# DR. A.P.J ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

**STUDY & EVALUATION SCHEME WITH SYLLABUS**

**FOR**

**B.TECH. II YEAR**

# (FOOD TECHNOLOGY)

**ON**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**[ EFFECTIVE FROM THE SESSION 2017-18]**

## B.TECH. (FOOD TECHNOLOGY)

**2nd Year III- SEMESTER** **Session- 2017-18**

| S. No. | Subject Code | Subject Name | L-T-P | Th/Lab ESE | Sessional | | Total | Credit |
|---|---|---|---|---|---|---|---|---|
| | | | | | CT | TA | | |
| 1 | RAS301/ ROE030 to 039 | Mathematics-III/ Science Based OE | 3-1-0 | 70 | 20 | 10 | 100 | 4 |
| 2 | RVE301/ RAS302 | Universal Human Values & Professional Ethics / Environment & Ecology | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 3 | RCH303 | Material & Energy Balance | 3-1-0 | 70 | 20 | 10 | 100 | 4 |
| 4 | RCH305 | Fluid Flow & Solid Handling | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 5 | RFT301 | Food Microbiology | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 6 | RFT302 | Composition, Quality & Safety of Foods | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 7 | RCH355 | Material & Energy Balance Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 8 | RCH356 | Fluid Flow & Solid Handling Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 9 | RFT351 | Food Microbiology Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 10 | RFT352 | Composition, Quality & Safety of Foods Labs | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| | **TOTAL** | | | | | | **1000** | **24** |

**Science Based Open Electives:**

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

**2nd Year IV-SEMESTER** **Session- 2017-18**

| S. No. | Subject Code | Subject Name | L-T-P | Th/Lab ESE | Sessional | | Total | Credit |
|---|---|---|---|---|---|---|---|---|
| | | | | | CT | TA | | |
| 1 | ROE040 to 049/ RAS401 | Science Based OE/ Mathematics-III | 3-1-0 | 70 | 20 | 10 | 100 | 4 |
| 2 | RAS402/ RVE401 | Environment & Ecology/ Universal Human Values & Professional Ethics | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 3 | RCH403 | Heat Transfer | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 4 | RCH404 | Chemical Engineering Thermodynamics | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 5 | RFT401 | Food Biochemistry | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 6 | RFT402 | Food Chemistry & Nutrition | 3-1-0 | 70 | 20 | 10 | 100 | 4 |
| 7 | RCH452 | Heat Transfer Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 8 | RFT451 | Food Biochemistry Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 9 | RFT452 | Food Chemistry & Nutrition Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 10 | RFT453 | Seminar | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| | TOTAL | | | | | | **1000** | **24** |

**Science Based Open Electives:**

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

## SEMESTER - III

### RFT301 FOOD MICROBIOLOGY

**UNIT-I**

General characteristics of microorganism: Classification, morphology, physiology, growth, nutrition and reproduction; Pure culture techniques and maintenance of cultures, control of microorganisms.

**UNIT-II**

Incidence of microorganism in foods, Sources of contamination. Principles underlying spoilage of foods. Physical and Chemical methods to control microorganisms. Food poisoning and food borne infections, Microbial toxins, Indicator organisms.

**UNIT-III**

Contamination, spoilage and preservation of cereal products, sugar products, fruit and vegetable products, Bakery Products, Microbiological standard of foods.

**UNIT-IV**

Contamination, spoilage and preservation of Meat products, Fish and Sea foods , Egg and Poultry products, Milk and Milk products and other foods. Microbiolgical limits.

**UNIT-V**

Food plant sanitation, inspection and control, personnel hygiene, Microbes in food fermentation, putrefaction, Lipolysis; Antagonism and Synergism in microorganisms. Rapid methods in detection of microorganisms. Standard plate count; Yeast and mould count

**Text Books:**

1. Banawart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. Food Microbiology. 4th Ed. McGraw Hill.
3. Garbutt J. 1997. Essentials of Food Microbiology. Arnold Heinemann.
4. Jay JM, Loessner MJ & Golden DA. 2005. Modern Food Microbiology. 7th Ed. Springer.
5. Ray B. 2004. Fundamentals of Food Microbiology.3rd Ed. CRC

### RFT302 COMPOSITION, QUALITY & SAFETY OF FOODS

**UNIT-I**

Composition: Chemical constituents of foods: Desirable and Potentially undesirable food constituents and their importance. Recommended Dietary Allowances (RDA). Basal metabolic rate and dietary requirements of different age groups. Composition of foods – General and specific for different foods of plant and animal origin.

**UNIT-II**

Carbohydrates: Classes, Nomenclature and structure. Dietary utilization and disturbances Lipids: Definition, Classification and structure: Fatty acids composition of natural lipids of plants and animal origin, Essential fatty acids. Role and use of natural lipids and tailor made fats in foods.

**UNIT-III**

Protein: Physico-chemical properties of amino acids, peptides and proteins, structure - function relationship of proteins, Essential Amino acids. Nutritional attributes of food and their implications.

**UNIT- IV**

Quality: Basic concepts. Nutritional and sensory attributes and their assessments, causes of undesirable changes leading to quality deterioration in foods and their implications. Determination of probable cause(s) of observed quality change in foods.

**UNIT-V**

Safety: Operational sense of food safety, Potential Food derived health hazards- Microbial contamination. Pesticide residues, Environmental Contamination. Risk and risk assessment. HACCP. Adulteration in Foods. Testing food for its safety.

**Text Books:**

1. Fennema OR.1996. Food Chemistry. Marcel Dekker.

2. Meyer LH. 1987. Food Chemistry. CBS Publishers
3. Krammer A & Twigg BA.1973. Quality Control in Food Industry. Vol. I,II. AVI Publ.
4. Macrae R, Roloson R & Sadlu MJ.1994.Encyclopedia of Food Science &Technology & Nutrition. Vol. XVI. Academic Press.

## RFT351 FOOD MICROBIOLOGY LAB

1.Microscope its parts and utility in identification and differentiation of various microorganisms as bacteria, yeast and mold.

2. Familiarization with common techniques for handling pure culture serial dilution, Inoculation, slide preparation incubation, counting etc.

3. Micrometry and determination of size of different microbes.

4. Simple and differential staining of microorganisms and their examination.

5. Direct total, viable, and non-viable count of microorganisms in milk.

6. Preparation and sterilization of media and glass ware for microbial counts.

7. Determination of Standard Plate Count (SPC) in natural and/or processed foods.

8. Microbiological examination of some selected natural and processed foods.

9. Microbiological examination of potable water: Total and coliform count.

10. Enumeration of coliform organism in some selected processed foods.

**Reference Books:**

1. Banawart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. Food Microbiology. 4th Ed. McGraw Hill.
3. Garbutt J. 1997. Essentials of Food Microbiology. Arnold Heinemann.

## RFT352 COMPOSITION, QUALITY & SAFETY OF FOODS LAB

1. Sampling requirements, procedures and methods.

2. Determination of moisture content of foods by oven drying and distillation methods.

3. Determination of Total and Acid insoluble ash content in foods.

4. Determination of Crude fat content by solvent extraction methods in foods.

5. Determination of crude Protein by Kjeldhal Lowry methods.

6. Determination of reducing and total sugar content in foods.

7. Determination of crude Fibre content in foods.

8. Determination of specific mineral contents in foods such as Ca, Iron, P, Chloride etc.

9. Determination of specific vitamin content of food such as ascorbic acid, carotenes etc.
10.Chromatographic Separation and identification of sugars and amino acids.

**Reference Books:**

1. BIS and AOAC Methods of Food analysis.
2.“Hand Book of analysis and quality control for fruit and Vegetable Products”. IInd edition. Tata McGraw-Hill Publishing Company Ltd. New Delhi.

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## IV SEMESTER

## RFT401 FOOD BIOCHEMISTRY

**UNIT-I**
Nomenclature, Classification and specificity of enzymes and cofactors, Enzyme Kinetics: Factors affecting the rate of enzyme catalyzed reaction, regulation and control of enzyme action.

**UNIT-II**
Metabolic Pathways: Carbohydrates, proteins and fats; catabolism and anabolism

**UNIT-III**
Digestion, Absorption, Assimilation and Transport of nutrients in human beings.

**UNIT-IV**
Post harvest and Postmortem biochemical changes in foods: Changes in composition, color, texture, flavor and its implications on quality of foods.

**UNIT-V**
Application of enzymes in food processing: Endogenous enzymes and their role in modification of foods, enzyme added to foods during processing sources, conversions and specific applications.

**Text Books:**
1. A.L.Lehninger Principle of Biochemistry
2. Lubert Stryen Biochemistry
3. Fennema OR.1996. Food Chemistry. Marcel Dekker.
4. Meyer LH. 1987. Food Chemistry. CBS Publishers.
5. S.A.Joshi Nutrition and Dietetics
6. J.H.Weil General Biochemistry

## RFT402 FOOD CHEMISTRY AND NUTRITION

**UNIT- I**
(a) Water in Foods: Structure. Properties, Interactions, Water activity, Sorption Isotherms and food stability.
(b) Carbohydrates: Functions, Reactions and properties of simple and complex carbohydrate, Browning reactions, Selection of Natural or Modified carbohydrates for incorporation into processed food.

**UNIT- II**
Lipids: Consistency of commercial fats, Lipolysis, Auto oxidation, Thermal Decomposition and effect of ionizing radiation, Refining of oils, Modification of oils and fats, Role of food lipids in flavor, Nutritional aspects of natural and modified fats.

**UNIT- III**
Proteins: Chemical reactions and interactions of amino acids and proteins, De-naturation and it implications, Functional properties of food proteins, Modification of food proteins in processing and storage and its implications. Nutritive value of food proteins.

**UNIT- IV**
Vitamins, Minerals, Pigments and Flavours: Chemistry and stability of water and fat soluble vitamins, Chemical properties of minerals and their bioavailability, Enrichment and Fortification. Natural pigments in foods and their retention in processed foods. Flavoring constituents in foods, Development of process and reaction flavour volatiles.

**UNIT -V**

Food groups and their typical composition; essential nutrients- sources, functions, deficiency diseases; requirements and recommended dietary allowances. Malnutrition, Protein quality evaluation, Calorific value of foods.

**Text Books:**

1. Belitz HD.1999. Food Chemistry. Springer Verlag.
2. DeMan JM. 1976. Principles of Food Chemistry. AVI Publications.
3. Fennema OR.1996. Food Chemistry. Marcel Dekker.
4. Meyer LH. 1987. Food Chemistry. CBS Publishers.
5. Swaminathan M. 1974. Essentials of Foods and Nutrition. Vol. II. Ganesh & Co.

## RFT451 FOOD BIOCHEMISTRY LAB

1. Determination of enzyme activity and specific activity (Enzyme assay)
2. Determination of effect of temperature on enzyme activity
3. Determination of effect of pH on enzyme activity
4. Determination of effect of substrate concentration on enzyme activity & estimation of Km.
5. Estimation of enzymatic browning in foods.
6. Estimation of enhancement in an enzyme activity during ripening of fruits
7. Estimation of enhancement in an enzyme activity during sprouting of grains
8. Detection/ estimation of catalase and peroxidase activity in vegetable
9. Application of enzymes in various foods.

**Text Books:**

1. An introduction to practical biochemistry by D.T. Plummer, III Ed. Tata McGraw Hill Publishing Co. New Delhi
2. Principles of Enzymology for Food Science by J.R. Whitaker, Marcel Dekker Inc
3. Methods in Enzymology by S.P.Colwick and N.O. Kaplan, Acadmic Press

## RFT452 FOOD CHEMISTRY & NUTRITION LAB

1. Analysis of water for potable and food purposes
2. Moisture content in foods in relation to their stability
3. Non-enzymatic browning reactions and its determinations
4. Determination of rate/ extent of hydrolysis of sucrose/starch
5. Determination of free fatty acid content in fats and oils
6. Detection and estimation of oxidative rancidity in fats/oils
7. Determination of heat stability of vitamin C
8. Study of some reactions of proteins
9. Study of some processing changes in proteins
10. Study of some functional properties of proteins

**Text Books:**

1. The chemical analysis of foods and food products, by Morris B. Jacobs, III Edition,CBS Publishers and distributors New Delhi.
2. ISI hand book of food analysis
3. Hand book of analysis and quality control for fruit and vegetable products, by S.Ranganna, II Ed., Tata McGraw Hill Publishing Co. New Delhi.
4. Official Method of analysis of AOAC

## RFT453 SEMINAR

The student (s) will be required to prepare a detailed Seminar report on the topic (s) assigned to them along with an MS Power Point Presentation. The Seminar shall be delivered in the class followed by Queries.