cooking classes will include various tasks which all students must carry out. Classes will include all different types of recipes and students are expected to actively participate in all lessons regardless of personal likes or dislikes.
7. Each student is responsible for washing all utensils used during class and keeping the working station clean and tidy, with all the utensils as listed in the station inventory. Two students at a time will tidy up the kitchen common areas during each class.
8. Students are responsible for kitchen utensils and maintenance of the equipment. The cost of a) any missing utensil b) damages due to student carelessness will be shared by all students.
9. No visits are allowed in class at any time.
10. The use of cellular phones is not allowed within the school building.

Should students wish to store materials or equipment, lockers are available with a deposit (given back after returning the key).

7. COURSE FEES

Course fees cover course-related field learning activities, visits, and support the instructor's teaching methodologies. Book costs are not included in the course fee. If this course requires a fee, the exact amount is communicated prior to enrollment.

8. GRADING AND EVALUATION & ATTENDANCE

10% Attendance
30% Class Participation and Assignments
20% Midterm Exam, Field Learning project (if applicable), Special/Research Project (if applicable), Practical Performance (if applicable)
20% Final Exam
20% Paper/Project

The above grade breakdown percentages reflect the grading scale standards in the "Grading and Evaluation System" section of the catalog.

Attendance
Class participation is mandatory. Based on the hours defined in the Academic Catalog's attendance policy, students may miss up to 2 class encounters delivered as lecture hours. A third absence constitutes a course failure.

Please note that absence hours may vary according to the learning methodology, as per the academic catalog policy on credit hours:
https://catalog.auf-florence.org/standard_regulation

9. EXAMS / PROJECTS / ASSIGNMENTS

Final Exam: The final exam is divided into two sections:
Part I: written test
Part II: hands-on performance

The written test is divided into three sections:
Part I: 10 Multiple choice questions. Each correct answer is worth 2 points, for a total of 20 points.
Part II: 10 short-answer questions. Each correct and complete answer (concise explanations, main ideas, key words, names, etc.) is worth 5 points, for a total 50 points.
Part III: two essay questions; each correct and complete answer is worth 15 points (based on content, vocabulary, detail, etc.) for a total of 30 points.

No pencil allowed. Blue and black pens only.
The practical test will be defined by the Chef instructor.
Further details (guidelines, grading rubric, hands-on exam) are provided in the course portal.

The final exam is cumulative and will account for the 20% of the final grade breakdown.
The time and date of the exam cannot be changed for any reason.

Final Project: The final project accounts for 20% of the final course grade. The project details will be assigned the first day of class.

Assignments: This course requires at least 3 assignments as per the course outline in the syllabus.

Assignment #1: Students are asked to provide an 800 words research on one **preservation method applicable to food**, that was developed in the last 20 years. Due by Lesson 4.

Assignment #2: Students are asked to provide an 800 words research on the **main "revolutions" that shaped gastronomy in the history of mankind.** Due by Lesson 7.

Assignment #3: Students must analyze one instructor-assigned food by **contrasting domestic preparation techniques with industrial manufacturing**, detailing ingredient composition, additive functions, and the processing workflow. Due by Lesson 10.

Further details are provided in the course portal.

10. COURSE OUTLINE

Lesson 1	
Meet	In class
Lecture	**Course Overview and the History of the Science of Cooking** Molecular view of what "cooking" means - The birth of molecular gastronomy - The development of cooking styles with a new understanding of scientific ideas - Organic molecule classification - Types of chemical bonds and interactions
Objectives	Learn organic molecule classification - Gain familiarity with types of chemical bonds and interactions - Understand how the chemical-physical properties of water affect the cooking process - Understand the concept of "surface tension"
Readings/ Assignments	On food and Cooking - The Four Basic Molecules pp. 792-796 / 811-813 **Assignment #1 assigned: Research on one preservation method applicable to food.** DUE by Lesson 4

Lesson 2	
Meet	In class
Lecture	**Technology and Food** A look at traditional food production and a contrast with modern and industrial methods - Definition of Water activity (aw) in food and how this is exploited by food industry - Flavor Infusion and structure transformation.
Objectives	Distinguish traditional food-production systems from contemporary industrial technologies - Explain water activity (aw) and its role in texture, flavor infusion, and microbial control

Readings/ Assignments	The science of Cooking Ch. 5: Cooking methods and utensils On food and Cooking pp. 777-791 The science of Cooking Ch. 6, 7: Meat, poultry and fish

Lesson 3	
Meet	In class
Lecture	**Back to Basics** Proteins denaturation: egg cooking Protein coagulation: stabilizing meat proteins sous vide Starches: rice puffing
Objectives	Analyze the techniques that are used everyday and observe the ways that different methods change the same foods - Get confident with new twists on old recipes using modern materials
Lab	3 textures of a yolk (part 1 - tasting starts) - "Another carbonara" - Beef and creme anglais
Readings/ Assignments	On food and Cooking - The Four Basic Molecules pp. 84-87 **Assignment #2 assigned: Research on the main gastronomic "revolutions".** Due by Lesson 7.

Lesson 4	
Meet	In class
Lecture	**Food preservation** The biology of the food spoilage process: which parameters affect the most - Methods and technology of preserving foods - The new meanings of the word "Fresh" - A specific overview on alternative preservation methods: irradiation, packaging, dehydration, concentration, exotic gases
Objectives	Analyze the biological drivers of food spoilage and their impact on product stability - Evaluate modern preservation technologies, including irradiation, advanced packaging, dehydration, concentration, and controlled-atmosphere systems - Assess how evolving preservation methods reshape the concept of "freshness" in the food industry
Readings/ Assignments	See material on the course website **Assignment #1 DUE** **FINAL PROJECT OVERVIEW.**

Lesson 5

Meet	In class
Lecture	**Volatile molecules: Dry "Steaming"** **Starch gelatinization and structural transformation: Puffed Rice**
Objectives	Learn modern, cutting-edge cooking techniques - Develop new textures and flavors while rediscovering and understanding the benefits of heritage methods - Understand the features of soy lecithin
Lab	3 textures of a yolk (part 2 - tasting continues) Dry steamed scampi - Cotoletta and risotto 2.0
Readings/ Assignments	On food and Cooking pp. 387-388 / p. 802

Lesson 6	
Meet	In class
Lecture	**Cooking and Chemicals: Emulsifiers and Colorings** Structure, purposes and application in contemporary cuisine. **The origin of flavor** The evolving world of taste and smell
Objectives	Understand the reason and ways in which additives affect contemporary cuisine - Understand the concept of "solubility" from the molecular point of view - Learn emulsion classification, O/W or W/O emulsions: why an emulsifier is needed and the molecular basis of its function - Colorings: molecular classification - Artificial or organic colorings: differences and similarities
Readings/ Assignments	The science of Cooking Ch. 2: Sensuous molecules On food and Cooking - The Four Basic Molecules pp. 792-796 / p. 817

Lesson 7	
Meet	In class
Lecture	**Temperature and Pressure - Nutrient reaction to heat transfer** Cooking Carbohydrates, Proteins, Fats, Vitamins and Minerals Alternative and advanced ways of using heat - The thermodynamic relationship between Pressure and Temperature - Introduction to Liquid Nitrogen
Objectives	Explain how temperature, pressure, and heat-transfer mechanisms influence nutrient stability and food structure - Analyze the thermal behavior of carbohydrates, proteins, fats, vitamins, and minerals during cooking - Evaluate advanced and alternative heat-application techniques used in modern culinary practice - Interpret the thermodynamic relationship between pressure and temperature in controlled cooking systems - Understand the functional principles and culinary applications of liquid nitrogen.

Readings/ Assignments	On food and Cooking - The Four Basic Molecules pp.796-809 / p. 815 **Assignment #2 DUE**

Lesson 8	
Meet	In class
Lecture	**The Cold Kitchen: Liquid Nitrogen** Heat and pressure continued - Basic application of liquid nitrogen Basic application of the whipping syphon
Objectives	Understand the features of liquid nitrogen - Learn how to handle liquid nitrogen: safety measures - Use cold technology in the kitchen to enhance the versatility of the Chef and the presentation experience for the Client
Lab	Nitrocappuccino - Red cabbage gazpacho - Frozen Gin&Tonic
Readings/ Assignments	See material on the course website

Lesson 9	
Meet	In class
Lecture	**Jellification, Gums, Sets, and Emulsions** The theory and practice of applying modern food products to enhance the eating experience **Changing Food** A look at the way mass production has changed food products to meet mass production criteria
Objectives	Learn the definition and classification of jellification, gums, sets and emulsions - Learn calcium and alginates interactions - Understand the principles of the spherification technique Acquire knowledge of how Chefs are sharpening these techniques and ingredients to their advantage - Reflect on the room for development and open fields in molecular cuisine: examples of molecular gastronomy, molecular baking, and molecular pastry.
Readings/ Assignments	See material on the course website **FINAL PROJECT DUE**

Lesson 10	
Meet	In class

Lecture	**Working with Designer Products** Application of spheriphication technique: sodium alginate and calcium chloride - Agar Agar VS Gelatin Definition and characteristics of agar agar - Agar gel properties: focus on reversibility - Suitable applications of agar agar
Objectives	Application of cutting edge flavor and texture mediums, both natural and designer - Gain proficiency in the techniques of spherification and emulsification - Create unusual taste and texture matches
Visit/Lab	Ravioli stuffed with mussel water and seaweed - Oyster tartare with green apple and celery caviar, Prosecco air
Readings/ Assignments	See material on the course website **Assignment #3 DUE**

Lesson 11 Final Exam	
Meet	In class
Lecture	FINAL EXAM