

## **Revised Syllabus**

# **M. Sc. Nutritional Sciences**



**Centre of Food Technology**  
**University of Allahabad**  
**Allahabad**

**Centre of Food Technology  
Institute of Professional Studies  
University of Allahabad**

**M.Sc in Nutritional Sciences**

**Course Structure**

Semester	Paper Code	Title of Paper	Credits				
			L	T	P	Total (C)	
Sem I	FFT 511	Nutritional Biochemistry	2	0	0	2	
	FFT 512	Normal Human Nutrition	3	0	1	4	
	FFT 513	Human Physiology	3	0	0	3	
	FFT 514	Advanced Food Science	3	0	1	4	
	FFT 504	Research Methodology and Statistics	3	1	0	4	
	FFT 591	Communication Skills	1	0	1	2	
	FFT 592	Basics of Computer Application	1	0	1	2	
			<b>TOTAL</b>	<b>17</b>	<b>1</b>	<b>3</b>	<b>21</b>
	Sem II	FFT 515	Dietetics and Therapeutic Nutrition	3	1	1	5
FFT 516		Community Health and Nutrition	3	0	1	4	
FFT 517		Methods of Investigation in Nutritional Research	3	0	1	4	
FFT 518		Advanced Nutritional Biochemistry	2	0	0	2	
Elective-I (Any two)		FFT 555	Food Processing Technology	2	0	0	2
		FFT 552	Intellectual Property Rights				
		FFT 553	Specialty Foods	2	0	0	2
		FFT 593	Communication Skills and Scientific Writing	1	0	1	2
			<b>TOTAL</b>	<b>16</b>	<b>0</b>	<b>4</b>	<b>20</b>
Sem III	FFT 611	Applied Nutrition	3	0	0	3	
	FFT 612	Microbiology of Food and Disease	3	0	1	4	
	FFT 613	Advanced Diet Therapy	3	0	1	4	
	Elective-II (Any two)	FFT 654	Food Product Development	2	0	0	2
		FFT 655	Institutional Food Management				
		FFT 656	Maternal and Child Nutrition	2	0	0	2
		FFT 657	Food Standards and Food Laws				
		FFT 691	Workplace Skills	1	0	1	2
		FFT 614	Training and Workshop	0	0	2	2*
	FFT 642	Seminar	0	0	1	1	
		<b>TOTAL</b>	<b>14</b>	<b>0</b>	<b>6</b>	<b>20</b>	
Sem IV	FFT 647	Thesis	0	0	20	20	
		<b>TOTAL CREDITS</b>	<b>47</b>	<b>1</b>	<b>33</b>	<b>81</b>	

\*Non Credit Requirement

## SEMESTER I

### Core Course FFT 511 : Nutritional Biochemistry

Credits: (2-0-0-2)

**Level:** Post Graduate

**Semester:** Autumn

**Pre-requisite:** B.Sc. with Chemistry/Biochemistry as one of the paper /course

**Objective:** To acquaint the students with knowledge of properties and metabolism of carbohydrates, proteins and lipids and micronutrients.

**Course Content:**

UNIT I (2 Lectures)

Chemistry of Macronutrients: Chemistry of dietary carbohydrates, lipids and proteins.

Introduction to metabolism: Catabolism and anabolism.

UNIT II (3 Lectures)

Role of enzymes in metabolism: Classification, mechanism of action, factors affecting enzyme activity, vitamins and minerals as coenzymes and co-factors.

UNIT III (10 Lectures)

Carbohydrate metabolism: An overview of aerobic and anaerobic carbohydrate metabolism: Energy from dietary carbohydrate through Glycolysis, Tricarboxylic Acid cycle. Utilization of glycogen. Gluconeogenesis. Significance of Pentose phosphate pathway and glucuronic acid pathway. Photosynthesis. Utilization and storage of dietary carbohydrates.

UNIT IV (10 Lectures)

Lipid metabolism: Introduction to lipids as energy sources,  $\beta$  oxidation, biosynthesis of fatty acids, utilization and storage of body fat.

Protein Metabolism: Transamination and deamination, essential and non-essential amino acids, nitrogen excretion and the Urea cycle. Biosynthesis of some important nitrogen compounds, overview of amino acid oxidation, body protein synthesis and breakdown.

UNIT V (5 Lectures)

Electron transport chain and oxidative phosphorylation: Formation of ATP.

Integration of biochemical pathways. Overview of food to energy conversion.

Hormones as regulators of biochemical pathways: Introductory concepts.

**Learning Outcomes:** To develop an insight of basic biochemistry of the bio molecules.

**Reference Books**

- Dandekar, S. (2011.) Medical Biochemistry. B.L. Churchill Livingstone (P) Ltd. New Delhi, India.
- Nelson, D. L. (2003). Lehninger Principles of Biochemistry. Macmillan Worth Publishers, India.
- Deb, A.C. (2004). Biochemistry. Book Agency (P) Ltd. Calcutta, India.
- Satyanarayana, U. (2009). Biochemistry. Books and Allied (P) Ltd. Calcutta, India.
- Robert, K. (2006). Harper's illustrated Biochemistry. McGraw Hill, Boston.

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### Core Course FFT 512 Normal Human Nutrition

Credits: (3-0-2-4)

**Level:** Post graduate

**Semester:** Autumn

**Pre-requisite:** B.Sc. with Chemistry/Biochemistry

## Objective:

To acquaint students with functions, importance and requirements of various nutrients in humans and their deficiency diseases.

## Course Content:

UNIT I (8 Lectures)

Introduction to Normal Nutrition: The fuels used by the body, body composition. Energy Requirements: Components of energy expenditure, Basal metabolic requirements, Activity, Growth, Measurement, Recommended allowances, Food Groups, Balanced diet, Exchange lists Use of Food tables.

UNIT II (8 Lectures)

Carbohydrates: Types: Mono-, di-, oligo- and polysaccharides. Starch and non-starch polysaccharides. Dietary Fibre. Functions, Dietary sources, Requirements, Storage. Fat: Types in relation to cis-, trans-, chain length, unsaturation. Functions, Dietary sources, Requirements. Lipoproteins in transport. Storage.

UNIT III (7 Lectures)

Proteins: Functions. Dietary sources, Concept and evaluation of protein quality. Determination of nitrogen, amino acids, PER, NPR, NPU, BV, Chemical score. Complementary requirements.

UNIT IV (18 Lectures)

Vitamins: Classification. Difference between lipid-soluble and water-soluble vitamins. Lipid-soluble vitamins: A, D, E and K. Water soluble vitamins: Thiamine, Riboflavin, Niacin, Pyridoxine, Biotin, Ascorbic acid, other vitamin-like substances. Transport, absorption, storage, functions, requirements, dietary sources, prevention and cure of deficiency and/or excess, if any. Minerals: Macro- and micro minerals: Calcium, Iron, Iodine, Fluorine. Functions, dietary sources, absorption, transport and storage. Cure and prevention of deficiency and/or excess if any. Trace elements.

UNIT V (4 Lectures)

Water and Electrolytes: Sodium and Potassium: Functions, dietary sources, cure and prevention of deficiency and/or excess if any. Oral rehydration therapy.

## Practical:

- Energy requirements of self- calculation of BMR and activity increments.
- Identification of the deficiency diseases on the basis of clinical signs and symptoms.
- Self-recording of 7 day dietary intakes for adults.
- Calculation of individual nutrients and Comparison with requirements (RDA). Tabulation and analyses of above data for the class with inferences based on statistical applications.
- Rank /order of foodstuffs on the basis of their nutrient content.
- Enlisting of the content of low sodium, low potassium, high sodium and high potassium containing foods.
- Planning of a protein rich recipe and calculation of its nutritive value and cost per serving.
- Planning of a calcium rich recipe and calculation of its nutritive value and cost per serving.
- Planning of an iron rich recipe and calculation of its nutritive value and cost per serving.
- Planning of a vitamin C rich recipe and calculation of its nutritive value and cost per serving.
- Planning of a vitamin A rich recipe and calculation of nutritive value and cost per serving.
- Planning of a thiamine rich recipe and calculation of its nutritive value and cost per serving.
- Planning of a riboflavin rich recipe and calculation of its nutritive value and cost per serving.
- Planning of a niacin rich recipe and calculation of its nutritive value and cost per serving.
- Qualitative estimation of carbohydrates.
- Quantitative estimation of carbohydrates.
- Qualitative estimation of protein.
- Quantitative estimation of protein.
- Total blood leucocyte count and differential leukocyte count.
- Blood hemoglobin assay by Sahli's method.
- Measurement of Random Blood glucose.

- Blood pressure measurement by Sphygmomanometer.
- Measurement of body temperature and pulse rate in relation to diurnal variations.
- Qualitative urine analysis for normal constituents.
- Qualitative urine analysis for abnormal constituents.

**Learning Outcome:**

To develop knowledge of the nutritional significance of macro and micronutrients.

**Reference Books**

- Bamji, M.S., Rao, N.P & Reddy, V. (1996). Textbook of Human Nutrition. Oxford & IBH Publishing Co. (P). Ltd. Delhi.
- Garrow, J.S. et al. (2001). Nutrition and Dietetics. Churchill and Livingstone, Edinburgh.
- Gopalan, G. RamaShastri B.V & Balasuvramnian, S.C. (2000). Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad 500-007, India.
- Khanna, K. (2007). Textbook of Nutrition and Dietetics. Elite publishing house, New Delhi.
- Shils. M.E. (2006). Modern Nutrition in Health and Disease. Lippincot, Williams & Williams, USA.
- Smolin , L.A. (2006). Nutrition: Science and Application. Harcourt brace College Publishing. New Delhi.
- Sri Lakshmi, B. (2000). Nutrition Science. New Age International (P) Ltd. Pub. New Delhi
- Swaminathan, M. (2009). Textbook of Food and Nutrition. Bappco publishers, Bangalore.
- Whitney, E.R & Rodney Roltes, S. (1996) Under Standing Nutrition. West Publishing Company, New York, USA.

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**Core Course: FFT 513 Human Physiology**

**Credits: (3-0-0-3)**

**Level:** Post graduate

**Semester:** Autumn

**Pre-requisite:** Biology as a subject at Secondary level.

**Objective:** To enable students to understand the anatomy and functions of human body.

**Course Content:**

- UNIT I (4 Lectures)  
Physiological principles: Cell structure and function, body fluid compartments, transport mechanisms, homeostasis and feedback control systems.
- UNIT II (9 Lectures)  
General organization of the Nervous system: Sensory and motor nerves, major levels of nervous system function, Central and autonomic nervous systems, transmission of nerve impulse, synapse, neurotransmitters.
- UNIT III (11 Lectures)  
Digestion and absorption in the gastrointestinal tract: Digestion and absorption of carbohydrates, fats and proteins, gastrointestinal hormones.  
Blood: Composition of blood, functions of blood constituents, homeostasis, blood transfusion and tissue transplant.  
Circulatory system: Pumping of heart, cardiac cycle, ECG, blood pressure.
- UNIT IV (10 Lectures)  
The immune response: Humoral and Cell-mediated. Principles and factors affecting vaccination.  
Regulation of acid-base balance: Role of buffers in blood, respiratory control, renal control.  
Transport and exchange of respiratory gases: carbon-di-oxide, oxygen and ammonia.  
Urine formation: Principles. Effect on body fluids.

UNIT V (11 Lectures)  
Elements of Reproductive physiology: Sex hormones. Breast milk production and its role in contraception.  
Principles of Endocrinology: Chemical control of metabolism, adrenaline, thyroid hormones. Control of water and electrolyte metabolism, calcium metabolism. Prostaglandins, endorphins and enkephalins. Renin-angiotensin system.

**Learning Outcome:** To develop vivid understanding of the various human physiological systems.

**Reference Books**

- Guyton, A.C. & Hall, J.E. (2001). Text Book of Medical Physiology. Harcourt Publishings International Company, New Delhi.
- Jain, A. K. (2008). Human Physiology in a nutshell. Arichal Publishing Company, Sirmour (H.P).
- Chaudhury, K.C (2004). Concise Medical Physiology. New Central Book Publishing, Calcutta.
- Ganong, W.F. (2001). Review of Medical Physiology. Tata McGraw-Hill publishing company. New Delhi.

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**Core Course FFT 514 : Advanced Food Science**

**Credits: (3-0-2-4)**

**Level:** Post graduate

**Semester:** Autumn

**Pre-requisite:** Chemistry/Biochemistry as one of the paper/course at under graduate level.

**Objective:**

To provide understanding about composition and nutritive value of food and knowledge relevant to processing, shelf life extension, reduction of toxins and enhancement in sensory quality of food.

**Course Content:**

UNIT I (7 Lectures)

Introduction to Food Science: Scope and development.

Food preparation: Basic terminology of cooking methods, chemical, physico-chemical and microbiological effects of heat on food constituents. Sensory evaluation of food.

UNIT II (7 Lectures)

Effects of cooking, processing, and storage on nutrients in:

Cereals, pulses, fruits, Vegetables, Milk and milk products, meat, fish and poultry, sugars, beverages.

UNIT III (10 Lectures)

Role of Food Additives in food preparation: Anti-oxidants. Coloring agents. Curing agents. Emulsifiers. Flavoring agents. Leavening agents. Nutrient supplements, Sweeteners. pH controllers. Preservatives and other additives.

UNIT IV (11 Lectures)

Food toxins: Naturally occurring toxins- Trypsin inhibitors, hemagglutinins, lathyragens, aflatoxins, saponins, cyanogens, gossypol, glucosinolates etc., toxicants due to processing. Methods of improving nutritional quality of foods: Germination, Fermentation, Supplementation, Fortification.

UNIT V (10 Lectures)

Food Preservation: Causes of food spoilage, principles of food preservation, and methods of food preservation.

Food packaging: Basic concepts.

Food adulteration: Definition, common adulterants in different foods, contamination, methods of detection.

### Practical

- Weights and measures of common foodstuffs. Standardization of handful and fistfull measures.
- Raw weights and cooked weights of servings, nutritive value and cost of common Indian recipes, such as *chapatti*, *dal*, rice, vegetables, etc. Relationship between nutritive value, volume and weight.
- To conduct sensory evaluation of the given samples using descriptive method.
- To conduct sensory evaluation of sugar sample with the help of 'Duo trio test' and prepare evaluation card for the same.
- To conduct sensory evaluation of sugar samples using 'Triangle Test' and prepare an evaluation card for the same.
- To study and conduct sensory evaluation of different pairs of sugar with lemon samples using 'paired test' and prepare score card for the same.
- To study different cooking methods.
- To study the gelatinization properties of food starches.
- To study various factors affecting the gelatinization properties of food starches.
- To determine the best method of preparing a stable emulsion like mayonnaise.
- To demonstrate the process of sugar re crystallization through the preparation of fondant, *shakkarpara* and fudge.
- To study the effect of temperature on solubility of sugar and determine the concentration at which the solutions become saturated.
- To study the effects of different environmental conditions on the process of fermentation.
- To study the time, temperature and water required for soaking whole pulses and legumes and the effect of cooking on the same.
- To study and detect various adulterants in food stuffs.

### Learning Outcome:

To build an understanding of the nutritional implications of structure of food matrix, food quality and processing treatments.

### Reference Books

- Manay, M. and Manay, S.N. (2014). Food Facts and Principles. New Age International (P) Limited, New Delhi.
- Meyer, .L.H (1987). Food Chemistry. CBS Publishers.
- Mudambi S. (1997). Food Science. New Age International (P) Limited, New Delhi.
- Potter, N.N. (2007). Food Science. C.B.S Publishing, New Delhi, India
- Srilakshmi, B. (2015). Food Science. New Age International (P) Limited, New Delhi.

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## Core Course FFT 504 : Research Methodology and Statistics

Credits: (3-1-0-4)

**Level:** Post graduate

**Semester:** Autumn

**Pre-requisite:** Basic knowledge of mathematics

### Objective:

The students will be exposed to various statistical tools required to analyze the experimental data in nutrition and community research

### Course Content

UNIT I

lectures)

Scientific Approach to Research: Meaning, significance, types of research studies.

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Research Process: Formulating the problem, objectives, hypothesis, Experimental design, sample design, collecting data: observation, interview, questionnaire, case study, focus group discussion, analysis of data, interpretation, Report writing, Nutritional/Food Surveillance.

UNIT II (12 lectures)

Sampling design: Census vs. sample survey. Steps, types.

Scaling techniques: Continuum, Reliability, Validity, Scale construction techniques.

Experimental designs: Randomized Block design

Processing of data: Development of code book.

UNIT III (12 lectures)

Measurements: Nature of measurements, types of measurement scale, Frequency distribution, graphical presentation of data.

Measures of Central Tendency: Computation of mean, median and mode, their uses.

Measures of variability: Computation of mean deviations, Quartile deviation and standard deviation, their uses.

UNIT IV (12 lectures)

Correlation: Regression, Meaning, Spearman and Pearson's techniques of correlation, Linear regression. Chi Square:

UNIT V (12 lectures)

Tests of significance of difference between means: t-test. Analysis of Variance (ANOVA): One way and two ways. Applications to food quality assessments, Multivariate statistics: MANOVA, Non-parametric statistics. Uses and merits. Statistical packages.

**Learning Outcomes:** The students are expected to have learnt statistical tools for analyzing data.

### Reference Books

- Aggarwal BL. 2003. *Basic Statistics*. New Age.
- Gupta SP. 2004. *Statistical Methods*. S. Chand & Sons.
- Elhance, D.L. (2008). *Fundamentals of Statistics*. Kitab Mahal, Patna.
- Garret H.P. (2004). *Statistics in Psychology and Education*. Vallies Fotter and Simons Ltd. Bombay.
- Kothari, C.R. (2008) *Research Methodology*. Wishwa Prakashan. New Delhi, India.
- Rao, K.V. (2007) *Biostatistics*. Jaypee Brothers medical publishers, New Delhi.
- Sundar, R.P. & Richard, J. (2003). *An Introduction to Biostatics*. Prentice Hall, New Delhi.

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## Foundation Course: FFT 591 Communication Skills Credits: (1-0-2-2)

**Level:** Post Graduate

**Semester:** Autumn

**Pre-requisite:** English as a subject at secondary level.

**Objective:** To equip the students with skills to write, communicate and articulate in English (verbal as well as written).

### Course Content

Unit I 2 lectures

Introduction to communication – Definition, Purpose, Basic communication model, need for effective communication, process & barriers to communication



Unit II	4 lectures
Grammar - Noun, Articles, Adjective & Degrees of comparisons, Preposition, Subject-verb agreement, Present, past & future Tense, Modals & Moods, Active & passive voice, Reported speech	
Unit III	4 lectures
Oral Communication –Identification of sounds (Phonetics), Consonant & Vowel sounds, Indianism, Syllable & Syllable Stress, Intonation & modulation, Word stress, Development of Speaking Skills.	
Unit IV	3 lectures
Written Communication –Formal & informal letter writing, Introduction to Essay writing.	
Unit V	2 lectures
Vocabulary building - Learning new words, Synonyms, Antonyms, use of suffix/prefix.	

**Practical:**

- Ice breaker session
- creating new words
- exercise on picture description
- story completion
- oral practice of vowel sounds and syllable stress (phonetics)
- Comprehension Practical
- Dictionary Quiz
- Paragraph writing
- Vocabulary building exercises
- Paragraph Reading

**Learning Outcomes:** The students are expected to be able to communicate effectively in English after completing the course.

**Reference books:**

- English Grammar Composition & Usage. J C Nesfield
- Essential Grammar in Use, Raymond Murphy, Cambridge
- Oxford English Grammar , Sidney Greenbaum, Oxford University Press

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**Foundation Course FFT 592: Basics of Computer Application**  
**Credits: (1-0-2-2)**

**Level:** Post Graduate

**Semester:** Autumn

**Pre-requisite:** Graduation in any stream.

**Objective:** To educate students about the basic use, applications and web applications so as to facilitate learning.

**Course Content**

UNIT I	(2 lectures)
Introduction to Computer (Hardware / Software)	(2 lectures)
UNIT II	
Microsoft Word and its applications (Documentation and Formatting)	(4 lectures)

UNIT III

MS Excel and its applications (Making Tabular data, charts & formatting, Use of general functions & formulae) (4 lectures)

UNIT IV

MS PowerPoint and its applications (Creating own design, design & formatting of a presentation, Use of Image, audio, video in the presentation) (3 lectures)

UNIT V

Use of Internet & Web Applications and Email Services, Industry customer approach.

**Practical**

- Basics of Computers, usage of short cut keys, taking out print outs, page set ups.
- Making of Power point Presentation
- E- Mail ( Subject line, salutation, subscription, how to mark cc, drafting, sending of mails, reverts, forwarding of mails, attaching pictures and documents, attaching ppts
- Differentiation between hardware and software and practical usage of both.
- Diagrammatic representation of pie-charts, tabular presentation of data/info, Etc
- Basic use of MS Excel/Spread Sheets

**Learning Outcomes:** Learning of basic computer applications and use of web services will be completed after studying the course.

**Reference Books**

- Fundamentals of Computers by E. Balagurusamy (Author) Publisher: McGraw Hill Education (India) Private Limited
- Ms Office 2007 in a Nutshell by S. Saxena (Author) Publisher: S.Chand (G/L) & Company Ltd

## SEMESTER II

### Core Course: FFT 515 Dietetics and Therapeutic Nutrition

Credits: (3-1-2-5)

**Level:** Post graduate

**Semester:** Spring

**Pre-requisite:** Completed courses on Human Nutrition and Food Science

**Objective:**

To familiarize students about estimation of RDA, deficiency of nutrients, estimation of different nutrients in normal and diseased conditions.

**Course Content:**

UNIT I (14 Lectures)

Life cycle nutrition: Nutrient requirements and diet plans for different stages of life:

- Pregnancy
- Lactation
- Infancy
- Childhood
- Adolescence
- Adulthood
- Geriatric group

UNIT II (9 Lectures)

In relation to physical activity: Diets for laborers and athletes.

Nutrition for weight management: Underweight, Overweight and obesity.

Introductory concepts of therapeutic nutrition: Normal diets, Dietary Modifications- soft diets, liquid diets, total parenteral nutrition, other therapeutic diets.

Food-based home remedies: Evaluation as scientific facts or food fads.

UNIT III (8 Lectures)

Classification, etiology, metabolic aberrations, clinical manifestations, complications, dietary management and counseling for:

- Febrile conditions such as viral fevers, typhoid and tuberculosis.
- Gastrointestinal diseases such as diarrhea, constipation, gastritis, flatulence, peptic ulcer.
- Malabsorption syndromes: Coeliac disease. Tropical sprue. Lactose intolerance.

UNIT IV (10 Lectures)

Classification, etiology, metabolic aberrations, clinical manifestations, complications, dietary management and counseling for:

- Diabetes: NIDDM, IDDM, GDM
- Cardiovascular diseases: Atherosclerosis, hypertension, hypercholesterolemia, hyperlipoproteinemia, congestive heart failure, myocardial infarction.
- Renal diseases: Nephrotic syndrome. Acute glomerulonephritis. Acute renal failure. Chronic renal failure.

UNIT V (4 Lectures)

Classification, etiology, metabolic aberrations, clinical manifestations, complications, dietary management and counseling for:

- Biliary diseases:
  - of liver: Hepatitis. Cirrhosis. Hepatic coma.
  - of gallbladder: Gall stones/Cholelithiasis.
  - of pancreas: Pancreatitis.

### **Practical**

Use of exchange lists for diet planning for various life stages including calculation and discussion of macronutrients and micronutrients along with dietary counseling for the following:

- Pregnancy and lactation
- Infancy and weaning
- Preschool and School age groups including packed lunches
- Adolescents
- Adults
- Old age group
- Athletes and laborers

Diet Planning for various deficiency conditions:

- Protein energy malnutrition
- Vitamin A deficiency
- Iron deficiency anemia
- Osteoporosis and osteomalacia.

Diet planning for special conditions:

- Diarrhea, constipation, gastritis, flatulence, peptic ulcer with special regard to fibre content.
- Viral fevers, typhoid, and tuberculosis with special reference to fluids, energy, protein.
- Hepatitis with special reference to protein and fat, especially invisible fat.
- Diabetes with special reference to energy, protein, carbohydrate and fibre.
- Chronic heart diseases with special reference to energy, fat, protein, carbohydrate and fiber.
- Hypertension with special reference to sodium and potassium
- Renal diseases with special reference to energy, protein, sodium, potassium and other minerals.

### **Learning Outcome:**

To make students competent in planning menus involving judicious modification of macro and micronutrients for various physiological and pathological conditions.

### **Reference Books**

- Antia, F.P. & Abraham, P. (1997). Clinical Dietetics and Nutrition 4<sup>th</sup> Ed., Oxford University Press, New Delhi.
- Bamji, M.S., Rao, N.P & Reddy, V. (1996). Textbook of Human Nutrition. Oxford & IBH Publishing Co. (P) Ltd. New Delhi.
- Eastwood, M. A. & Passmore, R. (1987). Human Nutrition and Dietetics. 8<sup>th</sup> Ed. ELBS Churchill Livingstone, London.
- Garrow, J.S. *et al.* (2001). Nutrition and Dietetics. Churchill and Livingstone, Edinburgh.
- Khanna, K. (2007). Textbook of Nutrition and Dietetics. Elite publishing house, New Delhi.
- Robinson, C.H. & Lawler, M.R. (1982). Normal and Therapeutic Nutrition. Oxford & IBH Pub. Co. New Delhi.
- Shils, M.E. (2006). Modern Nutrition in Health and Disease. Lippincot, Williams & Williams, USA.
- Whitney, E.R & Rodney Roltes, S. (1996) Under Standing Nutrition. West Publishing Company, New York, USA.

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## **Core Course: FFT 516 : Community Health and Nutrition** **Credits: (3-0-2-4)**

**Level:** Post graduate

**Semester:** Spring

**Pre-requisite:** Completed course on Human Nutrition and Statistics.

**Objective:**

To enable the students to understand the nutritional problems of the community and gain skills in planning, executing and evaluating community nutrition services and planning.

**Course Content:**

UNIT I (11 Lectures)

Concept of community, Community development, Social and cultural perspectives in relation to food preferences and health.

Nutritional epidemiology:

- Indices of Population health status: Birth rates, mortality rates, parity, sex ratio, life expectancy etc.
- Case control and Cohort studies.
- Nutritional Assessment and Methods of identification of Nutritional Problems: Salient features, Techniques of dietary survey, limitations and interpretation of data, Anthropometrical, biochemical, clinical and radiological techniques - limitations and interpretation.

UNIT II (10 Lectures)

Assessment of Nutritional Status: Developmental milestones: Gomez and Waterlow classifications of growth. Standard norms for evaluation of growth. Growth charts.

- Vulnerable or at-risk groups.

Nutritional problems of the Indian community: Etiology, Government intervention / combat strategies for:

- Low birth weight infants, protein-energy malnutrition, kwashiorkor and marasmus.
- Vitamin A deficiency, nutritional anemia, iodine deficiency disorders, endemic flourosis, lathyrisms.

UNIT III (9 Lectures)

Community Nutrition Services:

- Role of National Nutrition Monitoring Bureau. National Sample Survey in assessment of geographical distribution of dietary patterns in India.
- National and International Services. Governmental and Non-Governmental organizations. Health care delivery systems in rural and urban India. Immunization. Supplementary feeding programs, reasons for their success and failure.
- I.E.C. activities in relation to Nutrition. Panchayati Raj Institutions and Nutrition services.
- Nutrition Education. Objectives, channels, methods and evaluation of communication.

UNIT IV (9 Lectures)

Nutrition and Policy Planning:

- National nutritional policy and the State nutritional policy: Development, aims, Government guidelines and policies. Ministries involved.
- Public Distribution system and Administration.
- Food Production in relation to needs of the country, food security, food economics.

Global perspectives in malnutrition

Global environmental problems: Global warming and its impact on agriculture.

World food problems: Prevalence, indicators of economic and social statistics of nations, combat strategies. Role of Science and Technology.

UNIT V (6 Lectures)

Participatory techniques for community based programs:

Participatory learning and action: Definition and foundations.

Techniques: Time line, seasonal calendars, diagramming, focus group discussions.

Transect walks and observation.

Ranking, scoring and matrices.

Participatory monitoring and evaluation.

**Practical**

Diet and Nutrition Survey techniques:

- Development and pilot testing of a questionnaire for socio-economic measures

- Processing of data: Development of code book. Socioeconomic indicators: Kuppuswamy, Prasad, Kumar and other scales. Consumer price index.
- Conduction of diet survey for the assessment of per capita food availability by using standard bowl measurements and preparation of food frequency questionnaire.
- Anthropometric survey techniques. Measurement and significance of height, weight, mid-upper arm circumference (MUAC), waist-hip ratio, chest circumference, head circumference, sitting height / standing height ratios.
- Calculation of health indicators.
- Use of growth charts in assessing the growth pattern of children.
- Calculation of Body Mass Index (BMI) of the class and categorizing them into its respective grades.

Clinical survey techniques:

- Identification and recognition of signs and symptoms of common macronutrient deficiencies like Protein Energy malnutrition (Kwashiorkor and Marasmus).
- Identification and recognition of signs and symptoms of common micronutrients such as anemia, dermatitis, xerophthalmia, bitot's spot etc.

Techniques used in Community Nutrition and Epidemiology:

- Preparation of IEC tools for nutrition education and use of audio visual aids in community.
- Preparation of seasonal calendars and time line charts.
- Conduction of a Focus group discussion
- Computation and tabulation of indices used in assessing the status of community nutrition (Morbidity rate, Mortality rates, parity, Hospital Prognostic Index etc.)
- Evaluation of ICDS / UNICEF/CARE/ other community project and comparison with RDA.
- Conduction of a transect walk as a part of participatory outreach activity.

**Learning Outcome:**

To develop a keen insight to observe, assess and critically evaluate the nutritional status of the community so that remediation of these problems may be sought in future perspective.

**Reference Books**

- Gibson, R.S. (1990). Principles of Nutritional Assessment. Oxford University Press. New Delhi.
- Gopaldas, T. & Seshadri, S. (1987). Nutrition – Monitoring and Assessment. Oxford University Press. New Delhi.
- Jelliffe, D.B. Latest Ed. The Assessment of Nutritional Status of Community WHO/FAO Monograph series No.53, WHO Geneva.
- Maclaren, D.S. (1986). Nutrition in the Community 2<sup>nd</sup> Ed. John Willey and Sons, New York.
- Mann, S.K., Sangha, J.K., Mehta, U. & Jain, R. (1999). Manual on Community Nutrition. College of Home Science, PAU, Ludhiana.
- Obert, J.C. (1986). Community Nutrition. Mac Millan New York.
- Park, K. (2000). Park's Text Book of Preventive and Social Medicine 16<sup>th</sup> Ed. Banarsidas Bhanot Publishing Jabalpur, India.
- Shukla, P.K. (1982). Nutritional Problems of India. Prentice Hall of India.

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**Core Course: FFT 517 Methods of Investigation in Nutritional Research**  
**Credits: (3-0-2-4)**

**Level:** Post graduate

**Semester:** Spring

**Pre-requisite:** B.Sc. With chemistry/ Biochemistry as a paper/course

## Objective:

To acquaint the students about the basics of laboratory techniques used in the analysis of food and biological samples involved in nutritional research.

## Course Content:

UNIT I (14 Lectures)  
Principles and introductory concepts of general analytical techniques: Colorimetry and spectrophotometry, Chromatography, Fluorimetry, Electrophoresis, Radioisotope methodology, Saturation analysis- Radioimmunoassay. ELISA. Microbiological assays. Metabolic balance studies. Polymerase Chain Reaction (PCR): its role in diagnosis of oncogenes and cancer.

UNIT II (8 Lectures)  
Methods for food analysis: Estimation of carbohydrates, protein, fat, vitamins and minerals

UNIT III (10 Lectures)  
Methods of assessment of nutritional status: Hematological tests. Nitrogen balance and other metabolic studies. Animal experimentation.  
Methods for analysis of biological samples: Blood, plasma, serum, urine, feces. Relative merits and demerits.

UNIT IV (8 Lectures)  
Significance of commonly measured analytes: Blood cells, plasma proteins, ions, enzymes, proteins, lipids and lipoproteins, major metabolites such as urea, hormones, acid-base balance, gases in blood in assessment. Merits and demerits of various methods.

UNIT V (5 Lectures)  
Non-invasive methods for assessment: Radiological, Bone mineral density, ECG, EEG, NMR. Advantages and limitations.

## Practical

- Quantitative estimation of Blood Hemoglobin-cyanmethemoglobin method.
- Quantitative estimation of Serum protein
- Quantitative estimation of Blood Cholesterol and lipid profile.
- Quantitative estimation of Blood urea.
- Quantitative estimation of Urinary nitrogen and creatinine estimation in spott and 24-hour urine collections.
- Quantitative estimation of Serum creatinine.
- Quantitative estimation of Iron in blood.
- Quantitative estimation of Calcium in blood.
- To determine the titrable acidity in food sample
- To determine the moisture in the given food sample by Hot-air Oven method.
- To determine the protein content in food sample by Micro-Kjeldahl/Kjeltec method.
- To determine the fat composition in the given food sample by soxhlet method.
- Estimation of total ash in the given sample
- To determine the crude fibre in the given food sample.
- To calculate the percentage Carbohydrate in the given food sample.
- To calculate the calorific value of the given food sample.
- To determine the calcium in the sample by titration method.
- To determine the phosphorus in the sample by using spectrophotometer.
- To determine the iron content in the given sample by using spectrophotometer.
- To determine the total reducing sugar in the sample by lane and Eynon method.
- To determine sodium chloride content in food products.

## Learning Outcome:

To enable students to judiciously plan the use of non-invasive and invasive applications for planning suitable research methodologies.

## Reference Books

- Moor, M.L & Irmitu, T.F. (1970). Introductory Foods Laboratory Manual of Food Preparation and Evaluation. Mac Millian. London.
- Swaminathan, M. (1995). Food Chemistry and Experimental Foods. Bappco publishers, Bangalore, India.
- Ranganna, S. (2010). Handbook of Analysis & Quality Control. Tata McGraw-Hill publishing company Ltd. New Delhi.
- Indian Standards Quality Management Systems (2002). BIS, New Delhi.
- AOAC (2012). American Association of Analytical Chemists. Washington D.C.

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## Elective Course: FFT 518 : Advanced Nutritional Biochemistry

**Credits: (2-0-0-2)**

**Level:** Post graduate

**Semester:** Spring

**Pre-requisite:** Must have completed basic papers on Nutrition and Biochemistry

**Objective:** To make students aware of the intricate changes in the biochemical mechanisms occurring during stress, starvation, nutritional deficiencies, genetic disorders etc. and thereby enabling them to plan customized menus for the same.

### Course Content:

UNIT I (7 Lectures)

Meaning and scope of health versus disease

Assessment of health and disease:

Biochemical tests in assessment of health and nutritional status. Analytical factors affecting results of biochemical tests.

Assessment of sub-clinical and clinical nutrient deficiencies: Biochemical indices of thiamine, riboflavin, niacin, vitamin A, iron, calcium, and other nutrient status. Blood and urine analysis Vitamin load tests and clinical assessment.

UNIT II (4 Lectures)

Biochemistry of starvation: Alternate methods of energy generation, organ interrelationships during starvation, acid-base balance, ketosis.

Regulation of Food Intake: Regulatory mechanisms, nervous regulation of food intake

UNIT III (7 Lectures)

Adipose tissue metabolism: White and brown adipose tissue, lipolysis, re-esterification, lipoprotein lipase.

Lipoprotein metabolism: Metabolism of chylomicrons, VLDL, IDL, HDL and LDL. Formation of atherosclerotic plaque. Effects of dietary and other factors.

Alcohol Metabolism: As a source of energy. Fatty liver and cirrhosis.

UNIT IV (6 Lectures)

Genetic controls in the body: Storage of genetic information. Its implications for disease.

Food and Endorphins: Alteration of mental states by food.

Oncogenes and cancer. Carcinogens and mutagens in food.

UNIT V (6 Lectures)

Free Radicals and anti-oxidants: Formation and harmful effects of free radicals. Defense against free oxygen species. Role of anti-oxidant enzymes, vitamins and other free radical scavengers.

Biochemistry of stress

### Learning Outcome:

To develop the understanding of complex nutritional changes in the body in starvation, cancer, genetic disorders etc. and plan menus suitable for such multiple disorders.



### Reference Books

- Anderson, L, Dibble, M.U. & Turkki. (1982). Nutrition in Health and Disease. JB Lippincott Co. Toronto.
- Murray, R.K, Granner, D.K & Rodwell V.W. (2006). Harper's Illustrated Biochemistry. McGraw-Hill, Boston.
- Plummer, D.T. (2006). Practical Biochemistry. Tata McGraw Hill Publishing Company Ltd. New Delhi, India.
- Dandekar, S. (2011). Medical Biochemistry, B.L. Churchill Livingstone (P) Ltd. New Delhi, India.
- Nelson, D. L. (2003). Lehninger Principles of Biochemistry. Macmilan Worth Publishers, India.

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## Elective Course: FFT 555 Food Processing Technology

Credits: (2-0-0-2)

**Level:** Post graduate

**Semester:** Spring

**Pre-requisite:** Completed paper on Food Science or Food Chemistry

### Objective:

To familiarize students about the processing technology of various food stuffs, physical and chemical principles in food processing like drying, freezing, high pressure processing, microwave heating etc.

### Course content:

UNIT I (10 Lectures)  
Basic principles underlying food processing operations including thermal, radiation, refrigeration, freezing and dehydration.

Membrane technology: Introduction to pressure activated membrane processes: micro- filtration, UF, NF and RO and their industrial application. Supercritical fluid extraction: Concept, property of near critical fluids NCF and extraction methods.

UNIT II (8 Lectures)  
Microwave and radio frequency processing: Definition, Advantages, mechanism of heat generation, application in food processing.  
Hurdle technology: Types of preservation techniques and their principles, concept of hurdle technology and its application.

UNIT III (4 Lectures)  
High Pressure processing: Concept, equipments for HPP treatment, mechanism of microbial inactivation and its application in food processing.  
Ultrasonic processing: Properties of ultrasonic, application of ultrasonic as processing techniques.

UNIT IV (6 Lectures)  
Newer techniques in food processing: Application of technologies of high intensity light, pulse electric field, Ohmic heating, IR heating, inductive heating and pulsed X-rays in food processing and preservation.

UNIT V (2 Lectures)  
Nanotechnology: Principles and applications in foods.

### Learning Outcome:

To impart industrial readiness to students in application of various food processing techniques on the nutritional and pharmaceutical profile of foods.

### Reference Books

- Barbosa-Canovas (2002). Novel Food Processing Technologies. CRC press. New Delhi.

- Dutta, A.K & Anantheswaran, R.C. (1999). Hand Book of Microwave Technology for Food Applications.
- Frame, N.D. (Ed.). (1994). The technology of Extrusion Cooking. Blackie academic.
- Gould, G.W. (2000). New Methods of Food Preservation. CRC press.
- Shi J. (Ed) (2006). Functional Food Ingredients and Nutraceuticals: Processing Technologies. CRC press. New Delhi.

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## **Elective Course FFT 552 : Intellectual Property Rights**

**Credits: (2-0-0-2)**

**Level:** Post Graduate

**Semester:** Spring

**Pre-requisite:** Graduation in any stream.

**Objective:**

To sensitize the students regarding the essentials of Intellectual Property Rights, its fundamentals, legislations and significance to it in the development of agriculture, food and nutritional security.

**Course Content**

UNIT I (6 lectures)  
Need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPs Agreement.

UNIT II (7 lectures)  
Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties.

UNIT III (5 lectures)  
Fundamentals of patents, copyrights, geographical indications, designs and layout, trademarks.

UNIT IV (6 lectures)  
Protection of plant varieties and farmers' rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection;

UNIT V (6 lectures)  
International Treaty on Plant Genetic; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement

**Learning Outcome:** The course is expected to acquaint the students with different IPR and its their importance in protecting individual rights.

**Reference Books**

- Erbisch FH & Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI, Wallingford.
- Ganguli, Prabudha. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill, New Delhi.

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## **Elective Course FFT 553 : Specialty Foods**

**Credits: (2-0-0-2)**

**Level:** Post Graduate

**Semester:** Spring

**Pre-requisite:** Basic knowledge of Food Science and Nutrition at undergraduate level.

**Objective:**

To make students understand the need, importance and process of developing healthy and nutritious foods for special category of population groups.

**Course Contents**

UNIT I (6 lectures)

Need and scope of specialty foods: Specialty food based on ease in preparation cost health benefits; Functional foods, Convenience food, Health care and medical benefits, Nutritional status, Low cost foods.

UNIT II (6 lectures)

Specialty foods based on sources; Cereals and millets, Legumes and pulses, Fruits and vegetables, Animal food sources, By product based, Non conventional foods.

UNIT III (6 lectures)

Specialty foods based on process; Innovative process technology, Food additives basis, Bioactive components, Novel nutraceuticals products, Packaging techniques, Adaptable technology basis, Fast and PET foods.

UNIT IV (5 lectures)

Specialty food based on genetics; Genetically modified foods, Transgenic foods, Biotechnological aspects of detoxification. Proprietary foods. Supplementary foods.

UNIT V (7 lectures)

Therapeutic foods; Modification of diets in disorders, feeding purposes, Disease oriented of different organs ex: digestive tract, liver, cardiovascular system, kidney, metabolic disorders, allergy, endocrine disorders.

Specific consumer oriented foods; Defence persons, Space / astronaut, High altitude mountain climbers, Disaster situation – crises, care, maintenance. Specialty foods based on growing condition -organic, inorganic farming.

**Learning Outcome:** After completion of course the students would have an understanding of various specialty foods and their development based on variation of sources, process and genetics.

**Reference Books**

- Gibson GR & William CM. 2000. *Functional Foods - Concept to Product*.
- Robert EC. 2006. *Handbook of Nutraceuticals and Functional Foods*. 2<sup>nd</sup> Ed. Wildman.
- Manson P.2001. *Dietary Supplements*. 2nd Ed. Pharmaceutical Press.
- Bamji MS, Rao NP & Reddy V. 2003. *Textbook of Human Nutrition*. Oxford & IBH.

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## **Foundation Course: FFT 593 Communication Skills & Scientific Writing Credits: (1-0-2-2)**

**Level:** Post Graduate

**Semester:** Spring

**Pre-requisite:** Knowledge of basics of communication skills.

**Objective:**

To educate the students about kinds of communication, enhance their vocabulary and teach them types of formal writing used in academic research.

**Course Content**

Unit I	3 lectures
Advance Communication- Types of communication, Mass Communication, Levels of professional communication, Role of newspapers, radio, Cinema and TV, role of social media and networking	
Unit II	2 lectures
Audio Visual Communication – Nature and scope of visual aids, use of Power Presentations in professional life	
Unit III	3 lectures
Grammar usage and Word power – Phrase and Clauses, Idioms, Proverbs, Homophones, Homonyms, Reading and Comprehension.	
Unit IV	2 lectures
Advance writing skills – Movie review, Book review	
Unit V	5 lectures
Scientific Writing – Introduction to Technical writing, definition, types, characteristics, Report Writing, CV & Resume making, plagiarism	

**Practical:**

- Sentence framing exercises - revision
- Writing descriptive paragraphs
- Dictionary consulting activities-Spell bee,
- Role Plays
- Movie viewing Sessions
- Book Reading sessions
- Impromptu Presentations
- Listening Practice
- Creating audio visual (AVs) using photographs
- Reading Scientific Texts
- Outlining a research

**Learning Outcome:** The course would have equipped the students with advance communication skills and basics of technical writing.

**Reference Books**

- Test your English Vocabulary in use, Michael McCarthy, Felicity O'Dell, Cambridge
- Wren & Martin, High School English Grammar and Composition, S.Chand, Paperback, 2005
- Oxford English Grammar Use, Micheal Swan & Catheirne Walter, Oxford University Press
- Using English in Science & Technology, Singh, R.K., Prakash Book Depot, Bareilly, 2000.

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## SEMESTER III

### Core Course: FFT 611 Applied Nutrition

Credits: (3-0-0-3)

**Level:** Post Graduate

**Semester:** Autumn

**Pre-requisite:** Basic understanding of Nutrition and Food Science

**Objective:** To acquaint the students about importance of nutrition in health and in various stages of life, immunity, drug-nutrient interaction and application of biotechnology in Foods and Nutrition.

**Course content:**

UNIT I (12 Lectures)

Nutrition for Health and Fitness:

- Nutrition in eating disorders. Anorexia Nervosa, Bulimia.
- Nutrition for exercise and sports performance. Energy production. Nutritional requirements for optimum performance. Ergogenic aids. Carbohydrate loading.
- Nutrition for bone health.
- Role of nutrition in skin and hair care: Cosmetic effects of diet. Cellulite. Allergies. Anti-aging foods. Foods as cosmetic agents.

UNIT II (7 Lectures)

Nutrition and immunity: Basics of immunity. Nutrition in infections. Immunity in varying nutritional states.

UNIT III (11 Lectures)

Drug-nutrient interrelationships: Effects of drugs on nutrient absorption and utilization, effects of foods and nutrients on drug utilization. Effects of nutritional states on drug metabolism.

Food toxins: Chemical toxins, pesticides, insecticides, metallic, their residual and harmful effects, methods of removal.

UNIT IV (10 Lectures)

Scientific evaluation of food-related beliefs: Fads. Application of research methodology to test claims of efficacy of foods used in alternative systems of medicines: ayurvedic, herbal and home remedies.

UNIT V (5 Lectures)

Application of Biotechnology in food: GM foods and their health implications, functional foods, organic foods, impact of WTO in food regulation.

**Learning Outcome:**

To enable students to understand the intricacies of nutrition support in applied aspects and must be able to counsel people requiring special nutritional management like eating disorders, sports, malnutrition etc.

**Reference Books:**

- Shils. M.E. (2006). Modern Nutrition in Health and Disease. Lippincot, Williams & Williams, USA.
- Mahan, L.K. & Escott Stump, S. (2000). Krause's Food Nutrition and Diet Therapy 10th Ed., WB Saunders & Co. London.
- Whitney, E.R and Rodney Roltes, S. (1996). Under Standing Nutrition. West Publishing Company, New York, USA.
- Bamji, M.S, Rao, N.P & Reddy, V. (1996). Textbook of Human Nutrition. Oxford & IBH Publishing Co. (P) Ltd. Delhi.
- Wardlaw, G. (2010). Contemporary Nutrition and Diet Therapy. Benchmark publications.
- Gopalan, G. RamaShastri, B.V. & Balasvramnian, S.C. (2000). Nutritive Value of Indian Foods, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.

## **Core Course: FFT 612 : Microbiology of Food and Disease** **Credits: (3-0-2-4)**

**Level:** Post Graduate

**Semester:** Autumn

**Pre-requisite:** Science in Secondary level

**Objective:** To acquaint students with different groups of micro-organisms associated with food and food borne diseases, their activities, destruction and detection in food.

### **Course content:**

UNIT I (4 Lectures)

Introduction to microbes: Bacteria, Fungi, Algae, Viruses.

Sources of Food contamination: Air. Water. Soil. Sewage. Post-processing.

Food spoilage of different food groups

UNIT II (6 Lectures)

Environmental contaminants: Pesticides, insecticides, untreated sewage in food. Causes and prevention. Contamination of water. Analysis and treatment. Public water supply: Sources, regulations, contaminants.

UNIT IV (7 Lectures)

Consumer Protection: Consumer concerns about food and water. Food safety and sanitation

Microbes and the production of foods and beverages: Role of microbes in production of milk products, pickled foods, fermented foods, bakery products, alcoholic beverages.

UNIT V (7 Lectures)

Food toxins: Toxins in the food chain, microbial toxins and food intoxications, sources of contamination, effect on health, preventive measures, methods of inactivation or destruction.

Microbes in diseases: Food borne illnesses. Causes and prevention.: Infectious intestinal diseases, Bacterial diseases of the digestive tract, viral infections.

UNIT VI (6 Lectures)

Biotechnology applications: Diagnosis of diseases, medical therapy, vaccines.

### **Practical**

- Cleaning and sterilization procedures of glassware.
- Preparation of culture media and broth.
- To sterilize the media and equipment.
- To prepare serial dilutions.
- Plating techniques.
- Culturing the bacteria on a solid media by using serial dilution method and determining the number of viable cells in the culture (standard plate count).
- Determination of Yeasts and Moulds in water sample.
- Determination of Coliform in water sample.
- Introduction to microscopy and to study cell morphology with simple staining.
- To stain bacteria with gram stain.

**Learning Outcome:** To realize the significance of food safety and protection of food against the disease outbreaks caused by various microorganisms and contaminants.

### **Reference Books**

- Banawart GJ. (1989). Basic Food Microbiology. 2<sup>nd</sup> Ed. AVI Publications.
- Frazier, J. & Westhoff, D.C. (1988). Food Microbiology. 4<sup>th</sup> Ed. McGraw Hill.
- Jay, J.M., Loessner, M.J. & Golden, D.A. (2005). Modern Food Microbiology. 7<sup>th</sup> Ed. Springer.
- Ray, B. (2004). Fundamentals of Food Microbiology. 3<sup>rd</sup> Ed. CRC
- Species, J.F.T. Food Microbiology Protocols. Humana Press Tolowa.

**Core Course: FFT 613 : Advanced Diet Therapy**  
**Credits: (3-0-2-4)**

**Level:** Post Graduate

**Semester:** Autumn

**Pre-requisite:** Basic understanding of nutritional biochemistry, dietetics and therapeutic nutrition.

**Objective:**

To familiarize the students with newer concepts in dietary management of various disorders and diseases.

**Course content:**

UNIT I (15 Lectures)

Advances in Nutrition Therapy of Selected Disease States: Biochemical basis of dietary modifications. Biochemical evaluation of efficacy of dietary changes, complications, short term and long term controls in the following conditions:

- Diabetes Mellitus.
- Cardiovascular diseases.
- Renal diseases.
- Obesity. Nutritional management in Bariatric surgery

UNIT II (10 Lectures)

Nutritional management of:

- Food allergies.
- Selected diseases of genetic origin such as Phenyl ketonuria, Galactosemia, Tyrosinemia, Maple syrup urine disease, Leucine induced hypoglycemia, Wilson's disease, Homocysteinuria, SCIDS.
- Diseases occurring due to inborn errors of metabolism such as arthritis, Gout, Rheumatism, Hyperuricemia.

UNIT III (8 Lectures)

Nutrition in Cancer: Molecular basis of Human Neoplasia. Relationship of diet to cancers at different sites. Diet, Nutrition and Cancer Prevention. Nutritional support to cancer patient.

UNIT IV (5 Lectures)

Nutrition in HIV/AIDS: Etiology. Manifestation and treatment of HIV Infection, Relationship between malnutrition and HIV/AIDS. Nutritional management of HIV/AIDS.

UNIT V (7 Lectures)

Nutritional Support in: Sepsis, Trauma and other Clinical Conditions: Burns, Trauma, Sepsis, Surgeries/ Preoperative cases

Enteral and Parenteral Nutrition and their complications.

**Practical**

Diet planning for patients having multiple diseases and congenital abnormalities.

- Gestational Diabetes and Pregnancy induced hypertension
- Tuberculosis with lactose intolerance
- Diabetes mellitus and cardiovascular diseases
- Diabetes mellitus and renal failure
- Heart failure and hemodialysis
- Salt restricted prudent diet for Coronary artery diseases and Myocardial infarction
- Galactosemia
- Hyperuricemia
- Low purine diets for Rheumatism
- Gluten free diets
- Enteral and Formula feeds (Total Parenteral Nutrition and Supplementary Peripheral Nutrition)
- HIV/AIDS and cancer
- Hypermetabolic care for Burns, Trauma and Sepsis (Formula+diet)

- Phenylketonuria, Tyrosinemia and homocysteinuria.
- Leucine induced hypoglycemia, Maple syrup urine disease and Wilson's disease.

**Learning Outcome:**

To inculcate the novel and advanced nutritional management practices in managing complications of lifestyle, degenerative and genetic diseases.

**Reference Books:**

- Mahan, L.K. & Escott Stump, S. (2000). Krause's Food Nutrition and Diet Therapy 10<sup>th</sup> Ed., WB Saunders & Co. London.
- Shils. M.E. (2006). Modern Nutrition in Health and Disease. Lippincot, Williams & Williams, USA.
- Stratifield P.S., Hui Y.H. & American Dietetic Association (1992). Nutrition & Diet Therapy, Jones and Barhett Publications.
- Passmore, R. & Eastwood, M. A. (1986). Human Nutrition & Dietetics. ELBS Churchill Livingstone.

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**Elective Course: FFT 655 : Institutional Food Management**  
**Credits: (2-0-0-2)**

**Level:** Post Graduate

**Semester:** Autumn

**Pre-requisite:** Basic understanding of Food Science.

**Objective:**

To enable the students to understand the process of planning, organizing and controlling the management of food and other resources in institutions.

**Course content:**

UNIT I (4 Lectures)

Food Service systems: Introductory concepts and development.

Types of food services: Hospital, hostel, cafeteria, community kitchens.

UNIT II (7 Lectures)

Planning for food services in hospitals:

- Physical plant, its location, floor plans, space allowance, kitchen units, storage unit, baking, dishwashing and servicing unit.
- Equipment requirement: For food preparation, storage, distribution and serving.
- Manpower requirement: Personnel management, selection, training and supervision

UNIT III (7 Lectures)

Food service management: Menu planning, Receipt of food and its storage, principles and techniques in quantity food production. Food service.

Time and energy management

Financial Management: Principles of accounting, pricing and cost control.

UNIT IV (8 Lectures)

Food Safety and Quality Control: Introduction to quality assurance and food safety assurance, Current concepts of quality control, Quality assurance programme; Quality plan, documentation of records, products standards, Product and purchase specifications, process control and HACCP, hygiene and housekeeping, corrective action, quality and programme and total quality process.

UNIT V (4 Lectures)

Laws affecting Food Service Operations

Consumer Education: Consumer Protection Laws, Consumer concerns. Personnel laws.

**Learning Outcome:** To enable students to become better managers and capable owners of food service institutions in future prospects.



### Reference Books

- Treat, N. & Richards (1997). Quantity Cookery. Little Brown & Co.
- West, B.B., Wood, L, Harger, V.F. & Shugart, G.S. (1977). Food Service in Institutions, John Wiley & Sons.
- Sethi, M. (2008). Institutional Food Management. New Age International (P) Ltd.
- Sethi, M. (2008). Catering Management. New Age International (P) Ltd.
- Bansal, T. (2011). Hotel facility and planning. Oxford publishing, New Delhi.

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## Elective course: FFT 654 Food Product Development Credits: (2-0-0-2)

**Level:** Post Graduate

**Semester:** Autumn

**Pre-requisite:** Basic knowledge of Food Science.

### Objective:

To acquaint the students about the need, types, basic technique and details of food product development to plan nutritious products.

### Course Content

UNIT I (6 lectures)

Concept of product development - product success and failure, factors for success, process of product development, managing for product's success. Innovation strategy - possibilities for innovation, building up strategy, product development programme.

UNIT II (5 lectures)

The product development process - product strategy, product design and process development, product commercialization, product launch and evaluation.

UNIT III (6 lectures)

The knowledge base for product development technology - knowledge and the food system, knowledge management, knowledge for conversion of product concept to new product, technological knowledge (product qualities, raw material properties, processing, packaging requirement, distribution and marketing.

UNIT IV (5 lectures)

Role of consumers in product development - consumer behaviour, food preferences, avoiding acceptance, integration of consumer needs in product development and sensory needs.

UNIT V (8 lectures)

Managing the product development process, - principles of product development management, people in product development management, designing the product development process, key decision points, establishing outcomes, budgets and constraints, managing and organizing product development process, innovative matrices, striving for continuous improvement, Improving success potential of new products, market exploration and acquisition, Legal aspects of new product launch.

**Learning Outcome:** The course must have acquainted the students with principles of food product design and development.

### Reference Books:

- Clarke & Wright W. 1999. Managing New Product and Process Development. Free Press.
- Earle R, Earle R & Anderson A. 2001. Food Product Development. Woodhead Publ.
- Fuller 2004. New Food Product Development - from Concept to Market Place. CRC.

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**Elective Course: FFT 656 Maternal and Child Nutrition**  
**Credits: (2-0-0-2)**

**Level:** Post graduate

**Semester:** Autumn

**Pre-requisite:** Basic understanding of Normal Human Nutrition and Community Health Nutrition.

**Objective:** To enable the students to understand the role of nutrition during pregnancy, lactation and infancy.

**Course Content:**

UNIT I (6 Lectures)  
Current scenario of maternal and child nutrition; Nutritional aspect of embryogenesis; Factors affecting outcome of pregnancy;

UNIT II (8 Lectures)  
Growth and development of fetus: Effects of maternal nutrition on birth weight. Appropriate-for-gestational-age. Low birth weight (LBW), small-for-date (SFD), premature babies. Physiological changes in body composition and mental development in relation to prenatal and postnatal nutrition.

UNIT III (6 Lectures)  
Effect of nutritional status of mother on quantity and quality of breast milk; recent guidelines in infant feeding and complementary feeding. Feeding of premature babies; HIV and breast feeding; drug abuse and breast feeding.

UNIT IV (5 Lectures)  
Nutritional problems and requirements of preschool and school going children; growth and development of children; growth monitoring using growth charts.

UNIT V (5 Lectures)  
Strategies to improve maternal and child health in India; role of BPNI in promotion of breast feeding in India; importance of world breast feeding week.

**Learning Outcome:** To enable students to develop customized regime in combating nutritional problems related to mother and child in accordance to whichever stream of work profile they choose.

**Reference Books**

- Anonymous, (1998). Indian Nutrition Profile. Dept. of Women & Child Dev. Ministry of Human Resource Dev. Govt. of India Press New Delhi.
- Bamji, M.S., Rao, N.P. & Reddy, V. (1999). Text Book of Human Nutrition. Oxford & IBH.
- Mahan, L.K. & Escott Stump, S. (2000). Krause's Food Nutrition and Diet Therapy 10<sup>th</sup> Ed., WB Saunders & Co. London
- Wardlaw, G. (2010). Contemporary Nutrition and Diet Therapy. Benchmark publications.
- Falkner, F. & Tanner, J.M. (1986). Human Growth- A Comprehensive Treatise. Development Biology Press.
- Francis, D.E.M. (1986). Nutrition in Life span. John Wiley & Sons. NNMB Reports.
- Falkner, F. & Tanner, J.M. (1986). Human Growth – Methodology, Ecological, Genetic and Nutritional Effects on Growth. Vol. III. Plenum Press.
- Sachdeva, H.P.S. & Choudhary, P. (1994). Nutrition in Children. Cambridge Press.

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**Elective Course: FFT 657 Food Standards and Food Laws**  
**Credits: (2-0-0-2)**

**Level:** Post Graduate

**Semester:** Autumn

**Pre-requisite:** Basic knowledge of Food Science

**Objective:**

To make students understand the significance, essentials, legislation, and protection systems involved in assuring food quality and safety.

**Course Content:**

UNIT I (8 lectures)

Food standards and laws: International – Concept of Codex alimentarius, HACCP, GMP, GHP, USFDA, ISO 9000, ISO 22000, ISO 14000. National – Introduction of BIS/IS, Food Safety and standards – 2006, Food Safety and standard regulation 2010, FPO, MPO, MMPO, Agmark.

UNIT II (8 lectures)

Prevention of food adulteration Act: Food Adulteration: definition, common adulterants in different foods, contamination, method of detection.

UNIT III

Food additives and legislation; coloring mater, preservatives, poisonous metals, antioxidants and emulsifying and stabilizing agents, insecticides and pesticides. PFA specification for food products, Nutritional labeling

UNIT IV (4 Lectures)

Quality Certification & Accreditation: Introduction and procedure.

UNIT V (8 Lectures)

Water Quality: Water standards and Analysis physical, chemical and microbiological characteristics of water analysis. Waste treatment: Fundamentals of Physical, Biological & Chemical waste treatments

**Learning Outcome:**

To develop experts of food standards and food laws having critical and analytical rationale in the field of food safety.

**Reference Books:**

- Early, R. (1995). Guide to Quality Management Systems for Food Industries. Blackie Academic.
- Krammer, A. & Twigg, B.A. (1973). Quality Control in Food Industry. Vol. I, II. AVI Publications.
- Alli, I. (2003). Food Quality Assurance: Principles & Practices. Boca Ratan, CRC press.
- Furia, T. E. (1980). Regulatory status of Direct Food Additives. CRC Press.
- Ranganna, S. (2010). Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2<sup>nd</sup> Ed. Tata-McGraw-Hill.
- Macrae, R., Roloson, R. & Sadlu, M.J. (1994). Encyclopedia of Food Science & Technology & Nutrition. Vol. XVI. Academic Press.
- Jellinek, G. (1985). Sensory Evaluation of Food - Theory and Practice. Ellis Horwood.

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**Foundation Course: FFT 691 Workplace Skills**  
**Credits: (1-0-2-2)**

**Level:** Post Graduate

**Semester:** Autumn

**Pre-requisite:** Understanding of basics of communication skills.

**Objective:** To enable students to have firm grounding in English to be able to use it effectively in professional as well as social contexts and have good job seeking skills to work in the fiercely competitive job market.

**Course Content:**

Unit I	3 lectures
Business communication - Job Application, Business Letters, Cover letter, Writing Emails, Minutes writing, Project report	
Unit II	2 lectures
Effective job seeking skills - Needed documentation, Application process, Preparing for the interview, Post interview process, Job interview question model.	
Unit III	3 lectures
Professional Practices and Ethical Codes- Work Ethics, Code of Conduct, Protocol, Motivation, Leadership, Formal writing.	
Unit IV	2 lectures
Presentation & public speaking skills – The art of listening, active listening, Presentation skills, public speaking.	
Unit V	5 lectures
Behavioral skills – Teamwork, Time management, Problem-solving Skills, Interpersonal & negotiation skills, building customer relations, Body language, Stress & Anger management.	

**Practical:**

- Oral presentations
- Using visual aids while presentations
- Critical Reading & Writing
- Mock interview
- Group discussions
- Team building exercises
- Proofreading and editing emails
- Cover letter drafting
- Resume-making
- Drafting reports

**Learning Outcome:** The course must have acquainted the students with communication and public speaking skills specially for interviews and group discussions.

**Reference Books**

- Barun K Mitra, Personality Development and Soft Skills, Oxford Higher Education
- Gopalawamy Ramesh and Mahadevan Ramesh, The Ace of Soft Skills, Pearson Education
- T. Anchukandam and J. Kuttainimathathil (Ed) Grow Free Live Free, Krisitu Jyoti Publications, Bangalore (1995)
- Mani Jacob (Ed) Resource Book for Value Education, Institute for Value Education, New Delhi 2002.
- T.N. & L.A. Olson Technical Writing & Professional Communication for Non-native speakers of English, McGraw-Hill, NY, 1991.

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**Core Course: FFT 631 : Training and Workshop\***  
**Credits: (0-0-4-2)**

**Level:** Post graduate

**Semester:** Autumn

**Pre-requisite:** Any course in nutrition.

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**Core Course: FFT 642 : Seminar**  
**Credits: (0-0-2-1)**

**Level:** Post graduate

**Semester:** Autumn

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**SEMESTER IV**

**FFT 647 : Thesis**  
**Credits : (0-0-40-20)**

**\*Non credit course**