OPEN ELECTIVE-8 **Kitchen Chemistry**

Semester	I
Paper Code	CHOE-VIII
Paper title	Kitchen Chemistry
Number of teaching hours per week	3
Total number of teaching hrs per semester	42
Number of credits	3

1. SCIENCE IN THE HOME KITCHEN **9 h**

The variability challenge- ingredient variables, equipment variables, technique variables. The modes of learning how to cook (expert instruction, observation, trial & error, question and answer).

Three ways of starting a chemical reaction in kitchen: (i) mechanical force- a catalyst for chemical change.

Case study: Reason for sweet oranges sometimes resulting in bitter juice; reason for sliced onions making people cry; blanched basil leaves

(ii) Heat- Chemicals that give fruits and plants their colour: chlorophyll, carotenoids and anthocyanins. Effect of cooking and pH on colour of fruits and vegetables. Effect of heat on fruits and vegetables

(iii) Combination of Ingredients -The anatomy of meat, tenderizing of meat, the science of marination.

Case study: The curious case of the shrinking apple pie.

Eggs: The science of whipping, heat and role of fat in coagulation; testing the tenderness of eggs (cooked with and without butter).

2. MATERIALS USED IN COOKWARE **5 h**

A comparison of the materials used to make modern cooking utensils such as copper, anodized cookware, steel and cast-iron pots and pans, teflon coated frying pans, plastic and wooden cutting boards, and ceramic casserole dishes. Triple coated steel.

3. METHODS OF COOKING **6 h**

Cooking media – air, water, steam and fat. Microwave cooking – method, advantage & disadvantages. Techniques of cooking- roasting, baking, frying, boiling, steaming, grilling etc.

4. CHEMISTRY OF COOKING **9 h**

The physical states of water, the acidity of water, the miscibility of fats and water, fats and heat, protein denaturation. Food additives: salt, sugar, baking soda, baking powder, sour

powder, cream of tartar, vanilla extract, MSG (monosodium glutamate), colorants and antioxidant agents. Chemicals produced while cooking and their harmful effects: polyaromatic hydrocarbons, nitrosamines, saturated fats.

5. GRAINS, BREAD AND LEAVENING 7 h

The basic structure of dough, batters and their products: gluten, starch, gas bubbles, fats. comparison of yeasts and chemical leavenings. Science behind the production of bread: ingredients, mixing and kneading, fermentation, baking and the role of steam. Maillard reaction. How to improve dough: investigation of protein bonds that form its glutenous network, mechanical behaviour of bread resembles that of plastic material.

Activity: Demonstration of dough making for muffins, brownies and cakes.

6. AMATEUR TO FOOD SCIENTIST 6 h

The science involved in making biriyani, brownies, chocolate chip cookies, French fries, hamburgers, ice cream sundaes, omelette, pancakes and pudding.

References:

1. Harold McGee, Ed. Scribner, 'On food and cooking, the science and lore of the kitchen', Chapter 10, pp 521-571.
2. Robert L. Wolke, Ed. W.W. Norton and company, 'Kitchen science explained, what Einstein told his cook' chapter 3, pp 97-109 and 114-116.
3. Fox, P. F. (Ed)., Developments in Dairy Chemistry. Applied Sci. Publ., New York (1982).
4. Fox, P. F. and Sweeny, McDairy, Chemistry and Bio-Chemistry. Academic /Platinum Publ., New York (1998).
5. Fox, P. F. (Ed)., Developments in Dairy Chemistry. Applied Sci. Publ., New York.
6. Jenness, R. and Patton, S. (1984). Principles of Dairy Chemistry. Wiley Eastern Pvt. Ltd, New Delhi (2006).
7. Mathur, M. P., Datta, D. R., and Dinakar, P., Text book of Dairy Chemistry, Directorate of Information and Publs., ICAR, New Delhi (1999).
8. Webb, B. H., Johonson, A. H., and Alford, J. A. (Eds)., Fundamentals of Dairy Chemistry. CBS Publ. and Distributors Pvt. Ltd., New Delhi (2008).
9. http://www.slideshare.net/c121401w/carcinogens-in-cooked-meat
10. http://chemistry.about.com/od/foodcookingchemistry/a/bha-bht-preservatives.htm
11. http://www.understandingfoodadditives.org/pages/Ch2p4-1.htm
12. http://www.worldofmolecules.com/foods/

Formative Assessment (Internal assessment) Theory	
Assessment Occasion/ type	**Weightage in Marks**
Continuous evaluation and class test	20
Seminars/Class work	10
Assignments/Discussions	10
Total	40