

### SEMESTER III

#### USCHA320 - SKILL BASED ELECTIVE: INDUSTRIAL CHEMISTRY

Year: II	Course Code	Title of the Course	Course Type	Course category	H/W	Credits	Marks
SEM:III	USCHA320	Industrial Chemistry	Theory	Skill Based Elective	2	2	100

#### Learning Objectives:

1. To acquire an in depth knowledge on various areas of industrial chemistry like polymers, leathers, textile, fuels, glasses, ceramics, cements and paints.
2. To help the students enhance the reasoning skills and understand the working of industrial processes.

#### Course Outcomes:

The Learners will be able to

1. Discuss the composition, characteristics and manufacture of various industrial products. (Polymer, Leather, Textile, Glass, Ceramics, Cements, Paints and Pigments).
2. Explain the various process involved in the manufacture of leathers and leather products.
3. Describe the importance of natural and synthetic fibres in textile industry.
4. Understand the classifications of fuels and learn the common terms related to it.
5. Understand how to implement the concepts in industrial working environment.

CO	PSO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H
CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H

<b>CO2</b>	H	H	H	H	M	H
<b>CO3</b>	H	H	H	H	M	H
<b>CO4</b>	H	H	H	H	M	H
<b>CO5</b>	H	H	H	H	M	H

### **Unit I: (6 Hours)**

- 1.1 Introduction- terms involved in polymers. (K1 & K2)
- 1.2 Classification of polymers. (K1, K2 & K3)
- 1.3 Polymerization, types of polymerization. (K1, K2 & K3)
- 1.4 Preparation, properties and uses of natural polymers. (K1 & K2)
- 1.5 Preparation, properties and uses of synthetic rubber- polyvinyl chloride, polyester, polyamide. (K1, K2 & K3)
- 1.6 Biodegradable polymers. (K1 & K2)

### **Unit II: (6 Hours)**

- 2.1 Introduction-constituent of animal skin. (K1 & K2)
- 2.2 Preparation of hides for tanning. (K1 & K2)
- 2.3 Process - cleaning and soaking, liming and unhairing, deliming, bating and pickling. (K1, K2 & K3)
- 2.4 Leather tanning-vegetable and chrome tanning. (K1, K2 & K3)
- 2.5 Finishing process- dyeing and fat liquoring. (K1, K2 & K3)
- 2.6 Cleaner processing and practices in beam house, Effluent treatment (K1, K2 & K3)

### **Unit III: (6 Hours)**

- 3.1 Introduction to textile fibres-Classification of textile fibres. (K1 & K2)
- 3.2 Differences between natural and synthetic fibres. (K1 & K2)
- 3.3 Synthetic fibres- Preparation and properties of Rayon and Nylon. (K1, K2 & K3)
- 3.4 Textile chemical processing for the fibres-Singeing, de-sizing, scouring, bleaching, mercerization. (K1, K2, K3 & K4)
- 3.5 Textile dyes- difference between pigments and dyes. (K1 & K2)
- 3.6 Classification of dyes- vat dyes, Azo dyes, chrome dyes, Acid and base dyes. (K1 & K2)

### **Unit IV: (6 Hours)**

- 4.1 Introduction- Classification of fuels. (K1 & K2)
- 4.2 Solid fuel-coal and coke- composition and properties. (K1 & K2)
- 4.3 Liquid fuel- Petroleum processing and fractions, Biofuels.(K1 & K2)
- 4.4 Cracking- catalytic cracking and methods-Knocking- octane number and cetane number. (K1, K2 & K3)

4.5 Synthetic petrol-Fischer Tropsch and Bergius processes. (K1, K2 & K3)

4.6 Fuel gases- Natural gas and Water gas. (K1 & K2)

#### **Unit V: (6 Hours)**

5.1 Glass- Raw materials- characteristics. (K1 & K2)

5.2 Methods of Manufacture- melting, shaping, annealing, finishing- special glasses. (K1, K2 & K3)

5.3 Refractories- characteristics, classification and properties. (K1 & K2)

5.4 General methods of manufacture of refractories. (K1, K2 & K3)

5.5 Cement- composition, setting of cement- crystalline and colloidal theory. (K1, K2 & K3)

5.6 Paints and pigments- Constituent of paints, pigments- white lead, ultramarine, Chrome yellow. (K1, K2 & K3)

#### **References:**

1. B.K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut, 2016.
2. B.N.Chakrabarty, Industrial Chemistry, Oxford & IBH Publishing Co, New Delhi, 1981.
3. P.C. Jain, Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Co (P) Ltd, 2018.
4. K. Sessa Maheswaramma, Mridula Chugh, Engineering Chemistry, Pearson Education India, 2016.
5. Thomas Bechtold, Tung Pham, Textile Chemistry, Walter de Gruyter GmbH & Co, 2019.
6. Jayashree Ghosh, A Textbook of Pharmaceutical Chemistry, S.Chand and Company Ltd., Reprint 2013.

#### **Open Educational Resources (OER):**

1. <https://plastics.americanchemistry.com/How-Plastics-Are-Made/>
2. <http://wwwchem.uwimona.edu.jm/courses/CHEM2402/Textiles/Leather.html>
3. <http://www.petroleum.co.uk/>
4. <https://nios.ac.in/media/documents/313courseE/L34A.pdf>

### **SEMESTER 1V**

#### **USCHB420 - SKILL BASED ELECTIVE: AGRICULTURAL CHEMISTRY**

<b>Year: II</b>	<b>Course Code</b>	<b>Title of the Course</b>	<b>Course Type</b>	<b>Course Category</b>	<b>H/W</b>	<b>Credits</b>	<b>Marks</b>
<b>SEM: IV</b>	USCHB420	Agricultural Chemistry	Theory	Skill Based	2	2	100

#### **Learning Objectives:**

1. To impart elementary ideas of soil chemistry, types of farming, insecticides, fungicides and herbicides.
2. To emphasize the importance of fertilizers.

#### **Course Outcomes:**

The Learners will be able to

1. Understand the scope of agriculture in India and Tamil Nadu.
2. Explain the physical and chemical properties of soil.
3. Describe the types of farming.
4. Summarize the certification of organic products.
5. Identify the benefits and adverse effects of pesticides.

CO	PSO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

### **Unit I: (6 Hours)**

1.1 Agriculture – Definition – Scope of agriculture in India and Tamil Nadu. (K1 & K2)

1.2 Branches of agriculture. (K1 & K2)

1.3 Agronomy – Art, Science and business of crop production. (K1 & K2)

1.4 Agronomical classification of crops - their importance. (K1 & K2)

1.5 Major crops of India and Tamil Nadu, Water resources in Tamil Nadu. (K1 & K2)

1.6 Factors affecting crop production – Moisture, aeration, light, temperature and nutrients.

(K1 & K2)

### **Unit II:(6 Hours)**

2.1 Soil chemistry – Introduction, soil classification and survey. (K1 & K2)

2.2 Properties of soil – soil texture and soil water. (K1 & K2)

2.3 Soil temperature and soil colloids. (K1 & K2)

2.4 Soil minerals and soil pH. (K1 & K2)

2.5 Soil acidity – alkalinity and buffering soil. (K1 & K2)

2.6 Soil fertility and soil formation. (K1 & K2)

### **Unit III: (6 Hours)**

3.1 Farming – types – subsistence farming and commercial farming. (K1 & K2)

3.2 Plantation farming, mixed farming and conventional farming. (K1 & K2)

3.3 Organic farming, poultry farming and dairy farming. (K1 & K2)

3.4 Advantages of organic farming- limitation of organic farming. (K1 & K2)

3.5 Certification of organic products – OFAI organic labeling system. (K1 & K2)

3.6 Research findings on organic food. (K1 & K2)

### **Unit IV: (6 Hours)**

4.1 Insecticides, Fungicides and Herbicides - Introduction. (K1 & K2)

4.2 Methods of using pest controls. (K1 & K2)

4.3 Insecticides – Arsenic compounds, fluorine compounds and boron compounds. (K1 & K2)

4.4 Insecticides- mercury compounds, copper compounds and sulphur compounds. (K1 & K2)

4.5 Modern insecticides – some important herbicides -Rodenticides. (K1 & K2)

4.6 Benefits of Pesticides, Adverse environmental effects of Pesticides. (K1 & K2)

### **Unit V: (6 Hours)**

5.1 Fertilizers – Classification- Examples of fertilizers. (K1 & K2)

5.2 Nitrogenous fertilizers- phosphate fertilizers- potash fertilizers. (K1 & K2)

5.3 Ill effects of fertilizers. (K1 & K2)

5.4 Manures, compost and saw dust. (K1 & K2)

5.5 Farmyard manure, compost, reinforcing manure and green manure. (K1 & K2)

5.6 Sewage and sludge - biogas production. (K1 & K2)

### **References:**

1. Sankaran, S. and V.T. Subbiah Mudaliar. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore. 1997
2. Principles and Practices of Agronomy. Agrobios. Jodhpur - 342 002.
3. Jayashree Ghosh. Fundamental Concepts of Applied Chemistry. S. Chand Publishing Ltd., 2006.
4. Kirpal Singh. Chemistry in Daily life 1<sup>st</sup> Edition, Prentice Hall of India Pvt. Ltd., 2008.

### **Open Educational Resources (OER):**

1. <https://nptel.ac.in/courses/126/105/126105016/>
2. <https://nptel.ac.in/courses/126/105/126105016/>
3. <https://nptel.ac.in/content/storage2/courses/103107086/module1/lecture1/lecture1.pdf>
4. <https://nptel.ac.in/courses/126/105/126105014/>

### SEMESTER V

#### USCHC520-SKILL BASED ELECTIVE: SMALL SCALE CHEMISTRY

<b>Year: III</b>	<b>Course Code</b>	<b>Title of the Course</b>	<b>Course Type</b>	<b>Course Category</b>	<b>H/W</b>	<b>Credits</b>	<b>Marks</b>
<b>SEM: V</b>	USCHC520	Small Scale Chemistry	Theory	Skill Based Elective	2	2	100

#### Learning Objectives:

1. To impart knowledge on small-scale industries.
2. To acquire skills in the manufacture of various small-scale products.

#### Course Outcomes:

The Learners will be able to

1. Understand the laws, role and steps involved in starting small scale industries.
2. Acquire skills to prepare soaps and detergents.
3. Describe the characteristics and uses of cosmetics and perfumes.
4. Gain skills in the manufacture of selected small-scale products.

CO	PSO					
	1	2	3	4	5	6
CO1	H	M	H	H	H	H
CO2	H	M	H	H	H	H
CO3	H	M	H	H	H	H
CO4	H	M	H	H	H	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H

<b>CO2</b>	H	H	H	H	M	H
<b>CO3</b>	H	H	H	H	M	H
<b>CO4</b>	H	H	H	H	M	H

### **Unit I: Small - Scale Industry**

- 1.1.Objectives and characteristics of small-scale industries (K1& K2)
- 1.2. Types of SSI, role of SSI in Indian economy. (K1& K2)
- 1.3. Steps in starting SSI (K1& K2)
- 1.4. Laws for SSI, Problems of SSI (K1& K2)
- 1.5. Finance management, Quality control – definition and advantages. (K1& K2)
- 1.6.Marketing and branding, Advertising – definition, objectives, advertising media.(K1 &K2)

### **Unit II: Soaps and Detergents**

- 2.1. Soaps- definition, fatty and non- fatty raw materials.(K1& K2)
- 2.2. Types of soaps, manufacture of laundry soap and bathing soap. (K1& K2)
- 2.3. Mechanism of cleansing action of soap.(K1& K2)
- 2.4. Composition, preparation and advantages of herbal soaps. (K1& K2)
- 2.5. Detergents - classification of surfactive agents (LABSA), manufacture of detergents. (K1& K2)
- 2.6. Shampoo – composition and manufacture of egg and herbal shampoo, anti-dandruff and conditioners.(K1& K2)

### **Unit III: Cosmetics and Perfumes**

- 3.1. Cosmetics – definition and history.(K1& K2)
- 3.2. Kinds of cosmetics. (K1& K2)
- 3.3. Preparation of face powder, face cream and lipstick.(K1& K2)
- 3.4. Perfumes - definition, essential ingredients in perfumes.(K1& K2)
- 3.5. Classification of essential oils.(K1& K2)
- 3.6. Preparation of perfumes.(K1& K2)

### **Unit IV: Miscellaneous Small-Scale Products**

- 4.1. Camphor – production, biosynthesis and applications. (K1& K2)
- 4.2. Bleaching powder – preparation, properties and uses. (K1& K2)
- 4.3. Biogas- composition, production and uses.(K1& K2)
- 4.4. Handmade paper from bagasse- composition of bagasse and uses.(K1& K2)
- 4.5. Asofoetida – composition, cultivation, manufactures and uses.(K1& K2)
- 4.6. Composition and manufacture of safety matches and agarbattis.(K1& K2)

### Unit V: Miscellaneous Small-Scale Products

- 5.1. Recycling of synthetic organic polymers – applications of PET and PVC. (K1& K2)
- 5.2. Recycling of synthetic organic polymers – applications of HDPE and polystyrene.(K1& K2)
- 5.3. Reverse osmosis of water – production and applications.(K1& K2)
- 5.4. Coconut oil – manufacture by dry and wet process and uses. (K1& K2)
- 5.5. Vulcanization of rubber, making an eraser. (K1& K2)
- 5.6. Pencils–forms of graphite, adhesion and lengthwise graphitization method & uses. (K1& K2)

#### Reference Books:

1. Dr. V. Balu, Entrepreneurship and Small Business Promotion, First Edition, Sri Venkateswara Publications, 2004.
2. B.N.Chakrabarty, Industrial Chemistry, Oxford & IBH Publishing Co. Pvt. Ltd., 1981.
3. A.N.Zamre, V.G.Ratolikar, A Textbook of Modern Applied Chemistry, M.G.Lomte Edition, S.Chand& Co., 1985.
4. Clarence Henry Eckles, Willes Barnes Combs and Harold Macy, Milk and Milk products, Tata McGraw- Hill Publishing Company, 2002.
5. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 2008.
6. H.Panda, Herbal soaps detergents Hand Book, National Institute of Industrial Research,2011.

#### Open Educational Resources (OER)

1. [https://chem.libretexts.org/Bookshelves/Organic\\_Chemistry/Supplemental\\_Modules\\_\(Organic\\_Chemistry\)/Lipids/Properties\\_and\\_Classification\\_of\\_Lipids/Soaps\\_and\\_Detergents\(Soaps\\_and\\_Detergents\)](https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Supplemental_Modules_(Organic_Chemistry)/Lipids/Properties_and_Classification_of_Lipids/Soaps_and_Detergents(Soaps_and_Detergents))
2. <https://www.pdfdrive.com/perfumes-cosmetics-and-soaps-modern-cosmetics-d157713809.html> (Perfumes, Cosmetics and Soaps e- book).

### SEMESTER VI – MAJOR ELECTIVE III A

#### UECHE20- APPLIED CHEMISTRY

Year: III SEM: VI	Course Code UECHE20	Title of the Course Applied Chemistry	Course Type Theory	Course Category Core- Elective	H/W 5	Credits 5	Marks 100
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#### Learning Objectives:

1. To impart knowledge on biological, dairy, leather, soil and dye chemistry.

#### Course Outcomes:

The Learners will be able to

1. Describe the digestion and absorption of carbohydrates, proteins and fats and describe the role of enzymes and physiological functions of hormones.



2. Recall the definition, constituents and physico-chemical properties of milk and indicate the composition of creams, butter, ghee and ice creams.
3. Demonstrate the chief processes involved in leather manufacture and treatment of tannery effluents
4. Classify and enumerate the properties of soils.
5. Determine the physico-chemical properties of water and illustrate reverse osmosis and ion-exchange methods.

CO	PSO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	M
CO2	H	H	H	H	M	M
CO3	H	H	H	H	M	M
CO4	H	H	H	H	M	M
CO5	H	H	H	H	M	M

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	M	M	H
CO2	H	H	H	M	M	H
CO3	H	H	H	M	M	H
CO4	H	H	H	M	M	H
CO5	H	H	H	M	M	H

### Unit I: (15 Hours)

- 1.1 Biological Chemistry:Elementary treatment of digestion and absorption of carbohydrates, proteins and fats. (K1, K2, K3 &K4)
- 1.2 Elementary treatment of enzymes, cofactors, prosthetic groups and theory of enzyme action.(K1, K2, K3 &K4)
- 1.3 Physiological functions of adrenaline and thyroxin.(K1, K2,K3 &K4)
- 1.4 Physiological functions of oxytocin and insulin. (K1, K2, K3& K4)
- 1.5 Physiological functions of sex harmones.(K1, K2,K3 & K4)
- 1.6 Micronutrients and their biological role in human systems.(K1, K2, K3 & K4)

## **Unit II: (15 Hours)**

- 2.1 Dairy Chemistry: Milk- Definition, Physicochemical properties of milk.(K1, K2,K3 &K4)
- 2.2 Constituents of milk and their physicochemical properties.(K1, K2,K3 & K4)
- 2.3 Chemical change taking place in milk due to processing parameters- boiling, pasteurization, sterilization and homogenization.(K1, K2, K3 &K4)
- 2.4 Definition and composition of creams, butter, ghee and icecreams. (K1, K2,K3 &K4)
- 2.5 Milk powder-definition, need for making powder. (K1, K2,K3 & K4)
- 2.6 Principles involved in drying process- spray drying and drum drying.(K1, K2,K3 & K4)

## **Unit III: (15 Hours)**

- 3.1 Leather Chemistry: Introduction, chief process used in leather manufacture.(K1,K2,K3 & K4)
- 3.2 Structure of hide and skin.(K1, K2,K3 & K4)
- 3.3 Leather processing-process before tannage. (K1, K2, K3 & K4)
- 3.4 Tanning process- vegetable tanning and chrome tanning. (K1, K2, K3& K4)
- 3.5 Finishing process - dyeing and fat liquoring. (K1, K2, K3& K4)
- 3.6 Tannery effluent and by product problems and treatment. (K1, K2, K3 & K4)

## **Unit IV: (15 Hours)**

- 4.1 Soil Chemistry: Introduction-soil classification. (K1, K2,K3 & K4)
- 4.2 Properties of soil, soil water, soil air, soil temperature, soil minerals, soil colloids, soil reaction and buffering. (K1,K2,K3 & K4)
- 4.3 Soil pH, soil acidity, soil salinity and alkalinity. (K1, K2,K3 & K4)
- 4.4 Cation Exchange Capacity and its significance. (K1, K2, K3 &K4)
- 4.5 Soil fertility and soil formation. (K1, K2,K3 &K4)
- 4.6 Nutrient cycle –Biological nitrogen fixation. (K1, K2, K3 & K4)

## **Unit V: (15 Hours)**

- 5.1 Water Chemistry: Sources of water. K1, K2, K3 &K4)
- 5.2 Physical characteristics-colour, temperature, turbidity, Total solids, Total Dissolved Solids.(K1, K2, K3 &K4)
- 5.3 Chemical characteristics - Hardness, degree of hardness, temporary and permanent hardness, Scale formation, removal of hardness.(K1, K2, K3 &K4)
- 5.4 pH, Alkalinity, Dissolved Oxygen. .(K1, K2, K3 &K4)
- 5.5 Biological characteristics – Biological Oxygen Demand. (K1, K2, K3 &K4)
- 5.6 Reverse osmosis and ion exchange methods – principle and functions.(K1, K2, K3 &K4)

### Reference Books:

1. G.R. Agarwal, Kiran Agarwal and O.P. Agarwal, Agarwal's Text Book of Biochemistry, 18<sup>th</sup> Edition, Goel Publishing House, 2015.
2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, 1<sup>st</sup> Edition, S.Chand& Co. Ltd, New Delhi, 2013.
3. Clarence Henry Eckles, Willes Barnes Combs, Harold Macy, Milk and Milk Products, 4<sup>th</sup> Edition, Tata McGraw Hill Publishing Company Ltd, Reprint 2002.
4. B.K.Sharma, Industrial Chemistry, 13<sup>th</sup> Edition, Goel Publishing House, Reprint 2016.
5. Dilip Kumar Das, Introductory Soil Science, 4<sup>th</sup> Edition, Kalyani Publishers, Reprint 2017.
6. Gurdeep Chatwal, Organic Chemistry of Natural Products, Vol. 2, Himalaya Publishing House, Reprint, 2018.
7. M. Satake, Y. Mido, Chemistry of Colour, 1<sup>st</sup> Edition, Discovery Publishing House, Reprint 2003.

### Open Educational Resources (OER)

1. <http://ecoursesonline.iasri.res.in/course/view.php?id=92>
2. <http://wwwchem.uwimona.edu.jm/courses/CHEM2402/Textiles/Leather.html>
3. [http://mimoza.marmara.edu.tr/~kyapsakli/enve202/Lecture12\\_Soil%20Chemistry.pdf](http://mimoza.marmara.edu.tr/~kyapsakli/enve202/Lecture12_Soil%20Chemistry.pdf)  
[http://inside.mines.edu/~epoeter/\\_GW/21WaterChem5/WaterChem5pdf.pdf](http://inside.mines.edu/~epoeter/_GW/21WaterChem5/WaterChem5pdf.pdf)

## SEMESTER VI

### USCHD620 - FOOD CHEMISTRY

Year: III SEM: VI	Course Code	Title of the Course	Course Type	Course Category	H/ W	Credits	Marks
	USCHD620	Food Chemistry	Theory	Skill Based Elective	2	2	100

### Learning Objectives:

1. To impart elementary ideas of various types of food, food additives, food poisons, food adulteration.
2. To emphasize the importance of vegetable and fruits.

### Course Outcomes:

The Learners will be able to

1. Apply simple analytical techniques for detecting food adulterants.
2. Describe the role of food additives, preservatives, flavours, colours and antioxidants.
3. Detect food poisons and apply first aid techniques.
4. Distinguish between alcoholic and nonalcoholic beverages.
5. Describe the importance of saturated and unsaturated fats in edible oils and the nutritive value of fruits and vegetables.

CO	PSO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

### **Unit I: (6 Hours)**

1.1 Food and food adulteration, food types, advantages and disadvantages. (K1 & K2).

1.2 Food adulteration- adulteration in food grains, milk and butter. (K1 & K2)

1.3 Food adulteration- adulteration in ghee, ice creams and cakes. (K1 & K2)

1.4 Food adulteration- adulteration in pepper, turmeric and chilli powder. (K1 & K2)

1.5 Food adulteration- adulteration in edible oils, coffee and tea powder. (K1 & K2)

1.6 Detection of adulterants by simple analytical techniques, FSSAI and HACCP laws. (K1 & K2)

## **Unit II: (6 Hours)**

- 2.1 Food additives - Definition, structure , advantages and disadvantages of artificial sweeteners – sucralose, saccharin, cyclamate and aspartate. (K1 & K2)
- 2.2 Food flavours-esters, aldehydes and heterocyclic compounds (K1 & K2)
- 2.3 Food flavours -spices - ajwain, aniseed, asafoetida, bay leaves, cardamom, cinnamon, cloves. (K1 & K2)
- 2.4 Food colours, emulsifying agents and preservatives . (K1 & K2)
- 2.5 Leavening agents- baking powder, baking soda, yeast. (K1 & K2)
- 2.6 Antioxidants- propyl gallate, butylated hydroxyl anisole and butylated hydroxyl toluene. (K1 & K2)

## **Unit III: (6 Hours)**

- 3.1 Food poison - pesticides and chemical poisons. (K1 & K2)
- 3.2 First aid for poison consumed victims. (K1 & K2)
- 3.3 Beverages - soft drinks- soda, carbonated drinks, fruit juices. (K1 & K2)
- 3.4 Alcoholic beverages- examples and composition. (K1 & K2)
- 3.5 Addiction to alcohol- diseases of liver. (K1 & K2)
- 3.6 Deaddiction measures. (K1 & K2)

## **Unit IV: (6 Hours)**

- 4.1 Edible oils - fats, oils, sources of oils, saturated and unsaturated fats. (K1 & K2)
- 4.2 Importance of MUFA and PUFA. (K1 & K2)
- 4.3 Iodine value, RM value, saponification values and their significance. (K1 & K2)
- 4.4 Rancidity- types, hydrolytic and oxidative. (K1 & K2)
- 4.5 Test for rancidity (K1 & K2)
- 4.6 Prevention of rancidity. (K1 & K2)

## **Unit V:(6 Hours)**

- 5.1 Vegetables and Fruits – classification and composition. (K1 & K2)
- 5.2 Nutritive value of green leafy vegetables, roots and tubers, other vegetables. (K1 & K2)
- 5.3 Pigments- water insoluble and water soluble pigments. (K1 & K2)
- 5.4 Vegetable cookery- preparation, changes during cooking, loss of nutrients during cooking. (K1 & K2)
- 5.5 Fruits- classification and composition. (K1 & K2)
- 5.6 Ripening of fruits, chemical fruit ripening and storage of fruits. (K1 & K2)

### **Reference Books:**

1. Lillian Hoagland Meyer, Food Chemistry, 1<sup>st</sup> Indian Edition, CBS Publishers and Distributors, 2004.
2. Norman W. Desrosier, James N. Desrosier, The technology of food preservation, 4<sup>th</sup> Indian Edition, CBS Publishers and Distributors, 1987.
3. Norman N. Potter, Joseph H. Hotchkiss, Food science, 5<sup>th</sup> Edition, CBS Publishers and Distributors, 1999.

- Vijay Kaushik., Dietotherapy, 1<sup>st</sup> Edition, Mangal Deep Publications, 2008.
- B.Srilakshmi, Food Science, 7<sup>th</sup> Edition, New Age International publishers, 2018.
- Seema Yadav, Food Chemistry, 1<sup>st</sup> Edition, Anmol publications, 2006

### Open Educational Resources:

- <https://freevidelectures.com/course/4443/nptel-dairy-food-process-products-technology/7>
- <https://nptel.ac.in/content/storage2/courses/103103029/pdf/mod6.pdf>
- <https://nptel.ac.in/courses/126/105/126105013/>

## SEMESTER – V/VI

### UGCHA520/620 - FOOD AND NUTRITION CHEMISTRY

Year :	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
III SEM : V&VI	UGCHA520/620	Food & Nutrition Chemistry	Theory	Elective	3	2	100

### Learning Objectives:

- To impart knowledge about the importance of food and its impact on human health.
- To highlight the nutritive value of fruits and vegetables and the importance of balanced diet.

### Course Outcomes:

The Learners will be able to

- Explain the sources, classification, functions, deficiency diseases and metabolism of carbohydrates.
- Explain the sources, classification, functions, deficiency diseases and metabolism of proteins and fats.
- Outline the sources, functions and deficiency diseases of fat soluble and water soluble vitamins.
- Describe the sources, functions, and deficiency diseases and RDA of essential and trace minerals.
- Appreciate the nutritive values and evaluate the chemical changes and loss of nutrients during cooking and storage of fruits and vegetables.

CO	PSO					
	1	2	3	4	5	6
CO1	H	M	H	H	H	H
CO2	H	M	H	H	H	H
CO3	H	M	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	M	H	H	H	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

### Unit I: (9 Hours)

- 1.1. Nutrition and Health – concept. (K1, K2)
- 1.2. Classification of food. (K1, K2)
- 1.3. Nutrients - macro and micro nutrients. (K1, K2)
- 1.4. Carbohydrates - sources, classification, functions, deficiency diseases, energy requirements. (K1, K2)
- 1.5. Blood sugar level. (K1, K2)
- 1.6. Carbohydrates metabolism - Glycolysis, Glyconeogenesis, Glycogenolysis. (K1, K2&K3)

### Unit II: (9 Hours)

- 2.1. Proteins - sources, classification, functions. (K1, K2)
- 2.2. Deficiency diseases, energy requirements. (K1, K2)
- 2.3. Protein metabolism. (K1, K2&K3)
- 2.4. Fats - Sources, classification, functions. (K1, K2)
- 2.5. Deficiency diseases, energy requirements. (K1, K2)
- 2.6. Fat metabolism. (K1, K2&K3)

### Unit III: (9 Hours)

- 3.1. Vitamins – classification, difference between fat soluble and water soluble vitamins. (K1, K2)
- 3.2. Fat soluble vitamins (A and D) (K1, K2)
- 3.3. Fat soluble vitamins (E and K) (K1, K2)
- 3.4. Water soluble vitamins (Thiamine, Riboflavin, Niacin Pyridoxine, Pantothenic acid,) sources, functions, deficiency diseases and daily requirements. (K1, K2)
- 3.5. Water soluble vitamins (Folate, Choline, Biotin, Cyanocobalamin) sources, functions, deficiency diseases and daily requirements. (K1, K2)
- 3.6. Ascorbic acid - sources, functions, deficiency diseases and daily requirements. (K1, K2)

### Unit IV: (9 Hours)

- 4.1. Minerals – classification. (K1, K2)

- 4.2. Major elements (Ca, P, Na, K) sources, functions, deficiency diseases and recommended requirements. (K1, K2)
- 4.3. Major elements (Fe, Mg, I and F), sources, functions, deficiency diseases and recommended requirements. (K1, K2)
- 4.4. Trace elements (Zn, Cu, Co, Se, Mo) - sources, functions, deficiency diseases and recommended requirements. (K1, K2)
- 4.5. Balanced diet - Recommended diet for adult - Indian men and women. (K1, K2)
- 4.6. Diet in pregnancy and lactation. (K1, K2)

**Unit V: (9 Hours)**

- 5.1. Vegetables – Nutritive value of green leafy vegetables, roots and tubers. (K1, K2)
- 5.2. Vegetable cookery (preliminary preparation, changes during cooking, loss of nutrients during cooking). (K1, K2)
- 5.3. Fruits – Nutritive value of fruits, pigments, water, cellulose and pectic substances, flavour constituents, polyphenols, bitterness in fruits. (K1, K2)
- 5.4. Ripening of fruits – chemical ripening. (K1, K2)
- 5.5. Storage of fruits. (K1, K2)
- 5.6. Antioxidants - antioxidant properties of vegetables and fruits. (K1, K2)

**Text Books:**

1. B.Srilakshmi, Food Sciences, 5<sup>th</sup> Edition, New Age International Publishers, 2010.
2. Shrinandan Bansal, Food and Nutrition, 2<sup>nd</sup> Edition, AI.T.B.S Publishers, India, 2010.

**Reference Books:**

1. K. Park - Park’s Text Book of Preventive and Social Medicine, 20<sup>th</sup> Edition, Banarsidas Bhanot Publishers, Jabalpur, 2009.
2. G.R.Agarwal, Kiran Agarwal and O.P.Agarwal, Agarwal’s Textbook of Biochemistry, 11<sup>th</sup> Edition, Goel Publishing House, 2000.
3. Ambiga Shanmugam, Fundamentals of Biochemistry for Medical Students, 8<sup>th</sup> Edition, Reprint 2016.

**Open Educational Resources (OER):**

1. <http://epgp.inflibnet.ac.in/Home/ViewSubject?catid=444> (Different methods of cooking)
2. <http://epgp.inflibnet.ac.in/Home/ViewSubject?catid=444> (Classification of carbohydrates)
3. <http://epgp.inflibnet.ac.in/Home/ViewSubject?catid=444> (Functions of food)

**NON-MAJOR ELECTIVE – II**

**UGCHB520/620 -COSMETICS AND DYES**

<b>Year: III</b> <b>SEM: V/VI</b>	<b>Course Code:</b> UGCHB520/620	<b>Title of the Course:</b> Cosmetics and Dyes	<b>Course Type:</b> Theory	<b>Course Category:</b> Elective	<b>H/W</b> 3	<b>Credits</b> 2	<b>Marks</b> 100
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**Learning Objectives:**

1. To give a basic introduction to cosmetics, their classification and uses.



- To give a broad overview on the disadvantages of using synthetic cosmetics over herbal cosmetics, cosmetic safety and evaluation method, etc.
- To give an introduction to dyes and their applications in various industries from textile to pharmacy and food, contribution of various industries to environmental pollution and its effect on human health.

**Course Outcomes:**

The learners will be able to

- Define and classify cosmetics, deodorants, antiperspirants, perfumes, aerosols and identify the pros and cons of synthetic cosmetics.
- Describe the safety assessment methods used by FDA.
- Prepare and use fruits and vegetables based herbal cosmetics and evaluate the significance of aromatherapy and apply it to human health and beauty.
- Explain the properties of natural and synthetic dyes.
- Understand the impact of dyes used in textile and leather industry to environmental pollution and analyse the importance of dyes in pharmaceutical and food industry.

CO	PSO					
	1	2	3	4	5	6
CO1	H	M	H	H	H	H
CO2	H	M	H	H	H	H
CO3	H	M	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	M	H	H	H	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

**Unit I: (9 hours)**

- 1.1 Cosmetics – definition & classification based on use. (K1, K2)
- 1.2 Components of cosmetics. (K1, K2)
- 1.3 Deodorants, antiperspirants. (K1, K2)
- 1.4 Aerosols, perfumes and fragrances. (K1, K2)
- 1.5 Pros and cons of synthetic cosmetics. (K1, K2, K3)

**Unit II: (9 hours)**

- 2.1 Safety of Cosmetics. (K1, K2)
- 2.2 Basic concept of cosmetic safety. (K1, K2)
- 2.3 Safety test items. (K1,K2,K3)
- 2.4 Evaluation method. (K1, K2, K3)
- 2.5 Skin irritation, sensitization. (K1, K2)
- 2.6 Testing on human (Patch test, Usage test). (K1, K2)

**Unit III: (9 hours)**

- 3.1 Herbal cosmetics. (K1, K2)
- 3.2 Fruits and vegetables as hair care and skin care (apple, apricot, banana, carrot, cucumber, honey, lemon, tomato). (K1, K2)
- 3.3 Herbal Perfumes and fragrance. (K1, K2)
- 3.4 Skin care herbs – olive oil, sesame oil, black pepper, Amla. (K1, K2, K3)
- 3.5 Aromatherapy – various oils used in aromatherapy and their significance. (K1,K2, K3)
- 3.6 Standardization of herbs – importance, methods employed for standardization of herbal extracts. (K1, K2)

**Unit IV: (9 hours)**

- 4.1 Dyes - definition of dyes and types. (K1, K2)
- 4.2 Requirements of a good dye i.e.Colour, chromophore and auxochrome, solubility, linearity, coplanarity, fastness, substantivity, definition of fastness and its properties. (K1, K2,K3)
- 4.3 Mordants Definition with examples. (K1, K2)
- 4.4 Natural dyes - Definition; Advantages and limitations of natural dyes. (K1, K2)
- 4.5 Examples and uses of natural dyes with respect to henna, turmeric, saffron, indigo, chlorophyll –names of the chief dyeing material/s in each of the natural dye (structures not expected) (K1, K2)
- 4.6 Synthetic dyes - definition of synthetic dyes, primaries and intermediates. (K1, K2)

## Unit V: (9 hours)

- 5.1 Textile uses of dyes - impact of the textile and leather dye Industry on the environment with special emphasis on water pollution. (K1, K2, K3, K4)
- 5.2 Non textile uses of dyes - biomedical uses – Tablets, syrups and capsules. (K1, K2, K3, K4)
- 5.3 DNA markers and therapeutics. (K1, K2, K3)
- 5.4 Dyes in food and cosmetics - commonly used food colors and their limits. (K1, K2, K3)
- 5.5 Properties of dyes used in food and cosmetics. (K1, K2, K3)
- 5.6 Dyes sensitized solar cells – A tool to overcome the future energy crisis. (K1, K2)

### Reference Books:

1. Venkatraman K, Chemistry of Synthetic Dyes, Vol I – VIII, Academic Press 1972.
2. Lubs H.A., Robert E . The Chemistry of Synthetic Dyes and Pigments, Krieger Publishing Company, NY 1995.
3. Shenai V.A., Chemistry of Dyes and Principles of Dyeing, Sevak Publications, 1973.
4. Sodhi. G. S., Fundamental Concepts of Environmental Chemistry, 3rd Edition, Narosa Publishers, 2013.
5. Kirpal Singh, Chemistry in Daily Life, 3rd Edition, Prentice Hall of India Pvt., Ltd., 2012.
6. Dr. J. C. Kurian, Plants that heal, Vol 1., P.H. Lall, Oriental Watchman Publishing House, 1995.
7. C P Khare, Indian Medicinal plants: An illustrated Dictionary, Springer Science, 2007.
8. BehlPN, Srivatsava G., Herbs useful in dermatological Therapy, 2<sup>nd</sup> Edition, CBS Publishers & Distributors, 2002.
9. H. Panda, Herbal Soaps and Detergents Handbook, NIIR project consultancy services, 2011.
10. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, 2<sup>nd</sup> Edition, S. Chand & Company Ltd., New Delhi, 2006.
11. B C Maumdar, P C Mukhopadhyay, Principles and Practice of Herbal Garden, Daya Publishing House, New Delhi, 2006.

### Open Educational Resources (OER)

1. <http://fsdaup.gov.in/reg-drug-and-costmetic.htm>
2. <https://www.theherbarie.com/The-Herbarie-Formulary.html>
3. [https://www.medicalnewstoday.com/articles/10884#essential\\_oils](https://www.medicalnewstoday.com/articles/10884#essential_oils)
4. <https://www.britannica.com/technology/dye>