

**ANDHRA UNIVERSITY**  
**DEPARTMENT OF ORGANIC CHEMISTRY & FDW**  
**Revised Syllabus for M.Sc Chemistry**  
**(Chemistry of foods, drugs and water analysis specialization)**  
**(With effect from the Admitted batch of 2021-2022 Academic Year)**

**Programme objectives:**

1. To provide students in the scientific skills and chemical knowledge essential to develop and apply the knowledge in chemical sciences related to analysis of food and drug chemistry.
2. To provide knowledge, application, skills in water analysis
3. To equip students with effective scientific communication skills
4. To encourage the pursuit of lifelong education
5. To develop each student into a committed individual with ethical and social responsibility

**Programme Specific objectives:**

The students who complete the M.Sc. Chemistry (**Chemistry of foods, drugs and water analysis specialization**) course shall:

1. Have strong foundation in the fundamentals and applications of chemical knowledge and understanding
2. Have the abilities to think critically, logically and analytically and solve problem in the area of chemical sciences, drug chemistry, medicinal chemistry and water pollution
3. Have the abilities to carry out chemical experiments, record and analyze the results and design advanced models
4. Have the abilities to use modern library and information retrieving tools to obtain information and assimilate to generate concepts and apply them in challenging situations
5. Have the abilities to effectively communicate their knowledge and skills to other chemists and non-chemists in oral or written formats
6. Secure suitable employment in the areas of chemical industries like pharmaceutical (R&D, QA & QC), polymers, , environmental and pollution control, nanotechnology and composite materials, teaching and research, etc.
7. Have the personal attributes and ethical sensibilities to enable them to function as effective scientists and citizens

## M.Sc. Chemistry (Final Year)

**Specialization: Chemistry of FOODs, DRUGS and WATER ANALYSIS**

S.No	Paper Title	Course Type	Instruction Periods per week	External Marks	Internal Marks	Total Marks	Duration of External Examination	Credits
1	Chemistry of Drugs - I	Theory	4	80	20	100	3 hours	4
2	Chemistry of Drugs - II	Theory	4	80	20	100	3 hours	4
3	Drug Analysis-I	Theory	4	80	20	100	3 hours	4
4	Drug Analysis-II	Theory	4	80	20	100	3 hours	4
5	Practical-I: Drug analysis-I	Lab	3	80	20	100	6 hours	4
6	Practical-II: Drug analysis-II	Lab	3	80	20	100	6 hours	4
7	MOOC course	-	-	-	-	-	-	4
8	Value added course - Intellectual Property Rights (IPR)	-	-	-	-	-	-	2
		Total				600		30

Scheme of Instruction and Examination for **IV Semester**

S.No	Paper Title	Course Type	Instruction Periods per week	External Marks	Internal Marks	Total Marks	Duration of External Examination	Credits
1	Chemistry of Foods - I	Theory	4	80	20	100	3 hours	4
2	Chemistry of Foods - II	Theory	4	80	20	100	3 hours	4
3	Food Analysis-I	Theory	4	80	20	100	3 hours	4
4	Food Analysis-II	Theory	4	80	20	100	3 hours	4
5	Project work	Lab	-	100	-	100	-	4
6	Practical-I: Food Analysis	Lab	3	80	20	100	6 hours	4
7	Practical-II: Water Analysis	-	3	80	20	100	6 hours	4
8	MOOC course	-	-	-	-	-	-	4
9	Value added course (Research Methodology)		-	-	-	-	-	2
		Total				700		34

**M.Sc., CHEMISTRY**  
**Specialisation: Chemistry and Analysis of Foods, Drugs and Water**  
**(From the admitted batch of academic year 2021-2022)**  
**SEMESTER – III SYLLABUS**  
**Paper -I: Chemistry of Drugs -I**

**Course Objectives: To make the students**

- CO 1: Acquire the knowledge of introduction to drugs, CNS drugs, analgesics, drugs for allergic and urinary infections
- CO 2: Understand introduction to drugs, CNS drugs, analgesics, drugs for allergic and urinary infections
- CO 3: Apply the knowledge and understanding of in new situations introduction to drugs, CNS drugs, analgesics, drugs for allergic and urinary infections
- CO 4: Develop interest in the areas introduction to drugs, CNS drugs, analgesics, drugs for allergic and urinary infections

**Learning Outcomes:** At the end of the course, the learners should be able to:

- LO 1: Explain introduction to drugs, CNS drugs, analgesics, drugs for allergic and urinary infections
- LO 2: Interpret introduction to drugs, CNS drugs, analgesics, drugs for allergic and urinary infections
- LO 3: Compare introduction to drugs, CNS drugs, analgesics, drugs for allergic and urinary infections
- LO 4: Analyse introduction to drugs, CNS drugs, analgesics, drugs for allergic and urinary infections
- LO 5: Solve introduction to drugs, CNS drugs, analgesics, drugs for allergic and urinary infections
- LO 6: Identify introduction to drugs, CNS drugs, analgesics, drugs for allergic and urinary infections
- LO 7: Apply introduction to drugs, CNS drugs, analgesics, drugs for allergic and urinary infections

**Unit-I: Introduction to Drugs**

**[12 Hours]**

Basic consideration of drugs: Classification, nomenclature, metabolism. Development of drugs: Sources, Genesis of drugs – molecular modification general and special processes: prodrugs (prolongation of action, shortening of action, drug localisation, transport regulation, adjunct to pharmaceutical formulation). Rational drug design. Theoretical aspects of drug action: Structure–activity relationship (SAR), physicochemical parameters and pharmacological activity; drug receptors; mechanism of drug action.

**Unit-II: CNS Drugs**

**[12 Hours]**

Drugs affecting the central nervous system: Sedatives and hypnotics -Barbiturates (structure-activity relationship, metabolism); benzodiazepines (structure-activity relationship, metabolism); Synthesis of phenobarbital, hexobarbital, nitrazepam and oxazepam. Anaesthetics: General anaesthetics; local anaesthetics- Mode of action, structure-activity relationships. Synthesis of methohexital and chloro-procaine.

**Unit-III: Analgesics:**

**[12 Hours]**

Analgesics: Synthetic analgesics, structure - activity relationships, antipyretic analgesics, anti-inflammatory analgesics, metabolism and mode of action. Opioid analgesics and antagonists. Synthesis of meperidine, methadone and 6,7 -benzomorphans. Tranquilizers: phenothiazine derivatives - structure activity relationship, metabolism and mode of action; Synthesis of chlorpromazine.

**Unit-IV: ANS Drugs****[12 Hours]**

Drugs acting on autonomous nervous system (ANS). Adrenergic agents: Chemical classification, structure activity relationship, mode of action; Adrenergic blocking agents: Synthesis Ephedrine, propranolol, methyl dopa; cholinergic agents: Classification, structure - activity relationships, therapeutic actions. Cholinergic blocking agents: chemical classification, Synthesis: Cyclopentolate. ganglionic blocking agents.

**Unit-V Drugs curing allergic and urinary infection:****[12 Hours]**

Drugs curing allergic and urinary infection: Antihistamines: chemical classification; metabolism, structure activity relationship, mode of action. Synthesis: Diphenhydramine, triprolidine, chlorcyclizine, promethazine. Diuretics (Drugs acting on renal system): Classification, structure activity relationships and mode of action of organomercurials, phenoxy acetic acids, purines carbonic anhydrase inhibitors, benzothiadiazines, sulphamoyl benzoic acid derivatives, endocrine antagonists. Synthesis: Meralluride, acetazolamide, furosemide.

**Text Books:**

1. Essentials of medicinal chemistry , eds., Korolkovas and Burkhaltar, J.H., John wiley & sons.
2. Text book of Organic medicinal and pharmaceutical chemistry by Wilson and Gisvold.
3. Synthetic drugs by O. D. Tyagi.
4. Swinyard, E.A., " Remington's pharmaceutical sciences ", Ed., Artor Osal, Mack publishing company co., 1980, p.873.
5. Medicinal Chemistry, Volume ed. Burger.
6. The Organic Chemistry of Drug synthesis by Daniel Lednicer and Lester A. Mitscher

## PAPER -II: CHEMISTRY OF DRUGS –II

### Course Objectives: To make the students

- CO 1: Acquire the knowledge of drugs related to infectious diseases, anti-neoplastic, antibiotics, steroidal and non-steroidal hormones
- CO 2: Understand drugs related to infectious diseases, anti-neoplastic, antibiotics, steroidal and non-steroidal hormones
- CO 3: Apply the knowledge and understanding of drugs related to infectious diseases, anti-neoplastic, antibiotics, steroidal and non-steroidal hormones in new situations
- CO 4: Develop interest in the areas drugs related to infectious diseases, anti-neoplastic, antibiotics, steroidal and non-steroidal hormones

### Learning Outcomes: At the end of the course, the learners should be able to:

- LO 1: Explain drugs related to infectious diseases, anti-neoplastic, antibiotics, steroidal and non-steroidal hormones and their synthesis
- LO 2: Interpret drugs related to infectious diseases, anti-neoplastic, antibiotics, steroidal and non-steroidal hormones and their synthesis
- LO 3: Compare drugs related to infectious diseases, anti-neoplastic, antibiotics, steroidal and non-steroidal hormones and their synthesis
- LO 4: Analyse drugs related to infectious diseases, anti-neoplastic, antibiotics, steroidal and non-steroidal hormones and their synthesis
- LO 5: Solve drugs related to infectious diseases, anti-neoplastic, antibiotics, steroidal and non-steroidal hormones and their synthesis
- LO 6: Identify drugs related to infectious diseases, anti-neoplastic, antibiotics, steroidal and non-steroidal hormones and their synthesis
- LO 7: Apply drugs related to infectious diseases, anti-neoplastic, antibiotics, steroidal and non-steroidal hormones and their synthesis

### UNIT-I: Drugs Acting on Infectious Diseases:

[12 Hours]

Anthelmintic agents - Synthesis of diethyl carbamazine, niclosamide. Anti-tubercular drugs - synthesis of isoniazide, p-amino salicylic acid and thiacetazone. Antilepral drugs - Synthesis of dapsone, clofazimine Sulpha Drugs: Classification, structure - activity relationship, mode of action. Synthesis: Sulphadiazine, sulphaisoxazole, sulphadimethoxine.

### UNIT-II: Antineoplastic Drugs:

[12 Hours]

Classification; Synthesis: Chlorambucil, mercaptopurine Anti-AIDS and Anti-viral agents (A brief study and medicinal importance) Antimalarial Drugs - Classification Synthesis of Chloroquine

### UNIT-III: Plant drugs and Antibiotics Plant drugs:

[12 Hours]

Chemical composition, characteristics and therapeutic applications of the following plant drugs - Digitalis, strophanthus, ergot, opium, strychnosnux vomica, ipecacuanha, rauwolfia. Antibiotics: Brief account on the chemistry and mode of action of penicillins, cephalosporins, chloramphenicol, streptomycine and tetracyclines; Synthesis: chloramphenicol, Penicillin G.

### UNIT-IV: Steroidal Drugs

[12 Hours]

Brief account on the chemistry, structure - activity relationship and mode of action of estrogens, progestogens, androgens and anabolic agents and adrenal cortex hormones. Synthesis: Estrone, estradiol, progesterone, testosterone, cortisone.

### UNIT-V: Non-steroidal hormones:

[12 Hours]

Brief account on the non-steroidal hormones and their functions - thyroid, para thyroid, pituitary and pancreas hormones. Synthesis: Thyroxine, adrenaline.

### Text Books:

1. Essentials of medicinal chemistry , eds., Korolkovas and Burkhalter, J.H., John wiley & sons .
2. Text book of Organic medicinal and pharmaceutical chemistry by Wilson and Gisvold.
3. Synthetic drugs by O. D. Tyagi.
4. Swinyard, E.A., " Remington's phramaceutical sciences ", Ed., Artor Osal, Mack publishing company co., 1980, p.873.
5. Medicinal Chemistry Volumes, ed. Burger.
6. The Organic Chemistry of Drug synthesis by Daniel Lednicer and Lester A. Mitscher

### **Paper -III: Drug Analysis -I**

#### **Course Objectives: To make the students**

- CO 1: Acquire the knowledge of characterization and quantification of drugs, separation techniques, quantitative methods of analysis, hyphenated analytical techniques and spectroscopy
- CO 2: Understand characterization and quantification of drugs, separation techniques, quantitative methods of analysis, hyphenated analytical techniques and spectroscopy
- CO 3: Apply the knowledge and understanding of characterization and quantification of drugs, separation techniques, quantitative methods of analysis, hyphenated analytical techniques and spectroscopy in new situations
- CO 4: Develop interest in the areas characterization and quantification of drugs, separation techniques, quantitative methods of analysis, hyphenated analytical techniques and spectroscopy

#### **Learning Outcomes:** At the end of the course, the learners should be able to:

- LO 1: Explain characterization and quantification of drugs, separation techniques, quantitative methods of analysis, hyphenated analytical techniques and spectroscopy
- LO 2: Interpret characterization and quantification of drugs, separation techniques, quantitative methods of analysis, hyphenated analytical techniques and spectroscopy
- LO 3: Compare characterization and quantification of drugs, separation techniques, quantitative methods of analysis, hyphenated analytical techniques and spectroscopy
- LO 4: Analyse characterization and quantification of drugs, separation techniques, quantitative methods of analysis, hyphenated analytical techniques and spectroscopy
- LO 5: Solve characterization and quantification of drugs, separation techniques, quantitative methods of analysis, hyphenated analytical techniques and spectroscopy
- LO 6: Identify characterization and quantification of drugs, separation techniques, quantitative methods of analysis, hyphenated analytical techniques and spectroscopy
- LO 7: Apply characterization and quantification of drugs, separation techniques, quantitative methods of analysis, hyphenated analytical techniques and spectroscopy

#### **UNIT-I: Properties of Drugs**

**[12 Hours]**

General discussion Elementary explanation of IP, BP and USP. General Idea of the properties of drugs (due to presence of analytically useful groups) for their Characterisation and quantification. The typical drugs included barbiturates, carbamic acid derivatives, anti-pyretic analgesics, local anaesthetics, organometallic compounds, Sampling, identification tests, and limiting tests.

#### **UNIT-II: Separation Techniques**

**[12 Hours]**

Separation techniques - Principles of quantitative separations, solvent extraction. General idea on chromatographic separations of drugs - adsorption, ion exchange, paper, thin layer, molecular sieving, electrophoresis.

#### **Unit-III: Quantitative Methods of Analysis**

**[12 Hours]**

Quantitative methods of analysis Gravimetric analysis, volumetric estimations (acid-base, aqueous and non aqueous media; redox; precipitation and complex formation). Traditional and electrical properties: potentiometric, coulometric, amperometric and biamperometric titrations.

**Unit-IV: Hyphenated Analytical Techniques****[12 Hours]**

Gas liquid chromatography and high performance liquid chromatography, polarography, polarimetry the techniques employed in the determination of drugs - Sulpha drugs, antibiotics (Penicillins, cephalosporins, tetracyclines, chloramphenicol, streptomycin, cardiac glycosides. General idea of the techniques employed in the determination of drugs.

**Unit-V: Spectroscopy****[12 Hours]**

Colorimetry & UV-Visible Spectrophotometry, IR Spectrophotometry, fluorimetry, NMR and Mass spectrophotometry.

**Text Books:**

1. Analytical chemistry by Gary D. Christian, John Wiley & sons
2. Pharmaceutical analysis by T. Higuchi and Brochmann Haussen.
3. Pharmaceutical chemistry ( Volumes I&II) by L.G. Chattan (for analytical techniques)
4. Practical Pharmaceutical chemistry by A.E. Beckett and J.B.Stanlake (for limiting) tests only.
5. Pharmacognacy by C.S. Shaw and J.S. Qudry.
6. Microbiology by M.J. Pelezar and R.D. Reld ( for Microbiological assays only)
7. Instrumental Methods of Chemical Analysis by Chatwal and Anand
8. Instrumental Methods of Chemical Analysis by B. K. Sharma
9. Drugs and Cosmetics act.



## **Paper -IV: Drug analysis –II**

### **Course Objectives: To make the students**

- CO 1: Acquire the knowledge of good laboratory practices, microscopic techniques, physico-chemical assay of drugs and their application and drug act
- CO 2: Understand good laboratory practices, microscopic techniques, physico-chemical assay of drugs and their application and drug act
- CO 3: Apply the knowledge and understanding of good laboratory practices, microscopic techniques, physico-chemical assay of drugs and their application and drug act in new situations
- CO 4: Develop interest in the areas good laboratory practices, microscopic techniques, physico-chemical assay of drugs and their application and drug act

### **Learning Outcomes:** At the end of the course, the learners should be able to:

- LO 1: Explain good laboratory practices, microscopic techniques, physico-chemical assay of drugs and their application and drug act
- LO 2: Interpret good laboratory practices, microscopic techniques, physico-chemical assay of drugs and their application and drug act
- LO 3: Compare good laboratory practices, microscopic techniques, physico-chemical assay of drugs and their application and drug act
- LO 4: Analyse good laboratory practices, microscopic techniques, physico-chemical assay of drugs and their application and drug act
- LO 5: Solve good laboratory practices, microscopic techniques, physico-chemical assay of drugs and their application and drug act
- LO 6: Identify good laboratory practices, microscopic techniques, physico-chemical assay of drugs and their application and drug act
- LO 7: apply good laboratory practices, microscopic techniques, physico-chemical assay of drugs and their application and drug act

### **UNIT-I: Good Laboratory Practices**

**[12 Hours]**

Method validation and quality assurance for testing laboratories; Hierarchy of analytical methodology (technique, method, procedure, protocol) validation process: selectivity, linearity, accuracy, precision, sensitivity, range, limit of detection, limit of quantification, ruggedness or robustness. Quality assurance: control charts, documenting and archiving, proficiency testing, and laboratory accreditation. Reliability of analytical data: Errors in chemical analysis, classification of errors, determining the accuracy of methods, improving accuracy of analysis, statistical analysis, rejection of results, presentation of data.

### **UNIT-II: Microscopic Techniques**

**[12 Hours]**

Microbiology and microscopic examination of plant drugs General procedure for microbiological assays of antibiotics and disinfectants. Elementary treatment of methods (morphological, chemical and pharmacological) suitable for characterization of plant drugs, Evaluation of plant drugs through microscopical examination. The plant drugs include Digitalis, strophanthus, ergot, opium, strychnos nux vomica , ipeca caunha , rauwolfia.

### **UNIT-III: Physicochemical Assay of Drugs**

**[12 Hours]**

Applicability of physicochemical methods for the assay of drugs (any four different methods) based on the presence of analytical useful groups barbiturates, carbamic acid derivatives, anti-pyretic analgesics, local anesthetics, organometallic compounds

### **UNIT-IV: Application of Physicochemical Assay of Drugs**

**[12 Hours]**

Applicability of physicochemical methods for the assay of drugs (any four different methods) Sulpha drugs, antibiotics (penicillin, cephalosporin, tetracycline, chloramphenicol, streptomycin) and cardiac glycosides. Use of the reagents for the determination of drugs - metol oxidant, fast green FCF, Gibbs reagent, cobalt thiocyanate, MBTH.

**UNIT-V: Drug Act****[12 Hours]**

Brief account of drugs and cosmetics act: Definitions of terms – drug quality , adulterated drug, misbranded drugs, imported drugs functions of the drugs, technical advisory board and central drug laboratories; Duties of government analyst and drug inspectors; packing and labelling of drugs; conditions for sale and license conditions for manufacture and license.

**Text Books:**

1. Analytical chemistry by Gary D. christian, John wiley & sons
2. Pharmaceutical analysis by T. Higuchi and Brochmann Haussen.
3. Pharmaceutical chemistry (Volumes I&II) by L.G. Chattan (for analytical techniques)
4. Practical Pharmaceutical chemistry by AÉ. Beckett and J.B.Stanlake (for limiting) tests only.
5. Pharmacognacy by C.S. Shaw and J.S. Qudry.
6. Microbiology by M.J. Pelezar and R.D. Reld ( for Microbiological assays only)
7. Instrumental Methods of Chemical Analysis by Chatwal and Anand
8. Instrumental Methods of Chemical Analysis by B.K. Sharma
9. Drugs and Cosmetics act.

**SEMESTER – IV SYLLABUS**  
**PAPER-I: CHEMISTRY OF FOODS –I**

**Course Objectives: To make the students**

- CO 1: Acquire the knowledge of foods, food quality, food additives, pigments and colours and vitamins
- CO 2: Understand foods, food quality, food additives, pigments and colours and vitamins
- CO 3: Apply the knowledge and understanding of foods, food quality, food additives, pigments and colours and vitamins in new situations
- CO 4: Develop interest in the areas foods, food quality, food additives, pigments and colours and vitamins

**Learning Outcomes:** At the end of the course, the learners should be able to:

- LO 1: Explain foods, food quality, food additives, pigments and colours and vitamins
- LO 2: Interpret foods, food quality, food additives, pigments and colours and vitamins
- LO 3: Compare foods, food quality, food additives, pigments and colours and vitamins
- LO 4: Analyse foods, food quality, food additives, pigments and colours and vitamins
- LO 5: Solve issues related to foods, food quality, food additives, pigments and colours and vitamins
- LO 6: Identify foods, food quality, food additives, pigments and colours and vitamins
- LO 7: apply foods, food quality, food additives, pigments and colours and vitamins

**UNIT-I: Introduction to Foods** **[12 Hours]**

Classification, Chemical Composition and Nutritional value of common food stuffs, properties of foods. Food preservation and processing: Food deterioration, methods of preservation and processing by heat, cold, chill storage, deep freezing, drying, concentration, fermentation and radiation.

**UNIT-II: Food Quality** **[12 Hours]**

Sensory evaluation, objective methods, non-nutritional constituents and food safety.

**UNIT-III: Food Additives** **[12 Hours]**

Permitted food additives and their role: Antioxidants, coloring agents, flavors, emulsifiers, curating agents, non-nutritive sweeteners, flour improvers, leavening agents, stabilizers, thickeners and preservatives.

**Unit-IV: Pigments and Colours** **[12 Hours]**

Chlorophylls, myoglobin and hemoglobin, anthocyanins, flavonoids, tannins, betalains, quinones, xanthones, carotenoids.

**Unit-V: Vitamins** **[12 Hours]**

Classification, functions requirements, distribution in foods, loss during processing, effects of deficiency and characteristic properties of vitamins – B1 (Thiamine), B2(Riboflavin), B3(Pantothenic acid), B6(pyridoxine), B12( Cyanocobalamine), H(Biotin), P(Rutin) C(ascorbic acid) A(Retinol),D (Calciferol), E(Tocopherol) K(naphthoquinone), Folic acid(PGA) and Niacin.

**Text Books:**

1. Food Chemistry by L.W. Aurand and A.E. woods the AVI Publlising Inc.
2. Food Chemistry by L.H. Meyer, Affliated East- West press Ltd, New Delhi.
3. Foods- Facts and principles by N. Shakuntala Manay, M. Shdakshara Swamy.
4. Principles of Food Chemistry by John M. deMan.
5. Principles of Food Science, Part I,Food Chemistry edited by Owen R. Fennama , Mareal Dekker, Inc., New York.
6. Hand book of Food and Nutrition by M. Swaminathan.

## **Paper - II: Chemistry of Foods – II**

### **Course Objectives: To make the students**

- CO 1: Acquire the knowledge of enzymes, carbohydrates and their metabolism, proteins, amino acids and lipids
- CO 2: Understand enzymes, carbohydrates and their metabolism, proteins, amino acids and lipids
- CO 3: Apply the knowledge and understanding of enzymes, carbohydrates and their metabolism, proteins, amino acids and lipids in new situations
- CO 4: Develop interest in the areas enzymes, carbohydrates and their metabolism, proteins, amino acids and lipids

### **Learning Outcomes:** At the end of the course, the learners should be able to:

- LO 1: Explain enzymes, carbohydrates and their metabolism, proteins, amino acids and lipids
- LO 2: Interpret enzymes, carbohydrates and their metabolism, proteins, amino acids and lipids
- LO 3: Compare enzymes, carbohydrates and their metabolism, proteins, amino acids and lipids
- LO 4: Analyse enzymes, carbohydrates and their metabolism, proteins, amino acids and lipids
- LO 5: Solve issues related to enzymes, carbohydrates and their metabolism, proteins, amino acids and lipids
- LO 6: Identify enzymes, carbohydrates and their metabolism, proteins, amino acids and lipids
- LO 7: apply enzymes, carbohydrates and their metabolism, proteins, amino acids and lipids

### **UNIT-I: Enzymes**

**[12 Hours]**

Enzymes: Classification, specificity, factors effecting the rate of enzyme catalyzed reactions, enzyme inhibitors, enzymic browning, enzymes in food processing - carbohydrates, proteases, lipases, oxidoreductases. Water: Physical properties, structure of water molecule, bound water.

### **UNIT-II: Carbohydrates**

**[12 Hours]**

Carbohydrates: Classification, reactions of simple sugars; Oxidation, reduction, condensation with phenyl hydrazine, action of alkalis, action of acids, formation of esters, formation of coloured products. Function of sugars in foods - Browning reaction(non-enzymic). Polysaccharides: Brief study of the chemistry - starch dextrin, glycogen, cellulose, hemicellulose, pectic substances, gums. Sweetness of sugars, relation of structure to sweetness.

### **UNIT-III: Carbohydrate Metabolism**

**[12 Hours]**

Carbohydrate metabolism: Inter-conversion of hexoses in liver, anaerobic metabolism of glucose, krebs citric acid cycle, glyoxalate cycle, pentose phosphate path way.

### **UNIT-IV: Amino acids and Proteins**

**[12 Hours]**

Amino acids - classification, properties; food proteins - classification, protein structure, properties of proteins, denaturation, and protein gels, protolithic enzymes, chemistry of nucleic acids and their role in protein synthesis.

### **UNIT-V: Lipids**

**[12 Hours]**

Classification, role of lipids, fatty acids and glycerol derived from oils and fats; Physical properties - polymorphism, reactions of fats, rancidity, reversion, polymerisation, saponification, addition, hydrogenation, phospholipids, lipid metabolism; intermediary metabolism of fatty acids, synthesis of fatty acids.

**Text Books:**

1. Food Chemistry by L.W. Aurand and A.E. woods the AVI Publlising Inc.
2. Food Chemistry by L.H. Meyer, Affliated East- West press Ltd, New Delhi.
3. Foods- Facts and principles by N. Shakuntala Manay, M. Shdakshara Swamy.
4. Principles of Food Chemistry by John M. deMan.
5. Principles of Food Science, Part I,Food Chemistry edited by Owen R. Fennama, Mareal Dekker, Inc., New York.
6. Hand book of Food and Nutrition by M. Swaminathan .

### **Paper-III: Food Analysis – I**

#### **Course Objectives: To make the students**

- CO 1: Acquire the knowledge of food standards, assessment of vitamins, minerals and pesticides, preservatives, anti-oxidants and food adulteration
- CO 2: Understand food standards, assessment of vitamins, minerals and pesticides, preservatives, anti-oxidants and food adulteration
- CO 3: Apply the knowledge and understanding of food standards, assessment of vitamins, minerals and pesticides, preservatives, anti-oxidants and food adulteration in new situations
- CO 4: Develop interest in the areas foods, food quality, food additives, pigments and colours and vitamins

#### **Learning Outcomes:** At the end of the course, the learners should be able to:

- LO 1: Explain food standards, assessment of vitamins, minerals and pesticides, preservatives, anti-oxidants and food adulteration
- LO 2: Interpret food standards, assessment of vitamins, minerals and pesticides, preservatives, anti-oxidants and food adulteration
- LO 3: Compare food standards, assessment of vitamins, minerals and pesticides, preservatives, anti-oxidants and food adulteration
- LO 4: Analyse food standards, assessment of vitamins, minerals and pesticides, preservatives, anti-oxidants and food adulteration
- LO 5: Solve issues related to food standards, assessment of vitamins, minerals and pesticides, preservatives, anti-oxidants and food adulteration
- LO 6: Identify food standards, assessment of vitamins, minerals and pesticides, preservatives, anti-oxidants and food adulteration
- LO 7: apply food standards, assessment of vitamins, minerals and pesticides, preservatives, anti-oxidants and food adulteration

#### **UNIT-I: Food Standards**

**[12 Hours]**

Definitions of standards of quality Assessment of quality using routine and official methods of analysis and interpretation of analytical results: General methods for the determination of components: carbohydrates, proteins, amino acids, fats, mineral matter, moisture, crude fibre, synthetic dyes.

#### **UNIT-II: Assessment of Vitamins**

**[12 Hours]**

Methods for the determination of Water soluble vitamins :(B1, B2, B3, B5, B12, C and Folic acid) and fat soluble vitamins: (A, D, E and K) by visible spectrophotometric technique only.

#### **UNIT-III: Minerals and Pesticides**

**[12 Hours]**

Inorganic components (minerals): arsenic, cadmium, copper, lead, mercury, zinc, fluorine, sodium, potassium, calcium, phosphorous. Pesticides: thin layer chromatography and gas liquid chromatography as tools for organophosphorous and organo chlorine pesticides .

#### **UNIT-IV: Preservatives and Antioxidants**

**[12 Hours]**

Preservatives: (sulphur dioxide, benzoic acid, 4 hydroxy benzoic acid, nitrite, sorbic acid). antioxidants: (Gallates, butylated hydroxy anisole, butylated hydroxyl toluene). Fungal toxins (aflatoxins). Restriction on the use of colouring matter, preservatives, antioxidants, non-nutritive sweeteners and insecticides; contaminants in foods.

#### **UNIT-V: Food Adulteration**

**[12 Hours]**

Prevention of food adulteration act: definition of the terms- Food, nutritional food, adulterant, adulteration, misbranded common instances of adulteration in foods, central committee for food standards and central food laboratories and their functions; public analyst and Food inspectors and their duties. Packing and labelling of foods, conditions for sale and licence, conditions for manufacture and licence;

**Text Books:**

1. The Chemical analysis of foods by D. Pearson.
2. Food adulteration by Thankamma Jacob
3. Prevention of food adulteration act, Government of India and Ministry of health.
4. Food analysis by Wood man.
5. Instrumental methods of food analysis by A.J. Macleod.
6. Fruit and vegetable analysis by Ranganna.
7. Analysis of Water by J. Rodier.
8. The examination of water and water supplies by Edwin windle Taylor.
9. Instrumental analysis for water pollution control by Mancy.
10. Method of sampling and test for H<sub>2</sub>O used in industry – ISI.



## **Paper - IV: Food Analysis –II**

### **Course Objectives: To make the students**

- CO 1: Acquire the knowledge of sugars, non-alcoholic and alcoholic beverages, meat and fish, edible oils and fats and water and its analysis
- CO 2: Understand sugars, non-alcoholic and alcoholic beverages, meat and fish, edible oils and fats and water and its analysis
- CO 3: Apply the knowledge and understanding of sugars, non-alcoholic and alcoholic beverages, meat and fish, edible oils and fats and water and its analysis in new situations
- CO 4: Develop interest in the areas sugars, non-alcoholic and alcoholic beverages, meat and fish, edible oils and fats and water and its analysis

### **Learning Outcomes:** At the end of the course, the learners should be able to:

- LO 1: Explain sugars, non-alcoholic and alcoholic beverages, meat and fish, edible oils and fats and water and its analysis
- LO 2: Interpret sugars, non-alcoholic and alcoholic beverages, meat and fish, edible oils and fats and water and its analysis
- LO 3: Compare sugars, non-alcoholic and alcoholic beverages, meat and fish, edible oils and fats and water and its analysis
- LO 4: Analyse sugars, non-alcoholic and alcoholic beverages, meat and fish, edible oils and fats and water and its analysis
- LO 5: Solve issues related to sugars, non-alcoholic and alcoholic beverages, meat and fish, edible oils and fats and water and its analysis
- LO 6: Identify sugars, non-alcoholic and alcoholic beverages, meat and fish, edible oils and fats and water and its analysis
- LO 7: apply sugars, non-alcoholic and alcoholic beverages, meat and fish, edible oils and fats and water and its analysis

### **UNIT-I: Sugars**

**[12 Hours]**

Honey sugar, cane sugar, jams and jellies. Fruits and Vegetables: Fruits, canned fruits, pickles, fruit juices, soft drinks, cereals and flours; Wheat flour, Maida, bread, rice.

### **UNIT-II: Non-alcoholic and Alcoholic beverages**

**[12 Hours]**

Non-alcoholic beverages: Analysis of tea, coffee and cocoa; soft drinks. Alcoholic beverages (Fermentation products); Wine, brandy, whisky, beer chider, vinegar.

### **UNIT-III: Meat and Fish**

**[12 Hours]**

Meat: composition, nutritional value, assessment of spoilage of raw meat and cured meat, Sausage meat, meat extract. Fish: Raw fish, canned fish, fish caves - nutritional value and spoilage assessment.

### **UNIT-IV: Edible Oils and Fats**

**[12 Hours]**

Edible oils and fats: General study of the quality assessment. Herbs and Spices. Dairy products: Quality assessment of milk, butter, ghee, milk powder and ice-cream. Toxic elements (chromium, fluorine, arsenic and lead), undesirable elements (aluminium, copper, iron, manganese and zine), bacteriological analysis (detection and count of bacteria indicating faecal pollution).

### **UNIT-V: Water Analysis**

**[12 Hours]**

Water sampling, determination of the origin of infiltration's, organoleptic characterization, preliminary examination, physicochemical determination. Chemical and microbiological constituents of water; acidity and alkalinity, anions (phosphate, chloride, nitrite, nitrate, sulphate, silica), Cations (calcium, magnesium), chemical pollution indicators (free and saline

ammonia albuminoidal ammonia, Organic nitrogen, oxygen consumed by permanganate, chemical and biological oxygen demand),

**Text Books:**

1. The Chemical analysis of foods by D. Pearson.
2. Food adulteration by Thankamma Jacob.
3. Prevention of food adulteration act, Government of India and Ministry of health.
4. Food analysis by Wood man.
5. Instrumental methods of food analysis by A.J. Macleod.
6. Fruit and vegetable analysis by Ranganna.
7. Analysis of Water by J. Rodier.
8. The examination of water and water supplies by Edwin windle Taylor.
9. Instrumental analysis for water pollution control by Mancy.
10. Method of sampling and test for H<sub>2</sub>O used in industry – ISI.