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**APICIUS – INTERNATIONAL SCHOOL OF HOSPITALITY**

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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:

Understand the applications of science to cooking and how it changed our perception of cuisine, ingredients, flavors

Gain confidence and familiarity with the reactions of food during cooking or processing from a scientific point of view

Understand food reactions to the application of different methods

Gain an understanding through science of taste and satiety

Become confident with applying liquid nitrogen

Work with natural additives to create new textures

Understand the spherification technique and how it can be applied in present day cuisine

Produce relevant dishes based on scientific procedures through the application of molecular gastronomy concepts

Understand the idea of cooking as an application of scientific principles including the development of cooking methods and styles

Apply modern-day and cutting-edge cooking techniques to the research and development of new textures and flavors

### 3. REQUIREMENTS

Two semesters of Culinary Arts coursework or equivalent.

### 4. METHOD

This course consists of lectures, class discussions, projects, and site visits within the local community. Mediums for instruction used will include, but are not limited to, interactive and hands-on activities which challenge thought processes, academic texts and studies, videos, slides, guided problem solving, and experiential and/or field learning activities where applicable.

### 5. TEXTBOOK – FURTHER READINGS – RESOURCES

#### TEXTBOOK:

**Barham, Peter - The Science of Cooking - Springer, 2001**

The Textbooks are pre-ordered and available at: Paperback Exchange in Via delle Oche 4r or laFeltrinelli Via dei Cerretani 40R. Textbooks may also be available for purchase online or in e-book format.

The textbook is mandatory for successful completion of the course.

Where applicable, additional materials, handouts and/or notes will be provided by the instructor.

#### FURTHER READINGS

(Books listed below are available in the FUA-AUF library)

On Food and Cooking - Harold McGee - Hodder & Stoughton

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

#### LIBRARIES IN FLORENCE

The FUA-AUF library is located in Corso Tintori 21. Please consult the posted schedules for official opening times. Also note that the library is for consultation only and it is not possible to borrow materials. The library is equipped with a scanner and internet access so that you may save or email a

digital copy of the pages needed.

Students may also utilize additional libraries and research centers within the local community:

#### BIBLIOTECA PALAGIO DI PARTE GUELFA

Located in Piazzetta di Parte Guelfa between Piazza della Repubblica and Ponte Vecchio. Please consult the library website for hours of operation: [http://www.biblioteche.comune.fi.it/biblioteca\\_palagio\\_di\\_parte\\_guelfa/](http://www.biblioteche.comune.fi.it/biblioteca_palagio_di_parte_guelfa/)

#### BIBLIOTECA DELLE OBLATE

Located in via dell'Oriuolo 26. Please consult the library website for hours of operation: [www.bibliotecadelleoblate.it](http://www.bibliotecadelleoblate.it)

#### THE HAROLD ACTON LIBRARY AT THE BRITISH INSTITUTE OF FLORENCE

Located in Lungarno Guicciardini 9. Please consult the library website for hours of operation. This library requires a fee-based student membership. For information: [www.britishinstitute.it/en](http://www.britishinstitute.it/en)

## 6. FIELD LEARNING

Please consult your Official Registration for any mandatory field learning dates. Field Learning Activities cited in Official Registrations are an integral part of the course and also include an assignment that counts towards your final grade, details will be provided on the first day of class.

## 7. COURSE MATERIALS

### Professional Cooking courses

**This course includes cooking labs. The following rules are applicable to lab activities.**

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).

## 8. 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. The exact amount will be communicated by the instructor on the first day of class.

## 9. EVALUATION – GRADING SYSTEM

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

A = 93-100 %, A- = 90-92%, B+= 87-89%, B = 83-86%, B-=80-82%, C+ = 77-79%, C=73-76%, C- =70-72%, D = 60-69%, F= 0-59%, W = Official Withdrawal, W/F = Failure to withdraw by the designated date.

## 10. ATTENDANCE – PARTICIPATION

Academic integrity and mutual respect between instructor and student are central to the FUA-AUF academic policy and reflected in the attendance regulations. Student presence is mandatory and counts toward the final grade.

**An absence as per the FUA-AUF Academic Catalog is equivalent to 3 academic hours.**

On the second absence the attendance and participation grade will be impacted. Please note that missing certain field learning activities may count for more than one absence.

On the third absence the instructor may lower the final grade by one letter grade. (Example: Final grade average of 93% or A will become a B).

**The fourth absence constitutes automatic failure of the course. Students with excessive absences will be asked to withdraw with a W (if before the deadline) or leave the course with a WF.**

### LATE ARRIVAL AND EARLY DEPARTURE

Arriving late or departing early from class is not acceptable. Two late arrivals or early departures or a

combination will result in an unexcused absence. Travel is not an exceptional circumstance.

**TRAVEL (OR DELAYS DUE TO TRAVEL) IS NEVER AN EXCUSE FOR ABSENCE FROM CLASS.**

It is always the student's responsibility to know how many absences he or she has in a course. If in doubt, speak with your instructor!

**Participation:** Satisfactory participation will be the result of contributing to class discussions by putting forth insightful and constructive questions, comments and observations. Overall effort, cooperation during group work, proper care of work space and tools, responsible behavior, and completion of assignments will be assessed. All of the above criteria also apply to Field Learning and site visits.

## 11. EXAMS – PAPERS – PROJECTS

**The final Paper/Project accounts for 20% of the course grade.**

Format: topic, length, guidelines, and due date will be provided in the course addendum.

Material for research will be available in the FUA-AUF Library in Corso Tintori 21.

**The Final exam accounts for 20% of the final course grade** and it consists of a written and a practical test. For exam time and date consult the course addendum. The time and date of the exam cannot be changed for any reason.

Format: the written exam 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: 6 short-answer questions. Each correct and complete answer (concise explanations, main ideas, key words, names, etc.) is worth 10 points, for a total 60 points.

Part III: 1 essay question

The practical test will be decided by the Chef instructor. See information on the course addendum.

The Final Exam is cumulative.

## 12. LESSONS

<b>Lesson 1</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>Course Overview and the History of the Science of Cooking</b> 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
<b>Objectives</b>	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”
<b>Readings/ Assignments</b>	See material on the course website

<b>Lesson 2</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>Back to Basics</b> Proteins denaturation: egg cooking Protein coagulation: stabilizing meat proteins sous vide Starches: rice puffing
<b>Objectives</b>	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
<b>Visit</b>	Triade di manzo chianino - Magnum Dry rice for puffing;preparation starts
<b>Readings/ Assignments</b>	See material on the course website

<b>Lesson 3</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>Technology and Food</b> A look at traditional food production and preservation and a contrast with modern and industrial methods - The example of pressure cooker: the physical principle and chemical reaction derived from its use - Definition of Water activity (aw) in food and how this is exploited by food industry
<b>Objectives</b>	Understand how these methods evolve and develop flavors and textures
<b>Readings/ Assignments</b>	TB Chapter 5: Cooking methods and utensils See material on the course website

<b>Lesson 4</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>Cooking Carbohydrates, Proteins, Fats, Vitamins and Minerals</b> Nutrient reaction to heat transfer
<b>Objectives</b>	Understand the ways in which cooking effects the food we eat, including changing taste, texture, aroma, nutrition, and safety - Learn the close relationship between Time & Temperature - Understand the concept of protein denaturation - Learn carbohydrate modification during cooking process: caramelization, jellification - Get confident with carbohydrates and protein molecular interactions: the example of Maillard reaction - Understand molecular differences between fats and oils - Understand fat oxidation
<b>Readings/ Assignments</b>	TB Chapter 6, 7: Meat, poultry and fish See material on the course website

<b>Lesson 5</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>Cooking and Chemicals: Emulsifiers and Colorings</b> Structure, purposes and application in contemporary cuisine

<b>Objectives</b>	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
<b>Readings/ Assignments</b>	TB Chapter 2: Sensuous molecules See material on the course website

<b>Lesson 6</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>Dry “Steaming” - Puffed Rice</b>
<b>Objectives</b>	Learn modern, cutting-edge cooking techniques - Develop new textures and flavors while rediscovering and understanding the benefits of heritage methods
<b>Readings/ Assignments</b>	See material on the course website

<b>Lesson 7</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>MIDTERM EXAM</b>

<b>Lesson 8</b>	
	<b>BREAK</b>

<b>Lesson 9</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>Playing with Fire: Heat and Pressure</b> Methods and technology of preserving foods - The new meanings of the word “Fresh” - A specific overview on alternative preservation methods: irradiation, packaging, dehydration, concentration - Alternative and advanced ways of using heat - The biology of the food spoilage process: which parameters affect the most - The thermodynamic relationship between Pressure and Temperature
<b>Objectives</b>	Understand the way in which heating methods affect the structure and texture of foods
<b>Readings/ Assignments</b>	TB Chapter 4: Heat and heating / TB Chapter 13: Cooking with chocolate See material on the course website

<b>Lesson 10</b>	
<b>Meet</b>	In class

<b>Lecture</b>	<b>The Biology and Science of Taste and Satiety</b> The physiology of the digestive process - Molecular basis of the Glycemic and Satiety index of food: the example of “resistant starch” Introduction to carbon dioxide and liquid nitrogen
<b>Objectives</b>	Understand the way we taste and enjoy food, the biological needs of nutrition and food safety versus the need for variety and novelty - Understand the biology of the senses of taste and smell - Learn carbon dioxide and liquid nitrogen chemical structures and derived properties at low temperatures
<b>Readings/ Assignments</b>	TB Chapter 3: Taste and flavor See material on the course website

<b>Lesson 11</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>The Cold Kitchen: Liquid Nitrogen</b> Heat and pressure continued - Basic application of liquid nitrogen Basic application of the whipping syphon
<b>Objectives</b>	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
<b>Lab</b>	Nitrocappuccino - Red cabbage gazpacho
<b>Readings/ Assignments</b>	See material on the course website

<b>Lesson 12</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>Jellification, Gums, Sets, and Emulsions</b> The theory and practice of applying modern food products to enhance the eating experience
<b>Objectives</b>	Learn the definition and classification of jellification, gums, sets and emulsions - Learn calcium and alginates interactions - Understand the principles of the spherification technique
<b>Readings/ Assignments</b>	See material on the course website

<b>Lesson 13</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>Working with Designer Products</b> Application of spherification 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



<b>Objectives</b>	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
<b>Lab</b>	Ravioli ripieni di olio extra vergine - Fried egg - Spherification
<b>Readings/ Assignments</b>	See material on the course website

<b>Lesson 14</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>Changing Food</b> A look at the way mass production has changed food products to meet mass production criteria
<b>Objectives</b>	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.
<b>Readings/ Assignments</b>	See material on the course website

<b>Lesson 15</b>	
<b>Meet</b>	In class
<b>Lecture</b>	<b>FINAL EXAM - Final exam</b>