



## SYLLABUS

**PALAZZI FLORENCE ASSOCIATION FOR INTERNATIONAL EDUCATION  
FLORENCE UNIVERSITY OF THE ARTS  
APICIUS - INTERNATIONAL SCHOOL OF HOSPITALITY**

---

**SCHOOL OF FOOD AND WINE STUDIES**

**DEPARTMENT OF CULINARY ARTS**

**COURSE TITLE: PRECISION COOKING AND TEXTURE DEVELOPMENT**

**COURSE CODE: FWCAPC490**

---

3 Semester Credits

### **1. DESCRIPTION**

The course is divided into three phases and explores stimulating applications of contemporary cuisine. Precision cooking and texture development apply the latest scientific discoveries to food production and may require special instruments for the achievement of specific results. This course focuses on techniques that can be available in a professional environment and allow chefs to develop their creativity in order to reach new and sometimes unexpected results.

Phase 1, Temperature Application: This phase explores the possible applications in which precise and specific temperatures play a fundamental role. The microbiology as well as the sanitation practices for precision and low temperature cooking will be covered, with a complete overview of contemporary methods, equipment, and procedures used in contemporary kitchens and in food production labs. Special emphasis will be placed on sous-vide cooking through the use of the immersion circulator, applications of liquid nitrogen for different purposes other than freezing, stimulating effects of carbonation on food flavor perception, and the application of frozen food processing with the Pacojet food processor.

Phase 2, Gels and Thickening Agents: This phase examines how contemporary chefs and food technologists use ingredients in ways that earlier generations would have never imagined. Topics will analyze the increasing use of ingredients such as thickening and gelling agents in order to create sauces with unexpectedly smooth textures, hot and cold gels, firm coating gels, and methylcellulose gels. With the support of a chemist, specific additives will be evaluated, discussed, and tested.

Phase 3, Gases and Air-Based Preparations: This phase focuses on contemporary techniques of texture changes obtained by incorporating specific gases into foods in order to modify familiar textures, improve presentation methods, and serve unusual and contemporary dishes. Items such as foams, froth, and puffed snacks will be analyzed. Students will examine and test diverse types of foams, both hot and cold with different foaming agents from animal and vegetable sources, as well as learn how to produce light foams, thick fine-textured foams, textured snacks, airs, and froths.

This course includes experiential learning hours with our Community Engagement Member Institutions (CEMI).

### **2. OBJECTIVES**

The aim of the course is to introduce students to the new frontiers of cookery by a full immersion in the science of cooking that has developed during the last decades and changed culinary art dramatically like many other past revolutions did. Students will have the possibility

to practice with instruments and materials that can be usually seen only in books or on television and understand the great potential of modernist cookery. The course offers the possibility to understand how flavors, textures and visual appearance of food can be impacted by using specific techniques and ingredients.

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

- Understand there is chemistry behind every single food preparation either prepared following the traditional methods or the contemporary techniques
- Understand that the application of modernist techniques and ingredients is not a deflection from cooking but just its natural evolution
- Understand the advantages of specific temperatures on the development of textures and flavors once impossible to reach with traditional methods
- Apply natural additives for the creation of food with unexpected textures, flavors and temperatures
- Gain knowledge of techniques that will widen their creativity
- Understand the suitable applications of the learned techniques in a restaurant menu and the advantages most of these techniques offer in terms of food cost control

### **3. REQUIREMENTS**

Culinary Arts Majors only. The Science of Cooking: An Introduction to Molecular Cuisine, or equivalent.

### **4. METHOD**

This course consists of lectures, class discussions, and projects. Mediums for instruction used may 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. TEXT BOOK – FURTHER READINGS – RESOURCES**

#### **TEXT BOOK**

**Modernist cuisine** - Myhrvold-Young-Bilet - The Cooking Lab

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 text book 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: The Science and Lore of the Kitchen** - Harold McGee - Hodder&Stoughton

**The Flavor Thesaurus** - Niki Segnit - Bloomsbury

**Molecular Gastronomy: exploring the science of flavor** - Herve This - Columbia University Press

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

#### **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**

NOTE: STUDENTS MUST ALSO ADHERE TO KITCHEN RULES OUTLINED IN THE GANZO/FEDORA BOOKLET

1. All students are strictly required to attend class wearing a clean uniform: the jacket provided by the school, 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.

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 and in-class activities, responsible behavior, and completion of assignments will be assessed. All of the above criteria also apply to Field Learning and site visits if applicable.

## **11. EXAMS – PAPERS – PROJECTS**

### **Assignments**

Students are asked to manage the kitchen with a responsible behavior and abide by the HACCP guidelines. Students are asked to collaborate to the purchasing, storing and issuing of the ingredients necessary to provide the service related to the course activities.

**Class participation and assignments account for the 30% of the final course grade.**

### **Project**

Students are asked to provide the menus for the Friday a la carte dinners that will be held at Ganzo School Teaching Restaurant according to the teacher indications and the course topics. Format, guidelines and due dates will be available on the course website.

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

## **Practical Performances**

The practical performances refer to the quality and the improvement during the experiential learning activities at Fedora and Ganzo.

**Practical performances account for the 20% of the final course grade.**

## **Final Exam**

**The final exam is composed of three assessments, held after each of the three phases of the course:**

### **Phase assessments**

10 multiple choice and short answer questions after each of the three phases

**The Final exam accounts for 20% of the final course grade and will be cumulative.**

For exam time and date consult the course website.

**The time and date of the exam cannot be changed for any reason.**

## **12. LESSONS**

### **Topics**

#### **Phase 1**

##### **Introduction to the course**

The development of cuisine in the history of mankind - Evolution of cooking and cooking revolutions during centuries - Molecular gastronomy and how it changed the way we think about food - The modernist revolution and the new scientific approach to cooking - The Modernist Cuisine Manifesto - Modernist cuisine in France, Spain, England and United States: differences and common grounds

##### **The “modernist” kitchen - How the contemporary revolution changed the kitchen layout**

The modernist cuisine equipment: kitchen, lab or both ? - Thickeners, hydrocolloids, gels, gums, enzymes, centrifuge, cryogenic freezing: psychological barriers at the base of the understanding of modernist revolution

##### **Readings**

TB - From origins of cooking to the modernist revolution pp. 1-6 > 82  
On food and cooking - Harold McGee - INTRODUCTION pp.1-5 - THE FOUR BASIC FOOD MOLECULES Ch.15 - A CHEMISTRY PRIMER Appendix pp.811-818

##### **Cryogenic freezing - Advanced culinary applications of liquid nitrogen**

Definition of liquid nitrogen and chemical features - Applications of liquid nitrogen for cooking - The effects of temperature difference on food texture: cryosearing - Cryogenic freezing for shattering, powdering, poaching - Decorating food with the help of liquid nitrogen: shaping fat or viscous materials, disassembling fruits - Safe handling of cryogens

##### **Readings**

TB pp. 2-456 / 2-463

##### **Cryogenic freezing and carbonation - Carbonating with dry-ice and carbon dioxide**

Definition of carbonation - Carbonating with carbon dioxide and dry-ice: method and suggestions

The chemistry of fizziness: why do our taste buds detect carbonation as sour? - The importance

of temperature for carbon dioxide dissolving - Applications of carbon dioxide: carbonating liquids and solid foods - Carbon dioxide for food preservation - Safe handling of cryogenics

### Readings

TB pp. 2-464 > 473

### Pacojet

Introduction to the system - The new frontier of *processing* food - "Pacotizing": processing frozen recipes without thawing them - Precision-spinning all types of food into a fine, creamy consistency - Advantages of Pacojet on nutritional values preservation, texture, color and flavor - Advantages on food cost control

### Readings

TB pp. 2-406 > 410 - [www.pacojet.com](http://www.pacojet.com)

### Sous-vide cooking applications - Immersion circulator and the cook&hold cooking method

Overview on sous vide packaging system - Common problems when vacuum sealing food - Sous vide equipment: controlling temperature as the key to sous vide advantages on food texture - Sous vide cookers: focus on controlled water circulation - Applications of sous vide for cooking

**Advanced sous vide cooking techniques:** Focus on Cook and hold to final temperature for slow changes in meat structure - Water bath strategies for cooking sous vide: bath set to final temperature / set hotter than final temperature / combination of the two methods

### Readings

TB pp.4-192 > 279

### Test: Phase 1 assessment

---

### Phase 2

#### Thickening: from reduction by concentration to modern hydrocolloids - Part 1

Fluids viscosity and its relation with temperature

Factors involved in thickening a liquid: temperature, clarity, viscosity, pH, flavor release, mouthfeel, weeping

Traditional thickeners: the limit of starch for flavor release

Modern thickeners and suitable applications

#### Focus on: modified starches

Pre-hydrated starches for instant "pour and stir" application

Advantages of modified starches application: lump-free thickening effects, high solubility in hot and cold liquids, excellent flavor release

Tapioca maltodextrin and modified tapioca starch applications

Stabilizing high-fat liquids into powders

Transforming fruit purees with high water content into dehydrated crunchies

### Readings

TB pp. 4- 6 > 19 - TB pp. 4-30 > 37

#### Thickening: from reduction by concentration to modern hydrocolloids - Part 2

#### Focus on: modern hydrocolloids

Definition of hydrocolloids: from common flour and gelatin to xanthan gum, and carrageenan -

Survey on modern hydrocolloids: purposes and uses

How dispersion and hydration work

How thickeners are differentiated: aesthetic and functional properties

Application of hydrocolloids for thickening hot and cold liquids

**Focus on lambda carrageenan:** strong interaction with proteins and stability for dairy based solutions

**Focus on xanthan gum and locust bean gum:** properties and uses

## Readings

TB pp. 4-38 > 47

### Gels - Part 1

Definition of gels - How gelling works

Thermo-reversible and thermo-irreversible gels

Familiar and traditional gels

Egg gels, Starch Gels, Dairy and tofu gels: definition and characteristics

### Modern gels

Gelling with hydrocolloids - Sources of hydrocolloid agents - How to choose an appropriate gelling agent: factors that influence the choice

### Cold gels

Suitable gelling agents: 160 bloom gelatin, iota and kappa carrageenan, agar agar, low-acyl gellan, high-acyl gellan - Select gelling agents depending on desired consistency and starting liquid - Firm & Coating gels: the new frontier of chaud-froid

### Fluid gels

The double personality of fluid gels: variation of viscosity depending on the amount of force applied - Focus on Agar agar and gellan gum

Fluid gels as a suitable first step for syphon thick foams

## Readings

TB pp. 4-67 > 123 - 4-124 > 160 Fluid gels TB pp. 4-176 > 183  
On food and cooking - Harold McGee pp. 597-610

### Gels - Part 2

#### Hot gels

Agar agar, carrageenan, LM pectin and gellan: gelling agents with a *warm* melting point: a sensory revolution

Expanding textures and melting points by combining gelling agents and gums

**Hot fruit and vegetables gel** - Interference of natural acidity and calcium content on gel formation - Step by step method for a hot fruit gel

**Gel films** - application to both cold or hot gels - Suitable equipment

## Readings

TB pp. 4-160 > 169 - TB pp. 4-170 > 175

## Test: Phase 2 assessment

---

### Phase 3

#### Foams - Part 1

Definition of foam: a *special* type of emulsion - Dispersed and continuous phase - The complexity of foams - The importance of creating new foams through practical experiments

#### Foaming agents (or foam stabilizers)

Examples of foams and related stabilizers

Interaction and contrast between foam stabilizers

Survey on traditional and familiar foams, traditional stabilizers and preparation methods -

Making a foam: conventional and unconventional methods

## **Modernist foams**

Combination of classical and innovative stabilizers - Survey on innovative foam stabilizers and foam inhibitors - Suitable tools to make foams: from whisk to the aquarium bubbler

Different foam structures due to different foaming agents and foaming methods

**The whipping syphon:** advanced applications - Nitrous oxide and carbon dioxide: the reasons for a choice

### **Readings**

TB pp. 4-243 > 263

## **Foams - Part 2**

Different consistencies and stability for various culinary purposes

**Froths, airs and bubbles:** definition and preparation methods - Suitable foaming tools

**Light foams:** suitable applications and foaming methods - Tips and suggestions for stability

**Thick foams:** fine textured foams with abundant continuous phase - Different serving temperatures of gelatin foams and other hydrocolloid-based foams - suitable stabilizers for hot foams

### **Readings**

TB pp. 4-264 > 287

## **Foams - Part 3**

**Set foams:** when continuous phase solidifies - Different textures of set foams - Suitable foaming methods and foam stabilizers - Hot and cold set foams

HPMC application to hot and cold set foams

**Puffed snacks:** starch gel dehydrated bases - The importance of moisture content

### **Readings**

TB pp. 4-288 > 315

## **Test: Phase 3 assessment**

---

### **Learning Outcomes**

- Understand the development of cuisine through the great revolutions that occurred during centuries
- Understand the importance of considering the modernist revolution as the latest step in culinary evolution and not just a deflection from cooking
- Learn the importance of precision instruments and technical equipment
- Learn the possible applications of cryofreezing for a variety of purposes
- Understand the potential danger when handling liquid nitrogen and learn the safety rules
- Understand the potential applications of carbonation: for preservation and for flavor
- Learn how to handle dry-ice
- Understand the added value of fizziness
- Learn how to infuse flavors with carbonation
- Understand the advantages of processing food at freezing temperatures
- Learn all necessary steps in the use of Pacojet
- Learn how Pacojet can help keeping food cost under control
- Experience the flavor and texture of food processed with Pacojet
- Know the complete equipment set for cooking sous vide



- Understand the importance of precision cooking to develop slow changes during meat cooking  
Learn and apply cook and hold cooking technique
- Cooking sous vide for pasteurization
- Understand the impact of fluid viscosity when thickening
- Learn which are the factors that influence thickening
- Understand the limits of classic starches for flavor release
- Learn the variety of modified starches now available, their purposes and applications
- Identify hydrocolloids
- Understand the properties of thickeners
- Learn to use dedicated thickeners for specific effects and liquids composition
- Learn the sources of hydrocolloids as developed by chemical industries for food applications
- Learn to use modern hydrocolloids for gelling
- Learn the definition and structure of gels, made with the traditional to the contemporary materials
- Get confident with gelling agents for firm and coating gels
- Understand the advantages of cold coating gels compared to classi chaud-froid
- Learn the suitable applications of fluid gels
- Learn how to use gelling agents and thickeners that resist warm temperatures
- Understand the definition of foams and its structure
- Understand similarities and differences between emulsions and foams
- Learn the function of stabilizers and thickeners in foams formation
- Be able to compare familiar with contemporary foams
- Understand the purpose of foaming to achieve new textures and an overall lightness
- Learn all possible instruments to produce foams according to the chosen mixture and desired result
- Learn advanced applications of the whipping syphon
- Understand the suitable application of gases for syphon use
- Learn the distinction between froths, air and foams: how the bubbles size and geometry influence flavor perception
- Understand the use of airs and froths as airy and light sauces
- Learn the suitable stabilizers and gelling agents for set foams production
- Learn how to produce puffed snacks with familiar starches and contemporary additives
- Learn the special texture of vacuum-set foams and the possible applications