M.Sc.Degree

Programme: MASTER OF SCIENCE (FOOD AND NUTRITION)

Eligibility

A pass in any one of the following Degree Courses of B.Sc Nutrition and Dietetics, Nutrition, Food Service Management and Dietetics, Food Science and Quality Control, B.VOC- Food Processing Technology, Food Science and Nutrition, Botany, Zoology, Biochemistry, Biotechnology, Chemistry, Microbiology, Home science or Family and Community Science or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the **M.Sc Food and Nutrition Examination** of this College after a course study of two academic years.

Programme Objectives:

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. To provide advanced knowledge on food science and nutrition to enhance the quality of life through the improvement of human health and nutritional status
2. To enable the students to implement the basic food science in operation
3. To develop skills and techniques in food preparation with conservation of nutrients and palatability using cooking methods generally employed
4. To help the students to contribute proper utilization of foods and prevent wastes
5. To understand the prevalence of malnutrition in our Country and gain knowledge on effective methods to combat malnutrition.

PROGRAMME OUTCOMES

On successful completion of the programme, the following are the expected outcomes.

PO Number	PO Statement
PO1	To develop the knowledge of the students in the area of human nutrition, food science, food product development, food safety and quality management.
PO2	Apply recently advanced novel foods in medical nutrition therapy and recommend the physical activity to manage the common diseases and metabolic disorder to achieve the fitness and well being.
PO3	Familiarize with the problems and plan, implement, monitor and evaluate interventional programs related to food and nutrition and security to the community.
PO4	To build entrepreneurial values, attitudes, quality and desire in developing innovative food products by fulfilling quality parameters, used to meet the consumer needs nutritionally and commercially viable.
PO5	To develop skills and techniques for the students to become professionals in service industries.

MASTER OF SCIENCE (FOOD AND NUTRITION)

SCHEME OF EXAMINATION

Course Code	Subject	L	T	P	Exam Duration	Max Marks			Credit Points
						CA	CE	Total	
First Semester									
193FN2A1CA	Advanced Food Science	4	1	-	3	25	75	100	4
193FN2A1CB	Nutrition Through Life Cycle	4	1	1	3	25	75	100	4
193FN2A1CC	Physiological Aspects of Nutrition	4	2	-	3	25	75	100	4
193FN2A1CD	Food Chemistry	4	1	-	3	25	75	100	4
193FN2A1CP	Lab-I: Food science and food chemistry	-	-	4	3	40	60	100	2
	ELECTIVE I	4	-	-	3	25	75	100	3
		20	**5**	**5**				**600**	**21**
Second Semester									
193FN2A2CA	Food Processing	4	1	-	3	25	75	100	4
193FN2A2CB	Nutritional Biochemistry	4	-	-	3	25	75	100	4
193FN2A2CC	Therapeutic Nutrition – I	4	-	-	3	25	75	100	4
193FN2A2CD	Macro Nutrients	4	1	-	3	25	75	100	4
193FN2A2CE	EDC-Computer Applications in Nutrition	3	-	-	3	25	75	100	4
193FN2A2CP	Lab-II: Food Analysis	-	-	6	3	40	60	100	3
	DSE - ELECTIVE II	3			3	25	75	100	3
		22	**2**	**6**				**700**	**26**

24/4/19

BoS Chairman/HoD
Department of Food Science & Nutrition
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

Academic Council
CHAIRMAN
N.G.P. Arts and Science College

Third Semester									
193FN2A3CA	Micronutrients	4	1	-	3	25	75	100	4
193FN2A3CB	Therapeutic Nutrition – II	4	1	-	3	25	75	100	4
193MT2A3CC	Research Methodology and Statistics	4	1	-	3	25	75	100	4
193FN2A3CP	Lab-III: Clinical Nutrition Techniques	-	-	6	3	40	60	100	3
193FN2A3CQ	Lab-IV: Therapeutic Nutrition	-	-	4	3	40	60	100	2
193BC2A3CV	Mini Project Viva	2	-	-	3	40	60	100	3
193BC2A3IT	Internship	-	-	-	-	-	100	100	2
	ELECTIVE III	3	-	-	3	25	75	100	3
		17	**3**	**10**				**800**	**25**
Fourth Semester									
193FN2A4CA	Community Nutrition	4	1	-	3	25	75	100	4
193FN2A4CB	Food Safety Quality Management	4	1	-	3	25	75	100	4
193BC2A4CV	Project Work and Viva Voce	16	-	-	3	80	120	200	8
	ELECTIVE IV	4	-	-	3	25	75	100	2
		28	**2**					**500**	**18**
	TOTAL							**2600**	**90**

ELECTIVE – I

(Student shall select any one of the following course as Elective in first semester)

S. No	Course Code	Name of the Course
1.	193FN2A1DA	Functional Foods and Nutraceuticals
2.	193FN2A1DB	Food Product Development
3.	193FN2A1DC	Post Harvest Technology

ELECTIVE – II

(Student shall select any one of the following course as Elective in second semester)

S. No	Course Code	Name of the Course
1.	193FN2A2DA	Food Biotechnology
2.	193FN2A2DB	Food Packaging
3.	193FN2A2DC	Food Toxicology

ELECTIVE – III

(Student shall select any one of the following course as Elective in third semester)

S. No	Course Code	Name of the Course
1.	193FN2A3DA	Instrumentation in Food Industry
2.	193FN2A3DB	Convenience Foods
3.	193FN2A3DC	Food Microbiology

ELECTIVE – IV

(Student shall select any one of the following course as Elective in fourth semester)

S. No	Course Code	Name of the Course
1.	193FN2A4DP	Lab-V-A:Food Quality Control
2.	193FN2A4DQ	Lab-V-B:Nutrition in Health and Wellness
3.	193FN2A4DR	Lab-V-C: Shelf life Analysis of food

Self study paper offered by the Department of Nutrition and Dietetics

S. No.	Semester	Course Code	Course Title
1.	III	17PFNSS1	Composite Home science
2.	III	17PFNSS2	Diet Counseling

Regulation
(2019-2020)

PG Programme

Effective from the academic year 2019-20 and applicable to the students admitted to the Degree of Master of Arts/Commerce/Management/Science.

1. NOMENCLATURE

1.1 Faculty: Refers to a group of programmes concerned with a major division of knowledge. Eg. Faculty of Computer Science consists of Programmes like Computer Science, Information Technology, Computer Technology, Computer Applications etc.

1.2 Programme: Refers to the Master of Arts/Management/Commerce/Science Stream that a student has chosen for study.

1.3 Batch: Refers to the starting and completion year of a programme of study. Eg. Batch of 2015–2017 refers to students belonging to a 2-year Degree programme admitted in 2015 and completing in 2017.

1.4 Course: Refers to a component (a paper) of a programme. A course may be designed to involve lectures / tutorials / laboratory work / seminar / project work/ practical training / report writing / Viva voce, etc or a combination of these, to effectively meet the teaching and learning needs and the credits may be assigned suitably.

a) **Core Courses**

   A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

b) **Extra Departmental Course (EDC)**

   A course chosen generally from a related discipline/subject, with an intention to seek exposure in the discipline relating to the core domain of the student.

c) **Discipline Specific Elective Course (DSE)**: DSE courses are the courses offered by the respective disciplinary/ interdisciplinary programme.

d) Project Work:

It is considered as a special course involving application of knowledge in problem solving/analyzing/exploring a real-life situation. The Project work will be given in lieu of a Core paper.

e) Extra credits

Extra credits will be awarded to a student for achievements in co-curricular activities carried out outside the regular class hours. The guidelines for the award of extra credits are given in section two, these credits are not mandatory for completing the programme.

e) Advanced Learner Course (ALC):

ALC is doing work of a higher standard than usual for students at that stage in their education. Research work carried out in University/ Research Institutions/ Industries of repute in India or abroad for a period of 15 to 30 days.

2. EXTRA CREDITS

- Earning extra credit is mandatory. However, it is not essential for programme completion.
- Extra Credits will be awarded to a student for achievement in co-curricular/ extracurricular activities carried other than the regular class-hours.
- A student is permitted to earn a maximum of 10 extra Credits during the programme duration of PG from I to IV Semester.
- Candidate can claim a maximum of 1 credit under each category listed.

The following are the guidelines for the award of Extra credits:

2.1 Proficiency in Foreign Language

Qualification	Credit
A pass in any foreign language in the examination conducted by an authorized agency	1

2.2 Proficiency in Hindi

Qualification	Credit
A pass in the Hindi examination conducted by Dakshin Bharat Hindi Prachar Sabha	1

Examination passed during the programme period only will be considered for extra credit

2.3 Self-study Course

Qualification	Credit
A pass in the self-study courses offered by the department	1

The candidate should register in the self-study course offered by the department only in the III semester

2.4 Typewriting/Short hand

A Pass in shorthand /typewriting examination conducted by Tamil Nadu Department of Technical Education (TNDTE) and the credit will be awarded.

Qualification	Credit
A pass in the type writing /short hand examination offered by TNDTE	1

2.5 Diploma / Certificate

Courses offered by any recognized University / NCVRT

Qualification	Credit
A pass in any Certificate /Diploma/PG Diploma Course	1

2.6 CA /ICSI/ CMA

Qualification	Credit
Qualifying foundation/Inter level/Final in CA/ICSI/CMA etc.	1

2.7 Sports and Games

The Student can earn extra credit based on their achievement in sports as given below:

Qualification	Credits
Achievement in University/State /National/ International	1

2.8 Online Courses

Pass in any one of the online courses

Qualification	Credit
SWAYAM/NPTEL/Spoken Tutorial etc.,	1

2.9 Publications / Conference Presentations (Oral/ Poster) /Awards

Qualification	Credit
Research Publications in Journals/oral/poster presentation in Conference	1

2.10 Innovation / Incubation / Patent / Sponsored Projects / Consultancy

Qualification	Credit
Development of model/ Products/ Prototype/ Process/App/Registration of Patents/ Copyrights/ Trademarks/Sponsored Projects/Consultancy	1

2.11 Representation

Qualification	Credit
Participation in State / National level celebrations such as Independence day, Republic day Parade, National Integration camp etc.,	1

3. EXAMINATIONS

The following are the distribution of marks for External and Internal i.e., Comprehensive examination and Continuous Internal Assessment and passing minimum marks for theory papers of PG programmes.

TOTAL MARKS	EXTERNAL		Internal Max. marks	Overall Passing Minimum for total marks (Internal + External)
	Max. marks	Passing Minimum for External alone		
100	75	38	25	50
50	50	25	----	25

The following are the Distribution of marks for the Continuous Internal Assessment in the theory papers of PG programmes.

S. No.	For Theory– PG courses	Distribution of Marks
1	TESTS I (2 hours)	5
2	TESTS II / End semester Model test (3 hours)	10
3	OBE- Rubrics	10
	TOTAL MARKS	**25**

The following are the distribution of marks for the External Assessment in PG Theory courses

S. No.	For Theory– PG courses	Distribution of Marks	
1	Comprehensive (Written) Examination	65	50
2	Online MCQ Examination	10	--
	TOTAL MARKS	**75**	**50**

The following are the distribution of marks for External examinations (CE) and Continuous Internal Assessment (CIA) and passing minimum marks for the practical courses of PG programmes.

TOTAL MARKS	EXTERNAL		Internal Max. marks	Overall Passing Minimum for total marks (Internal + External)
	Max. marks	Passing Minimum for External alone		
100	60	30	40	50
200	120	60	80	100

The following are the distribution of marks for the Continuous Internal Assessment (CIA) in PG practical courses

S. No.	For Theory – PG Practical courses	Distribution of Marks	
1	Tests: Two tests out of which one shall be during the mid semester and the other to be conducted as model test at the end of the semester.)	24	48
2	OBE- Rubrics	16	32
	TOTAL MARKS	**40**	**80**

The following are the distribution of marks for the External Assessment in PG practical courses

S. No.	For Theory – PG Practical courses	Distribution of Marks	
1	Experiment-I	25	50
2	Experiment-II	25	50
3	Record & Viva-Voce	10	20
	TOTAL MARKS	**60**	**120**

The following are the distribution of marks for Project and Viva voce examinations/Industrial Training and Continuous Internal Assessments and passing minimum marks for the project courses/Industrial Training of PG programmes

TOTAL MARKS	EXTERNAL		Internal Max. marks	Overall Passing Minimum for total marks (Internal + External)
	Max. marks	Passing Minimum for External alone		
100	60	30	40	50
200	120	60	80	100

The following are the distribution of marks for the Continuous Internal Assessment in PG Project/ Industrial Training courses.

S. No.	For- PG Project courses/ Industrial Training	Distribution of Marks	
1	Review-I	8	16
2	Review-II	8	16
3	Review-III	8	16
4	OBE- Rubrics	16	32
	TOTAL MARKS	**40**	**80**

The following are the distribution of marks for the External Examination (CE) in PG Project / /Industrial Training courses

S. No.	For- PG Project courses/ Industrial Training Courses	Distribution of Marks	
1	Record Work and Presentation	40	80
2	Viva-Voce	20	40
	TOTAL MARKS	**60**	**120**

- The end semester examinations shall normally be conducted after completing 90 working days for each semester.

- The maximum marks for each theory and practical course (including the project work and Viva-Voce examination in the final Semester) shall be 100 with the following breakup.

(i) **Theory Courses**

Continuous Internal Assessment (CIA) : 25 Marks

End Semester Exams (ESE) : 75 Marks

(Online Exam: 10 Marks &Written Exam: 65 Marks)

(ii) **For Practical Courses**

Continuous Internal Assessment (CIA) : 40 Marks

End Semester Exams (ESE) : 60 Marks

Continuous Assessment OBE Rubrics Score Sheet

Degree: _____ Branch: _____ Semester: _____

Course Code: _____ Course: _____

Max. Marks: Internal:_____ External: _____ Total: _____

S. No.	REG. NO.	THEORY / PRACTICAL & LIBRARY CLASS PARTICIPATION (15) (Compulsory)				RUBRICS ASSESSMENT (SELECT ANY ONE)									Total Marks out of : 30	Total Marks out of : 16 / 10 / 08 / 04
						PAPERS / REPORTS (15)			ASSIGNMENTS (15)			CLASS PRESENTATION (15)				
		Library	Integration of Knowledge	Interaction & Participation	Demonstration of Knowledge	Organization & Knowledge	Format & Spelling	Reference / Experiments	Demonstration of Knowledge	Format & Spelling	Reference	Content & Coherence	Creativity and Speaking Skills	Duration of Presentation		
		6	3	3	3	5	5	5	5	5	5	5	5	5		
1																

a) Utilization of Library

Marks will be awarded to the student based on the hours spent in the library after the working hours and submission of report by the student.

Hours spent in Library	Marks	Type of Document submitted
2	1	Report/ Assignment/ Class presentation
4	2	
6	3	
8	4	
10	5	
12	6	

- During the Library hour, the student must spend time in reading the articles, books, journals of their subject of interest
- Each student should borrow minimum three books during the semester

b) Class Participation

Active participation in classroom discussion by the student will be evaluated based on Integration of knowledge, Interaction and Participation and demonstration of knowledge.

c) Papers / Reports/ Assignments/ Class Presentation

The student will be evaluated based on his ability to do analysis of application of theory to real world problems or creative extension of class room learning and his/her ability to communicate the given topic effectively and clearly. The following are the distribution of marks for the continuous internal assessment in PG practical courses

4. FOR PROGRAMME COMPLETION

Programme Completion (for students admitted during the A.Y.2019-20 and Onwards)

Student has to complete the following:

i) Core, EDC, DSE, Project as mentioned in the scheme
ii) Internship / Industrial/ Institutional training as mentioned in the scheme

Students must undertake industrial / institutional training for a minimum of 15 days and not exceeding 30 days during the II semester summer vacation. The students will submit the report for evaluation during III semester.

Based on the performance Grade will be awarded as follows:

Marks Scored	**Grade to be awarded**
75 and above	A
60-74	B
50-59	C
< 50	Re-Appearance

Course Code	Course Name	Category	L	T	P	Credit
193FN2A1CA	ADVANCED FOOD SCIENCE	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- To understand the structure, classification and nutrient composition of foods
- To appreciate the science of foods

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Analyze the structure of foods and Compare the nutrient composition of foods.	K4
CO2	Classify foods based on food processing and Explain the methods of processing different foods.	K4,K5
CO3	Interpret the factors which affects the nutritive value of foods, Classify the methods of cooking different foods.	K4,K5
CO4	Examine the postmortem changes in meat, Criticize the food quality, Analyze the medicinal value of foods	K4,K5
CO5	Choose foods based on quality, Decide storage conditions and subjective and objective evaluation of foods.	K5,K6

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	M	S	S	S
CO3	S	M	S	S	S
CO4	S	M	S	S	S
CO5	S	M	S	S	S

S Strong M Medium L Low

193FN2A1CA	CORE : ADVANCED FOOD SCIENCE	**SEMESTER I**

Total Credits: 4
Total Instruction Hours: 60 h

Syllabus

Unit I Cereals 12 h

Rice - Structure, Composition and nutritive value, Cereal cookery

Wheat - Structure, composition and nutritive value. Wheat flour — types, functionality of components, baking qualities, manufacture of bread and cakes.

Millets- Jowar, Bajra, Maize and Ragi, Composition and nutritive value and Products

Unit II Pulses & Fats and Oil 11 h

Pulses - Composition and nutritive value, methods of processing – dry and wet processing, vegetable protein mixes, Anti nutritional factors and eliminations

Nuts and Oilseeds- Composition and nutritive value, nutritious food mixes from oil seeds

Fats and Oil - Nutritional importance of oil and fats, Functions of oil and fats in foods, Sources, nutritional composition, rancidity — types and prevention, role of fat / oil in food preparations.

Unit III Vegetables and Fruits 14 h

Classification, Composition and nutritive value, selection, storage, pigments, browning reactions (Enzymatic and Non-Enzymatic), pectic substances, ripening of fruits, changes on cooking

Beverages – Classification: Milk and fruit based beverages, carbonated non-alcoholic beverages

Spices and condiments – Types, uses and abuses, role in cookery and medicinal uses

Evaluation of foods - Subjective and objective evaluation of foods.Study of proximate constituents.

Unit IV Milk and milk products & EGG 10 h

Milk and milk products- Composition, physical and chemical properties - effects of heat, acid and enzymes, processing of milk – pasteurization, homogenization, types of milkMilk products – Butter, cheese, milk powder, khoa, ice cream

Egg - Structure, composition, grading and selection, effects of heat on egg protein, egg foam (factors affecting foam formation) and role in cookery.

Unit V Meat, Poultry and Fish 13 h

Meat - Structure, composition, postmortem changes, Rigor mortis, Aging and Tenderization of meat, colour of meat, changes of meat in cookery and methods of cooking

Poultry - Classification, composition, market forms, selection factors and methods of cooking

Fish - Classification, composition, kinds of fish, characteristics of fresh fish, fish products and methods of cooking

Text Books

1. Srilakshmi,B (2015). Food Science. (8th Edn.) New Delhi: New Age International Private Ltd.
2. Manay & Shadaksharaswamy ,S.N. & M (2008). Food facts and Principles. (Edn.) NewDelhi: New Age International Private Ltd.

References

1. Potter.N.N and Hotchkiss ,. (1996). Food Science. (Edn.) Location:CBS Publisher.
2. SunetraRoday ,I.N. (2015). Food Science and Nutrition. (Edn.) New Delhi: Oxford Publishers.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A1CB	**CORE :** NUTRITION THROUGH LIFE CYCLE	CORE	4	1	1	4

PREAMBLE

This course has been designed for students to learn and understand

- To understand the role of adequate nutrition in stages of life cycle
- To gain advanced knowledge about nutrition for the betterment of health

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Plan diet for the different stages of the life span. Make use of nutritional requirements needed for health promotion and disease prevention for each stage of the life cycle	K4
CO2	Analyze specific dietary practices during lactation and design foods to increase milk production, supplementary and weaning foods for infants.	K4,K5
CO3	Recommend the nutrition for toddlers-physiological and cognitive development, feeding skill and behavior, common nutrition problems.	K4,K5
CO4	Evaluate physical growth, eating disorders, physiological psychological and socio economic factors effect nutritional status.	K4,K5
CO5	Choose the fitness assessments and plan nutritional needs during exercise and sports.	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A1CB	CORE : NUTRITION THROUGH LIFE CYCLE	**SEMESTER I**

Total Credits: 4
Total Instruction Hours: 72 h

Syllabus

Unit I Nutrition in Preconception and pregnancy 13 h

Nutrition in Preconception-Introduction, factors contributing infertility in female, premenstrual syndrome, obesity and fertility, eating disorder and fertility, polycystic ovary syndrome, nutrient intake for pre-conceptual women.

Nutrition in pregnancy - Stages of gestation, maternal physiological adjustments, weight gain during pregnancy and nutritional requirements for pregnancy, miscarriage, preterm delivery, multi fetal pregnancies, eating disorders and complications of pregnancy

Unit II Nutrition in Lactation and infants 16 h

Nutrition in Lactation - Physiological adjustments during lactation, Physiology of milk Production - hormonal controls and reflex action, lactation in relation to growth and health of infants, problems of breast feeding, nutritional components of colostrums and mature milk, special foods during lactation, nutritional requirements during lactation. Expressing and storing breast milk, Breast promotion network of India.

Nutrition in infants - Rate of growth, weight as the indicator, premature infant, feeding premature infants, low birth weight, breast vs. bottle feeding, nutritional allowances, supplementary feeding, and weaning foods.

Unit III Nutrition in Toddlers 12 h

Nutrition in Toddlers-Physiological and cognitive development, feeding skill and behavior, common nutrition problems Nutrition in Preschool Children - Growth and development of preschool children, food habits, nutritional requirements, supplementary foods.

Nutrition in School Age – Early and middle childhood, physiological development, food habits, nutritional needs and feeding, RDA, Foods habits.

Unit IV Nutrition During Adolescence, Adulthood and Old age 16 h

Nutrition During Adolescence - Physical growth, physiological and psychological problems associated with pubertal changes, nutritional needs, eating disorders — anorexia nervosa, bulimia nervosa, nutrition and medical problems in adolescent pregnancy and its requirements and complications.

Nutrition during Adulthood — Physiological changes of adulthood Nutrition and work efficiency for maintenance of health, RDA

Nutrition for Old Age – theories of ageing, physiological changes, Socio economic and psychological factors — nutritional requirements, factors affecting food intake, institutionalized changes in old age. Advances in geriatric nutrition.

Unit V Nutrition for Special Condition 15 h

Sports and Exercise Fitness - Physical fitness assessment — cardio respiratory fitness, assessment of body composition, muscular fitness assessment, flexibility assessment, Role of carbohydrate, fat and protein as a fuel for exercise, fluid and electrolyte balance during prolonged exercise, nutritional requirements in sports, dietary intake before, during and after exercise. Concept of aerobic exercises, Nutrition during higher altitudes, Nutrition during Space voyage soldiers, Nutrition for special children

Text Books

1 Mahan and Escott ,K & S (2000). Food Nutrition and Diet Therapy. (11th Edn.) USA : W.S. Saunder's Company.

2 Srilakshmi, B. (2010). Dietetics. (6thEdn.) New Delhi: New Age International Pvt. Ltd .

References

1 Shills, Olson, Shike, and Ross, E.M & M. (1999). Modem Nutrition in Health and Disease. (6th Edn.) Philadelphia: Lippincott Williams and Wilkins Publications.

2 Brown, J.E. (2002). Nutrition Through The Lifecycle. (Edn.) USA: Wadsworth Thomson Learning .

Course Code	Course Name	Category	L	T	P	Credit
193FN2A1CC	**CORE :** PHYSIOLOGICAL ASPECTS OF NUTRITION	CORE	4	2	-	4

PREAMBLE

This course has been designed for students to learn and understand

- To enable the students to gain knowledge on enzymes and its activities, immunological aspects, function tests
- To understand the physiological aspects of hormones, drugs and nutrient interactions

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Classify the different types of enzymes. Utilize the enzymes in medical diagnosis. Explain the functions of enzymes	K2,K3
CO2	Identify the factors influencing enzyme action. Discover the biological effect of hormones. Examine the synthesis and secretion of hormones.	K2,K3
CO3	Distinguish the immunity changes in deficiency. Categorize cells of immune system and immune responses.	K4
CO4	Inspect the composition of body fluids Analyze the mechanism of water and electrolytes, acid-base balance. Examine the gastric, renal, liver and endocrine function test	K4
CO5	Determine absorption, biotransformation, and drug metabolism. Elaborate drug and nutrient interaction.	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	S	M	M	S
CO3	S	S	M	M	S
CO4	S	S	M	M	S
CO5	S	S	M	M	S

S Strong M Medium L Low

193FN2A1CC	CORE : PHYSIOLOGICAL ASPECTS OF NUTRITION	**SEMESTER I**

Total Credits: 4
Total Instruction Hours: 72 h

Syllabus

Unit I Enzymes 15 h

Enzymes- Introduction, functions, major classification of enzymes in human body- Metabolic enzymes (Ligase, Lyase, Hydrolase, Transferase, Isomerase, Oxido-reductase and Kinase),Digestive enzymes(Amylase, protease and lipase) , Food enzymes (Lipase, Lactase, Protease, Amylase, Cellulase) and its action. Clinical significance of enzymes -(Pancreatic- α-amylase Lipase, liver- Aspartate transaminase, Alanine transaminase, Alkaline phosphatases, Gamma-glutamyl-transferase (GGT), Glutamate dehydrogenase and muscles- creatine kinase and lactate dehydrogenase.)

Unit II Hormones 14 h

Hormones - Principles of hormone action and endocrine control, synthesis, secretion and biological effect of pituitary, thyroid, parathyroid, adrenal, pancreas, male and female reproductive hormones.

Unit III Immunity 15 h

Immunity - Types of immunity, cells of the immune system, immune response – humoral immunity, cell mediated immunity, immune changes in malnutrition, vitamin deficiency, iron deficiency and zinc modulation, neuro-endocrine control of stress and immunity, immune mechanisms in infections, auto-immunity and hypersensitivity.

Unit IV Water and Electrolyte Balance 14 h

Water and Electrolyte Balance - Total body water, intake versus output of water, body fluid compartments, composition of body fluid, measurement of body fluid volumes, forces controlling the water and electrolyte balance between cells and extra cellular fluid, metabolism of water and electrolytes, regulation of acid balance, effect of diet on water, electrolyte and acid base balance.

Function tests - Gastric function test, liver function test, renal function test and endocrine function test.

Unit V Drugs 14 h

Drugs - Introduction, absorption, biotransformation and excretion of drugs, drug metabolism, routes of drug administration, and mechanisms of drug action factors modifying drug effects, receptor theories, drug and nutrient interactions and drug induced malnutrition.

Text Books

1. Sembulingam and Sembulingam.,,K&P (2013). "Essentials of Medical Physiology

. (6th Edn.) New Delhi,:JAYPEE Brothers, Medical Publishers.,.

2. Stites.D.P.,Terr.A.I. and Parsiow.T.G., 1994., "Basic and Clinical Immunology"., 8thEdition.,Prentice Hall International Inc.,r,. (1994). "Basic and Clinical Immunology. (10Edn.) :.

References

1. Guyton, Hall, , A.G. and J.B. (1996). Text Book of Medical Physiology. (9th Edn.) Bangalore: W.B. Sanders Company, Prism Books (Pvt.) Ltd.

2. Subrahmanyam,S. (2007). Text Book of Human Physiology.,. (Edn.) New Delhi, India: S.ChandPublications.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A1CD	**CORE :** FOOD CHEMISTRY	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- To gain insight into the chemistry of foods
- To understand the various properties exhibited by foods

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Elaborate the structure and properties of water and ice, types of water , solutions and colligative properties, Water activity and Food spoilage, Sorption phenomena, Elucidate the structure, formation, strength, types and permanence and Emulsions	K2 ,K3
CO2	Explicate the chemistry of Reactions of mono and oligosaccharides, Use of Polysaccharides in foods and gelatinization, retrogradation.	K3,K4
CO3	Illustrate the structure, physicochemical properties, functional properties of amino acids.	K3,, K4
CO4	Explicate the classification, sources, composition, and properties, role of lipids in food flavor. Discuss the lipids exposed to frying conditions	K3, K4
CO5	Illuminate the chemistry of Individual aroma compounds-vegetable, fruit and spice and condiment. Infer the Composition, flavorings extracts – natural and synthetic.	K4, K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	M
CO3	S	S	S	S	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A1CD	CORE : FOOD CHEMISTRY	**SEMESTER I**

Total Credits: 4
Total Instruction Hours: 60 h

Syllabus

Unit I Physico-chemical properties of water and foods 10 h

Structure and properties of water and ice, types of water, solutions and colligative properties, Water activity and Food spoilage, Sorption phenomena,

Gels: Structure, formation, strength, types and permanence Emulsions: formation, stability, surfactants and emulsifiers, Foams: Structure, formation and stabilization.

Unit II Chemistry of Starch and Sugars 14 h

reactions of mono and oligosaccharides, use of polysaccharides in foods: non-starch polysaccharides: cellulose, hemicelluloses, pectins, gums (gum arabic, guar gum, xanthan gum), agar, alginates, carrageenan

starch: structure, properties of amylose and amylopectin, effect of processing-gelatinization, methods for following gelatinization. Characteristics of some food starches. Effects of ingredients and conditions on gelatinization- retro gradation, polysaccharide hydrolysis, sugars and sweeteners: sugars, syrups, sugaralcohols, sugar products, caramelization.

Unit III Chemistry of Proteins 13 h

Amino acids, peptides and proteins - structure, physicochemical properties, functional properties, chemical and enzymatic modifications - denaturation, non-enzymatic browning, and other chemical changes, processing induced physical, chemical and nutritional changes, texturized proteins, protein isolates, concentrates, protein hydrolysate

Unit IV Chemistry of Fats and Oils 12 h

classification, sources, composition, and properties, role of lipids in food flavor. Effect of processing on chemical structure and physical properties; functional properties of fat and uses in food preparations, inter-esterification of fats. Lipids exposed to frying conditions, hydrogenated fat and irradiated foods Lipid-protein complexes, emulsions. Fat deterioration and antioxidants and fat substitutes.

Unit V Chemistry of Pectic Substances, Plant Pigments, Spices and Condiments 11 h

Pectins, phenolic components, enzymatic browning in fruits and vegetables, volatile compounds from vegetables during cooking, different types of plant pigments – water and fat soluble pigments, properties and active principles of spices and condiments.

Text Books

1 ShakuntalaManay, Shadaksharaswamy, M (2000). Foods, Facts and Principles,. (2th Edn.) Delhi: , New Age International Pvt Ltd Publishers.

2 Chandrasekhar, U.. (2002). Food Science and applications in Indian Cookery . (10Edn.) New Delhi: Phoenix Publishing House.

References

1 Swaminathan , M.. (2005). Food Science, Chemistry and Experimental Foods,. (Edn.) Bangalore: Bappco Publishers.

2 Meyer, L.H. (2004). Food Chemistry and Distributors . (4th Edn.) Location: CBS Publishers .

3 Paul, and Palmer, P.C. and , H.H . (2000). . Food Theory and Applications . (Revised Edn.) New York: JohnWiley and Sons.

4 Chopra and Panesar , H.K and P.S . (2010). Food Chemistry. (Edn.) New Delhi: Narosa Publishing House.

193FN2A1CP	LAB-I: FOOD SCIENCE AND FOOD CHEMISTRY	**SEMESTER I**

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1	Gelatinization of Starch, Retrogradation and Syneresis
2	Microscopic examination of uncooked and gelatinized
3	Gluten Formation
4	Stages of Sugar Cookery, Preparation of Fondant, Fudge, Caramel and Toffee
5	Scum formation, Boiling over and scorching of milk
6	Effect of Soaking, germination and fermentation of Pulses
7	Coagulation of egg white and egg yolk, Boiled Egg, Poached Egg, Omlettes, Custards, Cake and Mayonnaise
8	Coagulation and precipitation of milk proteins
9	Changes observed in cooking meat, fish and poultry, testing the tenderness of meat
10	Smoking Temperature of different fats, Factors affecting absorption of fats
11	Effect of acids, alkali and heat on water soluble and fat soluble pigments
12	Enzymatic Browning and Methods of prevention

NOTE Ten experiments are mandatory out of twelve

Course Code	Course Name	Category	L	T	P	Credit
193FN2A1DA	Elective : FUNCTIONAL FOODS AND NUTRACEUTICALS	Elective	4	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To enable students to gain insight on the importance of nutraceuticals
- To understand on various functional foods and their beneficiaries in health

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Analyze the basics and importance of nutraceuticals. Examine the basics and importance of functional foods	K4 , K5
CO2	Determine the properties and structure of various nutraceuticals Explain the functions of various nutraceuticals.	K4,K5
CO3	Inspect nutraceuticals of plant origin and nutraceuticals of animal origin Importance of nutraceuticals of plant and animal origin in the field of medicine and therapy.	K4,K5
CO4	Distinguish between functional foods and nutraceuticals. Compare the importance of nutritive and non-nutritive components. Explain the role of fibers and syn-biotic with respect to health	K4,K5
CO5	Design the role of nutraceuticals as food remedies. Test the role of nutraceuticals in alleviating disorders. Originate the role of nanotechnology in the field of functional food industry.	K4,K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	M	S	S
CO3	S	S	M	S	S
CO4	S	S	M	S	S
CO5	S	S	M	S	S

S Strong **M Medium** **L Low**

193FN2A1DA	ELECTIVE : FUNCTIONAL FOODS AND NUTRACEUTICALS	**SEMESTER I**

Total Credits: 3
Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Nutraceuticals as Science 9 h

Nutraceutical- Definition, Classification - Dietary supplements, Functional foods, Historical perspective, scope and future prospects, applied aspects of the Nutraceutical Science, Sources of Nutraceuticals

Unit II Properties, structure and functions of various Nutraceuticals 9 h

Glycosides, Isoprenoidderivaties, Glucosamine, Octacosanol, flavonoids, carotenoids, polyunsaturated fatty acids, lecithin, choline and spingolipids, Lycopene, Carnitine, Melatonin and Ornithine alpha ketoglutarate, Phytoestrogens, curcumin, organosulphur compounds as neutraceuticals. Use of proanthocyanidins, grape products, flaxseed oil as Nutraceuticals.

Unit III Nutraceuticals of plant and animal origin 10 h

Plant secondary metabolites, classification and sub-classification - Alkaloids, phenols, Terpenoids, extraction and purification, applications, Concept of cosmoceuticals and aquaceuticals Animal metabolites - Sources and extraction of nutraceuticals of animal origin, Examples: chitin, chitosan, glucosamine, chondroitin sulphate and other polysaccharides of animal origin, uses and applications in preventive medicine and treatment.

Unit IV Functional Foods 11 h

Definition, Relation of functional foods and Nutraceutical (FFN) to foods and drugs, applications of herbs to functional foods, Concept of free radicals and antioxidants; Nutritive and Non-nutritive food components with potential health effects, Soy proteins and soy isoflavones in human health; Role of nuts in cardiovascular disease prevention .Functional foods from wheat and rice and their health effects.

Role of Dietary fibers in disease prevention, Vegetables, Cereals, milk and dairy products as Functional foods, Health effects of prebiotics, probiotic and synbiotic foods and effects

Unit V Food as remedies 9 h

Nutraceuticals in treatment for cognitive decline, Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers etc, Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulinaetc.

Nutrigenomics-concept of personalized medicine.Use of Nanotechnology in functional food industry.

Text Books

1. Wildman, , R.E.C (2000). Handbook of Nutraceuticals and Functional Foods. (Edn.) Boca Raton : CRC Press.
2. Jeffery, H. W. (2002). Methods of Analysis for Functional Foods and Neutraceuticals. (1st Edn.) New York: CRC Press.

References

1. Mahan.K and Escott.S, . (2000). Food Nutrition and Diet Therapy. (11th Edn.) USA: W.S. Saunder's Company .
2. Murray Robert, (1990). Harper`s Biochemistry. (24th Edn.) UK: Prentice Hall International UK Ltd .
3. Degbasis Bagchi,. (2010). Biotechnology in functional foods and nutraceuticals. (10 Edn.) London: CRC press Taylor& Francis group.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A1DB	ELECTIVE : FOOD PRODUCT DEVELOPMENT	CORE	4	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To understand and know various aspects of food product develop food science and technology, packaging, nutrition values and marketing
- Recognize the potential for entrepreneurship through marketing

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Choose raw materials, portion control, standardizations for products. Make use of the technology and marketing on health concerns	K3
CO2	Categorize the products for development to the community.	K4
CO3	Examine sensory and objective evaluation test, score card designing and Instruments used for texture evaluation.	K4
CO4	Select the types of food packing materials Explain the patent laws and code for IPR	K5
CO5	Build the marketing structure and integration Improve the marketing efficiency	K6

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A1DB	ELECTIVE :FOOD PRODUCT DEVELOPMENT	**SEMESTER I**

Total Credits: 3
Total Instruction Hours: 48 h

Syllabus

Unit I New product development 9 h

Definition and classification, characterization and factors shaping new product development. Health concerns impact of technology and market place influence.

Unit II Formulation of new product development 9 h

Formulation of new product development for infants, preschool, sports person, elderly- Selection of raw materials, portion size, standardization methods, calculation of nutritive values, cost production, shelf life.

Unit III Sensory evaluation 10 h

Establishing sensory panels – Designing testing facilities – Analytical Test – Conduct a sensory Evaluation Test – Designing score card, objective evaluation, Instruments used for texture evaluation.

Unit IV Packaging 9 h

Packaging – Introduction, Types of packing materials. New product development – patent, patent laws, international code for Intellectual property rights (IPR).

Unit V Marketing 11 h

Concept of market and marketing – Approaches to study marketing and marketing functions, market structure, market efficiency and market integration. Role of government in promoting agricultural marketing. GST for newly developed product

Text Books

1. Baker, R.C (1988). Fundamentals of New Food Product Development. (8th Edn.) New Delhi: New Age International Private Ltd.
2. Fuller,., G.W (2008). New Food Product Development from Concept to Market place. (Edn.) NewDelhi: New Age International Private Ltd.

References

1. Sivarama Prasad ,A. (1985). Agricultural marketing in India. (Edn.) New Delhi: Mittal Publication.
2. Aaron, Brody, Joha Lord.,L & B. (2005). New Food Product for a changing Market place. (2nd Edn.) :.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A1DC	ELECTIVE :POST HARVEST TECHNOLOGY	CORE	4	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To understand and know various aspects of food product develop food science and technology, packaging, nutrition values and marketing
- Recognize the potential for entrepreneurship through marketing

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify the role of Post Harvest Technology in combating malnutrition in India	K3
CO2	Categorize the agents causes food spoilage.	K4
CO3	Examine the physical and chemical methods to control insects and rodents.	K4
CO4	Prioritize the Importance of storage structures for food grains. Explain the agencies that control food losses	K5
CO5	Improve the product-process efficiency of food grains. Discuss the role of new food products for the growing population.	K6

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A1DC	ELECTIVE : POST HARVEST TECHNOLOGY	**SEMESTER I**

Total Credits: 3
Total Instruction Hours: 48 h

Syllabus

Unit I 9 h

Introduction to Post Harvest Technology - Definition, importance and problem encountered.

Governmental measures to augment food production- need for food conservation. Food loss in the post harvest period, extent of losses, loss in the field, threshing yard, storage, marketing loss

Role of Post Harvest Technology in combating malnutrition in India

Unit II 10 h

Agents Causing Food Losses - Physical agents (moisture, temperature), Chemical losses, biological losses- insects- insects attacking food grains - types and life cycle, damage caused to food grains and detection of insect infestation, rats and rodents, birds, animals- Nature of damage, identification

Unit III 10 h

Control of Spoilage Agents - Importance and methods of sanitary handling, physical, chemical, biological and other means of control of insects, rats and rodents and birds

Insect control methods- Physical methods and chemical methods including fumigation techniques

Handling and Transport of Food Commodities - Traditional and improved methods, Nutrient losses in spoiled grains and National program to save grains

Unit IV 11 h

Storage of Grains - Importance of storage structures- requirements, traditional and modern and underground and above ground storage and their improvements, FCI godowns, PDS

Agencies Controlling Food Losses - Role of SGC, FCI, CWC, SWC, IGSI in controlling food losses

Unit V 8 h

Food Processing of Selected Food Items – wheat, rice, breakfast cereals, pulses, oilseeds.

ACTIVITY

1. Visit to FCI
2. Visit to Processing Mill (Cereal and Pulse)

Text Books

1. Potter ,N.W (1973). Food Science. (8th Edn.) the Westport: The A VI Publishing Co.
2. Chakravarthy ,A (1981). Post Harvest Technology of Cereals, Pulses and Oilseeds. (1stEdn.) NewDelhi: Oxford and IBH.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A2CA	FOOD PROCESSING	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Explore the students to gain knowledge about food processing sectors and strategies
- Appreciate the latest techniques involved in processing of cereals, pulses, oil seeds, milk, meat, poultry, fruits and vegetables

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Analyze the food processing sectors and methods of processing. Illustrate the different types of food commodities used for processing.	K3
CO2	Choose the processing method of cereals and millets. Explain the Nutrients lost during processing	K4, K5
CO3	Compare the different processing techniques of Legumes and oil seeds. Infer the Fortification of fats and oils.	K4, K5
CO4	Classify the processing methods of milk, meat, fish and egg. Integrate the processing techniques involved in manufacturing of its by products	K4, K5
CO5	Distinguish the thermal processing and non thermal processing. Summarize the Recent trends in packaging technology	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A2CA	CORE : FOOD PROCESSING	**SEMESTER II**

Total Credits: 4
Total Instruction Hours: 60 h

Syllabus

Unit I Food processing sector 10 h

Food processing sector –vision and mission, opportunities, strategies in the Indian food processing sector. Strengths, Weakness, Opportunities and Challenges of food processing operations.Role of Governmental organizations in up gradation of food industries.

Food Processing: Types of processed foods, and its effect on nutritional properties of foods.

Unit II Cereals and millets processing 12 h

Rice –Milling and its types, parboiling, process product (Rice flakes ,puffed rice, popped rice ,instant rice &rice flour) and its by products

Wheat Processing- Milling and process of products (whole wheat flour, refined flour and semolina) and its byproduct

Millets Processing –Sorghum, Pearl and Corn. Manufacture of breakfast cereals and millets

Changes in processing of cereal and millets

Unit III Legumes and oil seeds 13 h

Legumes and oil seeds processing of legumes- Modern methods of milling and process to eliminate the anti-nutritional factors. Processing of pulse based products

Processing of edible fats and oils – preparation of oil, vanaspathi, industrial fats, and low-fat spreads and Fortification of fats and oils

Soybean Processing- Soy protein concentrate and protein isolates.

Extruded foods- principle and classification of extruders, factors affecting extrusion performance and production of pasta.

Unit IV Milk, Meat, Fish and Egg 12 h

Milk and Milk products- processing Fermented (Cheese,yoghurt, temph and kefir) and non- fermented(channa,rabri,panner and ice cream)

Meat & poultry- Slaughtering, Processing and preservation methods. Processing of meat based products-sausage & Nuggets

Fish- processing and by products of fish- fish liver oil, fish meal, fish protein concentrate.

Egg- processing of egg products.

Unit V Fruits and vegetable processing 13 h

Fruits and vegetable processing- Drying and dehydration- Drum drying, tunnel, spray drying and fluidized bed drying

Thermal processing (canning, blanching, and sterilization) and Non-thermalprocessing(High Pressure Processing and Pulse Electric Field Technology)

Mushroom - Production, processing

Coffee, coco and tea processing, processing of spices -cardamom, chilly and ginger.

Recent trends in packaging technology: Modified Atmospheric Packaging and Controlled Atmospheric Packaging, Intelligent packing& Nano Active Packaging.

Text Books

1. Subulakshmi.G and Shoba A Udipi V.K (2017). Food Processing and preservation(volume –I Edn.) New Delhi:New age International publishers.
2. Sivasankar, B.., (2002). Food Processing and Preservation. (1Edn.) New Delhi: PHI Learning (P) Ltd., Publishers,

References

1. VijayaKhader. (2001). Food Science and Technology. New Delhi: ICMR. s.
2. Potter, N. and Hotch Kiss, J.H. (1996). Food Science. New Delhi: CBS Publishers and Distributors.
3. SunetraRoday, 2012 Oxford University Press.
4. Fellows. P.J., (2009.). Food Processing Technology- principle and practice. Woodhead Publishing Ltd. Cambridge.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A2CB	NUTRITIONAL BIOCHEMISTRY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- To enable the students to understand the application of biochemistry in the field of Food and Nutrition
- To gain knowledge on assay techniques and instrumentation

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Infer on carbohydrate metabolism.	K4
CO2	Illustrate the cholesterol metabolism and the inborn errors of fat metabolism.	K4,K5
CO3	Explain the biosynthesis and importance of protein metabolism in biochemical analysis.	K4,K5
CO4	Interpret the significance of nucleic acids in the field of biochemistry.	K4,K5
CO5	Editorialize the principle and techniques involved in the field of biochemistry.	K5,K6

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	S	S	S	M	S
CO3	S	S	S	M	S
CO4	S	S	S	M	S
CO5	S	S	S	M	S

S Strong M Medium L Low

193FN2A2CB	CORE : NUTRITIONAL BIOCHEMISTRY	**SEMESTER II**

Total Credits: 4
Total Instruction Hours: 48 h

Syllabus

Unit I Carbohydrates 10 h

Carbohydrates – classification, functions. Glycolysis, TCA cycle, HMP shunt and energy production, glycogenesis, gluconeogenesis. Renal threshold for glucose. Inborn error of carbohydrate metabolism – lactose intolerance, galactosemia.

Unit II Fatty Acids 10 h

Fatty Acids - classification, functions and oxidation of saturated and unsaturated fatty acids, Biosynthesis of cholesterol, structure and functions of lecithin, cephalin, phospholipids. Inborn errors of fat metabolism – niemann-pick disease, gouchers disease.

Unit III Protein 9 h

Protein- classification, functions and bio-synthesis.

General procedure for metabolism of amino acids –phenylalanine and methionine. Denaturation, transamination, deamination, decarboxylation, urea formation. Synthesis and breakdown of haemoglobin. Inborn errors of protein metabolism – maple syrup urine disease, phenyl ketonuria.

Unit IV Nucleic acids 9 h

Nucleic acids – structure, function and properties of DNA and RNA. Biosynthesis and breakdown of purine and pyrimidine nucleotides.

Assay Techniques: Bioassay techniques, microbiological assay of vitamins. ELISA.

Unit V Techniques in nutritional biochemistry 10 h

Techniques in nutritional biochemistry - Separation of sugars and amino acids by chromatography. Electrophoresis'separation of proteins.

Colorimetry and spectrophotometry - principle and procedures. pH meter – working and application.

Principle and procedure of operation of GC and HPLC.

Elemental analysis by atomic absorption spectroscopy and flame photometry

Text Books

1. Lehininger A.L (2000). Biochemistry. (Edn.) New York: Worth Publishers Inc.,
2. Deb A.C. (2004). Fundamentals of Biochemistry‖,. (8 Edn.) Kolkata -India: NewCentral Book Agency Pvt Ltd.

References

1. Shanmugam. A. (2004). Fundamentals of Biochemistry for Medical Students. (7 Edn.) India: Karthik Printers.
2. Sathyanarayana. U and Chakrapani. U (2004). Biochemistry. (3 Edn.) Kolkata, India: Books and Allied Pub.,
3. Tom brody, (2007). Nutritional Biochemistry. (2nd Edn.) U.K: Academicpress,
4. Sharma.D and Devanshi Sharma.C (2015), Nutritional Biochemistry. (2nd Edn.) New Delhi: CBS publishing pvtltd,.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A2CC	THERAPEUTIC NUTRITION– I	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- To understand the etiology, symptoms and complications of various diseases.
- To appreciate the significance of therapeutic diet for different diseased conditions.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Integrate the Principles of diet therapy and Nutrition Care Process (NCP).	K4,K5
CO2	Critique the Physiological changes in the Gastro Intestinal system and dietary modification for Gastro Intestinal Diseases and Inflammatory Diseases.	K4,K5
CO3	Generalize the Physiological changes Kidney and dietary Modification for Kidney.	K4,K5
CO4	Hypothesis the Physiological Changes and Nutritional modifications for Diabetes Mellitus.	K4,K5
CO5	Infer the Physiological Changes in Circulatory System and Nutritional Considerations in Diseases of the Heart and Circulatory System	K5, K6

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	S	M
CO2	M	S	S	S	M
CO3	M	S	S	S	M
CO4	M	S	S	S	M
CO5	M	S	S	S	M

S Strong M Medium L Low

193FN2A2CC	CORE : THERAPEUTIC NUTRITION– I	**SEMESTER II**

Total Credits: 4
Total Instruction Hours: 48 h

Syllabus

Unit I Therapeutic Diets 09 h

Therapeutic Diets – Principles, objectives and diet therapy, review of hospital diets, type of dietitians, role of dietitian in the hospital and community, Nutrition Care Process (NCP), diet planning and use of exchange list in nutrient calculation, diet counseling.

Enteral and Parenteral nutrition –Routes, methods, complications and nutrient composition of feeds. Functions of Indian Dietetic Association.

Unit II Gastro Intestinal Diseases 09 h

Diseases of Oesophagus: Esophagitis and Hiatus hernia.

Disease of Stomach: Indigestion, hypochlorhydria, acute and chronic gastritis and peptic ulcer, Gastroesophageal reflux disease.

Disease of Intestine: Flatulence, constipation - atonic, spastic and obstructive, diarrhoea - acute and chronic and steatorrhea.

Inflammatory Diseases -Diverticulosis, diverticulitis, regional enteritis,ulcerative colitis, malabsorption syndrome - sprue.

Unit III Kidney 09 h

Kidney – Etiology, dietary management for kidney disease- acute and chronic glomerulonephritis, nephrosis, acute kidney injury and chronic kidney disease, kidney transplant and dialysis, nephrolithiasis.

Unit IV Diabetes Mellitus 10 h

Diabetes Mellitus - Epidemiology / Incidence - Classification - symptoms. Metabolic changes: Long term and short term complications, clinical findings - diagnostic tests - glycemic index of foods, types of insulin, dietary complications and dietary management. Herbal plant remedies for diabetes mellitus.

Unit V Diseases of the Heart and Circulatory System 11 h

Diseases of the Heart and Circulatory System - Acute and chronic cardiac disorders, risk factors of cardiac diseases, dietary management in hypertension, atherosclerosis, congestive heart failure, hyperlipoproteinemia, hypercholesterolemia, role of antioxidants in the prevention and treatment of CVD.

Text Books

1. Mahan. B and Escott.S, (2000). Food Nutrition and Diet Therapy. (12th Edn.) Philadelphia, USA: W.S. Saunder's Company.
2. Davidson.S.S, Passmore.P, Branch.J.F, (1993). Human Nutrition and Dietetics. (9Edn.) Edinburgh and London: F andS, Lingstons Ltd.,

References

1. Antia, F.P (1989). Clinical Dietetics and Nutrition Oxford University. (Edn.) Mumbai:
2. Shills Olson E.M, Shike.M and Ross.A.C.,. (1999). Modem Nutrition in health and disease. (9th Edn.) Philadelphia: Lippincott Williams and Wilkins Publications.
3. Garrow.J.S & James.W.P.T, J. (2006). Human Nutrition &dietetics. (Edn.) : Churchill Livingstone.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A2CD	MACRO NUTRIENTS	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- To enable students to gain knowledge on the macro nutrients and its functions
- To update the requirements of nutrients, sources and its significance in terms of health and disease

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Examine the utilization of energy, basal metabolism and energy requirements.	K4,K5
CO2	Enumerate the metabolism of Carbohydrates and dietary fiber.	K4,K5
CO3	Infer the protein requirements and its metabolism through factorial method and quality of protein through animal studies.	K4,K5
CO4	Examine the mechanism of transport of lipid and the role of fats in the human system.	K4,K5
CO5	Explain the Hormone and Nutrient Interactions. Discuss the role of alcohol in digestive mechanism.	K4,K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A2CD	CORE : MACRO NUTRIENTS	**SEMESTER II**

Total Credits: 4
Total Instruction Hours: 60 h

Syllabus

Unit I Energy 12 h

Energy - Historical background, energy content of food, energy measurements - direct and indirect colorimetry, energy utilization in cells, basal metabolism, physical activity, resting energy expenditure. Regulatory thermo genesis, energy requirements, variables which influencing the energy requirements with reference to adults, infants, adolescents. ICMR, FAO and WHO requirements, energy balance and control of body weight, the interaction between three main energy nutrients - carbohydrates, proteins and fats.

Unit II Carbohydrates and Dietary fiber 12 h

Carbohydrates - Classification, digestion, absorption, utilization and nutritional importance. Dietary fiber - types of fiber in plant foods, sources, composition, digestion, clinical aspects. Role of dietary fiber in therapeutic nutrition. Effect of fiber in the absorption of different nutrients.

Unit III Protein 12 h

Protein - Classification of proteins and amino acids, function, digestion, absorption and utilization. Factors affecting protein utilization. Amino acid requirements, amino acid pattern, essential amino acids, amino acid balance, imbalance and toxicity. Computation of protein requirements through factorial method and balance study, ICMR and FAO / WHO requirements, evaluation of quality of protein, conduct of animal studies, food sources, role of animal proteins and vegetable protein mixture in combating malnutrition, estimation of amino acids and protein needs

Unit IV Fats and lipids 12 h

Fats and lipids - Classification of fats and fatty acids, digestion and absorption of fats, transport of lipid in blood, lipid transformation in the liver, role of essential fatty acids, deposition of fats in the body. Effect of deficiency and toxicity, role of fats in the etiology of arteriosclerosis.

Unit V Hormone and Nutrient Interactions 12 h

Hormone and Nutrient Interactions - Interaction over carbohydrate, protein and fat metabolism. Nutrition in alcoholism — effect of alcohol in digestion and absorption of nutrients, Alterations of nutrient metabolism and organ damage.

Text Books

1. Groff.J.L and Gropper.S.S. (2000). Advanced Nutrition and Human Metabolism. (3rd Edn.) USA: Thomson Wardsworth.
2. Swaminathan, M. (2002). Advanced Textbook on Food and Nutrition. (Vol I Edn.) India: Bangalore Printing press and Publishing Co.Ltd.

References

1. Srilakshmi, B. (2012). Nutrition Science. (Edn.) New Delhi: New Age Publisher.
2. Mahan.K and Escott.S, (2000). Food Nutrition and Diet Therapy. (11 Edn.) Philadelphia, USA: W.S. Saunder's Company.
3. Shils Olson.E.M, Shike.M and Ross.A.C, (1999). Modem Nutrition in health and disease. (9th Edn.) Philadelphia: Lippincott Williams and Wilkins Publications.
4. Whitney.E.N, Cataldo.C.B & Rolfes.S.R ,. (1998). Understanding normal and clinical nutrition. (2 Edn.) Delhi: Wadsworth Publishing Company, Inc.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A2CE	EDC - COMPUTER APPLICATIONS IN NUTRITION	CORE	3	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- To introduce the concept of Computer and Operating system
- To make students well versed with Word, Excel, Access and PowerPoint
- To enable students to learn computer networks and multimedia

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of computer, memory and operating system.	K1
CO2	Apply the knowledge for creating document and presentation.	K3
CO3	Build and analysis the table and database for nutrition using MS Excel and MS Access.	K3,K4
CO4	Apply the knowledge for creating nutrition webpage. Expose the concepts of computer networks.	K4,K5
CO5	Develop the online application in nutrition education using multimedia tools.	K4,K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	M	S
CO2	M	M	M	M	S
CO3	M	M	M	M	S
CO4	M	M	M	M	S
CO5	M	M	M	M	S

S Strong M Medium L Low

193FN2A2CE	EDC - COMPUTER APPLICATIONS IN NUTRITION	**SEMESTER II**

Total Credits: 4
Total Instruction Hours: 36 h

Syllabus

Unit I Computer 7 h

Computer definition, Types of Computer, Logical Organization of a Digital Computer-Memory: Main Memory, Secondary Memory, Input devices, Output devices, Operating system, Functions of an operating system, Types of Operating systems, Multi programming, Multitasking, Time sharing, Real time operating systems.

Unit II Word Basic 8 h

Word Basics: Starting word, Creating a new document, Opening preexisting document, Formatting Text and Documents, Working with Headers and Footers, Creating a simple table using the table menu, Creating presentations: Using auto content wizard, Using blank presentation option, Adding slides, Deleting a slide, Creating food and nutrition presentation.

Unit III MS Access 7 h

MS Access: Creating a Simple Database and Tables, Forms: The Form Wizard, Saving Forms, Modifying Forms, Finding, Sorting and Displaying Data. Excel Basics: Overview of Excel features, Creating a new worksheet, Selecting cells, moving cells, copying cells, sorting cell data, inserting rows, inserting columns, Deleting parts of a worksheet, entering and editing Formulas, Creating Nutrition database using MS Access

Unit IV LAN, MAN, WAN-TCP/IP 7 h

Introduction to LAN, MAN, WAN-TCP/IP-Common protocols in Intranet- WWW-Web browser-HTML, Creating Nutrition application using HTML tags.

Unit V Multimedia 7 h

Introduction to Multimedia: Components of Multimedia, Multimedia software tools, Multimedia Applications, Multimedia and hypermedia, online applications in Nutrition education.

Text Books

1. Gurvinder Singh and Rachhpal Singh (2014). P.C.Software and Programming in C. (4th Edn.)
2. Yadav, D.S. (2008). Fundamentals of Information Technology. (3rd Edn.) : .

References

1. Ze Niam Li and Mark S.Drew i, (2009). Fundamentals of Multimedia.
2. Chetan Srivastava,. (2014). Fundamentals of Information Technology.

193FN2A2CP	LAB-II:FOOD ANALYSIS	**SEMESTER II**

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Determination of Moisture content
2	Determination of Carbohydrate
3	Estimation of protein content of foods by Lowry's method
4	Estimation of fat content of foods by Soxhlet method
5	Estimation of crude fibre
6	Estimation of soluble and insoluble ash content
7	Estimation of Iron
8	Estimation of Phosphorus
9	Estimation of Calcium in milk and curd
10	Estimation of Ascorbic Acid from Citrus Fruits
11	Estimation of Iodine number and acid number
12	Determination of Saponification value of oil
13	Determination of Total Antioxidant capacity
14	Estimation of Thiamine and Riboflavin
15	Determination of β -Carotene and Lycopene

NOTES: Ten experiments out of fifteen.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A2DA	DSE-ELECTIVE: FOOD BIOTECHNOLOGY	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To understand the application of Biotechnology in the field of Foods and Nutrition
- To create interest in related activities of tissue culture, fermentation technology and learn the concepts of xenobiotics, nanotechnology and nutrigenomics.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Sketch out the importance of biotechnology and genetic engineering. Hypothesize the concepts of Nutrigenomics.	K3,K6
CO2	Integrate the traditional applications of biotechnology in Fermented foods.	K6
CO3	Generalize the regulations concerning Genetically Modified Foods in India and at the International level.	K6
CO4	Editorialize the importance of Xenobiotics in the field of biotechnology.	K5
CO5	Appraise the significance of nanotechnology and nano-biotechnology.	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	M
CO3	S	S	S	S	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A2DA	DSE- ELECTIVE: FOOD BIOTECHNOLOGY	**SEMESTER II**

Total Credits: 3
Total Instruction Hours: 36 h

Syllabus

Unit I Tools in biotechnology and Nutrigenomics 8 h

Definition, scope and importance of biotechnology-Tools of genetic engineering, enzymes-exonucleases, endonucleases, restriction endonucleases, ligases, reverse transcriptases and alkaline phosphatase Cloning vectors-plasmids, bacteriophage, cosmids, phasmids: Steps in genetic engineering. Nutrigenomics - concept, working, significance and relevance. Nutrigenomic diseases and nutrigenetic diseases.

Unit II Applications of biotechnology 7 h

Traditional applications of biotechnology in food -Importance of food fermentation in food preservation and nutritional enhancement. Fermented foods: eg dairy products, oriental fermentations, alcoholic beverages.

Unit III Genetic engineering 7 h

Plant and animal culture, transgenic plants, application of genetic engineering in food science and technology. Genetically modified foods – concept, types, application and regulations. Bio safety; risk assessment and management.

Unit IV Xenobiotics 7 h

Xenobiotics- Bio- dynamics of xenobiotics: Definition, Concepts and applications of xenobiotics. Downstream processing, biosensors, biochips, limiting factors and regulation.

Unit V Nanotechnology 7 h

Introduction to Nanotechnology and Nanobiotechnology: Nanoparticles and nucleic acid and protein based recognition groups. Nanoparticles as carrier for genetic material.

Recent trends in applications of nanotechnology in food industries -Nanosensors for microbial and chemical contaminants.

Text Books

1. Joshi, Ashok Pandaey.V.K (2009). Biotechnology: Food Fermentation, Microbiology, Biochemistry and Technology. (Volume –I Edn.) New Delhi: Asia Tech Publishers.
2. Khanna. V.K, (2011). Plant tissue culture. (1Edn.) New Delhi: Kalyani Publisher.

References

1. Green, P.J. (2002). Introduction to Food Biotechnology. U.S.A: CRC press.
2. Shanmugham, S. (2011). Nanotechnology. New Delhi: MJP publishers.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A2DB	DSE-ELECTIVE : FOOD PACKAGING	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- Enable students to understand the purpose and the need for food packaging technology
- To appreciate the recent packaging techniques, labeling methods and their applications in food industries

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify the functions of packaging materials for different foods.	K3
CO2	E3lucidate the characteristics, applications in food industry.	K4
CO3	Analyze the packaging techniques, implication and its application.	K4
CO4	Compare the eco-friendly alternatives to plastics and recommend the importance of biodegradable packaging material.	K4,K5
CO5	Choose the Standards for labeling concerned in food industries.	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A2DB	DSE-ELECTIVE : FOOD PACKAGING	**SEMESTER II**

Total Credits: 3
Total Instruction Hours: 36 h

Syllabus

Unit I Food packages 7 h

Definition, functions of packaging materials for different foods, characteristics of packaging material, food packages -bags, pouches, wrappers, tetra packs.

Unit II Packaging materials 7 h

Types of packaging materials – characteristics, applications in food industry, merits and demerits, textiles and wood, metal, glass, flexible films, rigid and semi-rigid plastic containers, paper and boards.

Unit III Techniques in packaging 7 h

Microwave ovenable containers – characteristics, applications and advantages. Retortable packages – Retort pouches, retortable aluminium containers, composite flexible retortable packages – application and advantages. Shrink packaging, active/smart/Intelligent packaging.

Unit IV Ecofriendly packaging 7 h

Ecofriendly alternatives to plastics – Edible packaging – advantages, material used – lipid coating, proteins, composite films, current applications, biodegradable packaging material – biopolymer based edible film. Packaging of finished goods – weighing, filling, scaling, wrapping, cartooning, labeling, marking and trapping.

Unit V Labelling 8 h

Labelling- Standards for labelling, Purpose of labels, description of label for food packaging, critical elements of food label, types of labels, common terms for labels, materials used, surface treatment, labels for freight containers, labelling regulations, bar code, nutrition labelling, health claims, mandatory labelling provisions.

Text Books

1. Food Packaging technology Hand book-. (2004). NIIR, Delhi.
2. Handbook on Modern Packaging Industry, V.K (2008). . NIIR, Delhi.

References

1. Griffrin, R.C, (2002). Principles of Food Packaging. (2nd Edn.) Avipub Co.Westport: Stainley Sacharous.
2. Food Packaging technology,. (2005). NIIR, Delhi: MJP publishers.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A2DC	DSE- ELECTIVE: FOOD TOXICOLOGY	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To understand the clinical, emergency, environmental, medico-legal and occupational aspects of toxicology.
- To prevent/ minimize the hazardous/ toxic substances in food products.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Editorialize the mechanism of toxicology and biotransformation.	K4,K5
CO2	Determination of toxicants in food and food poisoning.	K4,K5
CO3	Facilitate the regulations for Genetically modified foods and allergenisity	K6
CO4	Infer food contaminants and heavy metal contamination and radioactive contamination.	K4,K6
CO5	Speculate food additives and its limitations and toxicological effects.	K4,K6

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	S	S	M	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A2DC	DSE- ELECTIVE:FOOD TOXICOLOGY	**SEMESTER II**

Total Credits: 3
Total Instruction Hours: 36 h

Syllabus

Unit I Introduction to Toxicology 7 h

Introduction to Toxicology – Definition,Classification of toxic agents, characteristics of toxic exposure, interaction and tolerance, biotransformation. Xenobiotics – metabolism.

Mutagenesis, Oncogenesis, Teratogenesis - mechanism of toxicity.

Unit II Food Toxins 8 h

Food Toxins – Natural and Synthetic toxicants in foods, Importance of natural toxins in food, Toxicants of plant and animal origin; Microbial toxins (e.g. Algal toxins, bacterial toxins and fungal toxins). Food poisoning; Toxin determination in foods and their management.

Unit III Food allergies and allergens 7 h

Food allergies and allergens: Natural sources and chemistry of food allergens; true/untrue food allergies; handling of food allergies. Safety of Genetically Modified food: potential toxicity and allergenisity of GM foods.

Unit IV Contaminants in Food 7 h

Contaminants in Food: heavy metal contamination in food (mercury, arsenic lead, cadmium and aluminum) and their health impacts. Radioactive contamination of food.

Drug Residues in food: Fungicide and pesticide residues in foods, use of veterinary drugs.

Unit V Food Additives 7 h

Food Additives: Classification, functional role, limitations and toxicological effects of food additives; food processing generated toxicants: nitroso compounds, heterocyclic amines.

Food adulteration and potential toxicity of food adulterants.

Text Books

1. Helferich, and Winter, W & C.K (2001). Food Toxicology. New Delhi: CRC Press.
2. Shibamoto & Bjeldanes, T & L (2009). Introduction to Food Toxicology. (2Edn.) Burlington: Elsevier Inc.

References

1. Duffus.J.H and Worth.H.G.J,. (2006). Fundamental Toxicology. New Delhi: The Royal Society of Chemistry.
2. Stine.K.E and Brown.T.M. (2006). Principles of Toxicology. (2nd Edn.) New Delhi: CRC Press.

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Third Semester										
193FN2A3CA	CORE-IX	Micronutrients	4	-	-	3	25	75	100	4
193FN2A3CB	CORE-X	Therapeutic Nutrition – II	4	-	-	3	25	75	100	4
193FN2A3CC	CORE-IX	Research Methodology and Statistics	4	1	-	3	25	75	100	4
193FN 2A3CD	CORE-X	Food additives and contaminants	4	-	-	3	40	60	100	4
193FN2A3CP	CORE PRACTICAL-III	Clinical Nutrition Techniques	-	-	6	3	40	60	100	3
193FN2A3CQ	CORE PRACTICAL-IV	Therapeutic Nutrition	-	-	4	3	40	60	100	2
193FN2A3IT	IT	Internship	Grade A-C							
193FN2A3DA	DSE-III	Instrumentation in Food Industry	3	-	-	3	25	75	100	3
193FN2A3DB		Convenience Foods								
193FN2A3DC		Food Microbiology								
		Total	**19**	**1**	**10**				**700**	**24**

EXTRA CREDIT COURSES

The following are the courses offered under self study to earn extra credits:

S. No.	Course Code	Course Name
1	193FN2ASSA	Composite Home science
2	193FN2ASSB	Diet Counseling

Course Code	Course Name	Category	L	T	P	Credit
193FN2A3CA	MICRONUTRIENTS	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The role of micronutrients in health and disease
- The role of pseudo vitamins in health and disease
- The recent advances in the study of micro-nutrients

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the absorption, utilization, deficiency, toxicity, sources and requirements of minerals.	K2
CO2	Identify the functions, intake, utilization, bio availability, storage, and output of trace elements	K3
CO3	Examine the chemistry, biosynthesis, transport, utilization, storage and assay methods of Fat soluble vitamins.	K4
CO4	Examine the chemistry, physiological action, storage, transport, and biosynthesis of water soluble vitamins..	K4
CO5	Explain the chemistry, functions and metabolism of pseudo vitamins.Explain the deficiency, excess and dietary consideration of the pseudo vitamins.	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A3CA	MICRONUTRIENTS	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Minerals 10 h

Calcium – Distribution of calcium in the body, functions. Calcium absorption and utilization, regulation of calcium, requirements, sources, deficiency, toxicity, requirements.

Phosphorus - Concentration in the body, calcium - phosphorus ratio, phosphorus absorption and utilization, deficiency, toxicity, sources requirements.

Sodium, Potassium, Magnesium and Sulphur - Distribution, absorption, utilization, functions, sources, deficiency, toxicity and requirements.

Unit II Trace Elements 10 h

Iron- Functions, intake, utilization, bio availability of iron, storage, output and iron balance, (Iron Trunover),deficiency, toxicity and sources, requirements.

Iodine - History, functions, metabolism, deficiency.

Fluorine- functions, sources, requirements of fluoride in the prevention of dental caries, toxic effects of fluoride.

Functions, sources, requirements, deficiency and toxicity of zinc, copper, cobalt , manganese, selenium, chromium and.

Unit III Fat soluble vitamins 10 h

Vitamin A, D, E and K; History, Chemistry, biosynthesis, Physiological action, transport, utilization and storage, methods of assay, dietary sources and requirements of human deficiency and toxicity.

Unit IV Water Soluble Vitamins 9 h

Thiamine, riboflavin, niacin, vitamin B12, folic acid, pyridoxine, pantothenic acid, biotin and ascorbic acid: History, Chemistry, Physiological action, storage, transport, biosynthesis -of vitamins dietary sources deficiency and toxicity. Poor synthesis of

Unit V Pseudo vitamins 9h

Choline, carnitine, inositol, taurine, flavanoid, pangamate, laetrile -chemistry, functions and metabolism, deficiency, excess and dietary consideration.

Text Books

1. Williams.S.R., 2013., "Nutrition and Diet Therapy", Times Mirror Masby College Publishing St. Laws, Toronto, Boston.
2. Mahan.K and Escott.S., 2016., "Food & the Nutrition Care Process 14th Edition",W.S. Saunder's Company, Philadelphia, USA.

References

1. Whitney P.N., and Roes S.R., 2019., "Understanding Nutrition"., West Publication Co
2. Swaminathan, M., 2000., "Advanced Text Book foods Nutrition", Vol.1.,Bappco Publication., Bangalore., India

Course Code	Course Name	Category	L	T	P	Credit
193FN2A3CB	THERAPEUTIC NUTRITION – II	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The etiology, symptoms and complications of various diseases
- The significance of therapeutic diet for different diseased conditions
- The nutrition concepts to evaluate and improve the nutritional health of individuals with medical conditions

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Examine the aetiological factors and dietary modifications of fever and nutritional imbalances.	K4
CO2	Assess the nutritional needs of patients with inborn errors of metabolism. Evaluate the compliance to the dietary intervention.	K5
CO3	Assess the nutritional needs of patients with respiratory and Musculo-skeletal disorders	K5
CO4	Evaluate the compliance to the dietary intervention in diseases of Liver, Gall Bladder and Pancreas	K6
CO5	Assess the nutritional needs of patients with AIDS and Cancer. Evaluate the compliance to the diet intervention	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	S
CO4	S	S	M	M	M
CO5	S	S	M	M	S

S Strong **M** Medium **L** Low

193FN2A3CB	THERAPEUTIC NUTRITION – II	SEMESTER III

Total Credits: 4
Total Instruction Hours: 48 h

Syllabus

Unit I Fever and Infections 10 h

Etiological factors and Dietary modifications in Fevers and infection, COVID -19, Burns, Diet in allergy, Dental diseases -Dental caries and periodontitis, anemia, PEM, and eating disorders.
Nutritional Imbalances- Obesity and underweight, types of obesity, etiological factors, assessment of obesity, grades of obesity, theories - set point and fat cell theory, thermogenesis in obesity. Dietary modifications.

Unit II Inborn errors of Metabolism 10 h

Inborn errors of Metabolism-Etiology, symptoms and dietary treatment -Disorders of Amino Acid Metabolism- Phenylketonuria, tyrosinemia, histidinemia, maple syrup urine diseases and gout.
Disorders of Carbohydrate Metabolism-Galactosemia, fructose and lactose intolerance.

Unit III Diseases of Adrenal Cortex and Thyroid Gland 10 h

Diseases of Adrenal Cortex and Thyroid Gland-Etiology, symptoms and dietary management of Addison disease, Cushings Syndrome, hypothyroidism, hyperthyroidism, hypocalcaemia.
Respiratory and Musculo-skeletal disorders Arthritis, rheumatoid and osteoarthritis, asthma and chronic obstructive pulmonary diseases.
Nervous Disorders - Alzheimer's disease, Parkinson's disease, Epilepsy and multiple sclerosis.

Unit IV Diseases of Liver 9 h

Diseases of Liver, Gall Bladder and Pancreas-Etiology, dietary management in liver, gall bladder and pancreas diseases - jaundice, viral hepatitis, cirrhosis, hepatic coma and fatty liver, cholecystitis, cholelithiasis, acute and chronic pancreatitis.

Unit V HIV Infection and AIDS 9 h

Epidemiology, transmission of HIV, pathophysiology, clinical manifestations, HIV infection and other diseases, Immunity and AIDS virus, dietary management, Prevention and Control.
Nutrition in Cancer –Epidemiological studies, classification of neoplasms, principles of cancer pathogenesis. Causes of cancer cell development, metabolic and nutritional alterations in malignancy, nutritional therapy for cancer, nutritional problems in cancer.

Text Books

1. Srilakhmi .B., 2017., "Dietetics ", 8th Edition., New age International publisher,

2. Kathleen Mahan.L, Sylvia Escott-Stump., Saunders.W.B., 2000., "Krause Food, Nutrition, & Diet Therapy", 10th Edition., W.B. Saunders publisher The University of Michigan.

References

1. Mahan.K and Escott.S., 2000., "Food Nutrition and Diet Therapy", 11th Edition.,W.S. Saunder's Company, Philadelphia, USA.

2. Williams.S.R., 1989, "Nutrition and Diet Therapy", Times Mirror Masby College Publishing St. Laws, Toronto, Boston.

3. Antia, F.P., 1989., "Clinical Dietetics and Nutrition" Oxford University., Mumbai, India.

4. Shils E.M., Olson, Shike.M and Ross. A.C. 1999, "Modem Nutrition in Health and Disease", 9th Edition, Lippincott Williams and Wilkins Publications, Philadelphia.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A3CC	RESEARCH METHODOLOGY AND STATISTICS	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The details of sampling designs, measurement and scaling techniques and also different methods of data collection
- The art of interpretation and the art of writing research reports.
- Apply statistical procedure to analyze numerical data and draw inferences

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Distinguish the types of research Choose a hypothesis and plan a research. Analyze the sampling techniques	K3,K4
CO2	Choose and simplify the data collection methods. Organize and analyze the data	K4, K5
CO3	Priorities and design the data representation suitable for the research Compare and contrast the results obtained from the data	K4, K5
CO4	Statistically analyze the research data and explain the results. Measure the reliability of the research data	K4, K5
CO5	Justify the results using the test of significance. Provide a theoretical conclusion from the obtained data.	K5,K6

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	M	S	S	S	S
CO3	S	S	M	S	S
CO4	S	S	M	M	M
CO5	S	S	M	M	S

S Strong **M Medium** **L Low**

193FN2A3CC	RESEARCH METHODOLOGY AND STATISTICS	SEMESTER III

Total Credits: 4
Total Instruction Hours: 60 h

Syllabus

Unit I Research 11 h

Meaning of research, objectives of research, types of research and their application, selection and formulation of research problems, hypothesis, research design, different types, census and sample method, sampling methods — random sampling methods and non-random sampling methods, size of sample, sampling and non-sampling errors.

Unit II Collection and organisation of data 13 h

Methods of Collecting Primary Data - Questionnaire,schedule method, interview method, case study method, experimentation method, sources of secondary data, precautions while using secondary data.
Editing and Coding the Data
Organization of Data - Classification - meaning and objectives, classification of data, formation of discrete and continuous frequency distribution, tabulation - role, general rules of tabulation, types of tables

Unit III Report writing 13 h

Representation of Data - Diagrammatic and graphical representation - significance of diagrams, graphs and charts- general rules for constructing diagrams - types of diagrams.
Interpretation and Report Writing - Meaning of interpretation and precautions Format of research report- significance, steps and use of abbreviations, Format of thesis writing - front page, main text, bibliographical citations and appendices.
Publishing the research work - writing of abstract and article- content, style, grammar, reference citation.
Plagiarism - Definition, types, importance and examples of plagiarism.

Unit IV Measures of Central Tendency 11 h

Measures of Central Tendency - Mean, median, mode, their relative advantages and disadvantages. Measures of dispersion — mean, standard deviation, quartile deviation. Co-efficient of variation, percentile and percentile ranks. Association of attributes and contingency tables.

Unit V Tests of significance 12 h

Tests of significance – large and small sample-'t' and 'F' test, tests for independence using chi-square test. Analysis of variance- one-way and two-way classifications, Correlation, coefficient of correlation and its interpretation, rank correlation, regression equations and predictions

Text Books

1. Pillai .R.S.N., Bagavathi .V., 2001., "Statistics", Sultana Chand and Sons, New Delhi, India.
2. Gupta, S.P., 2002., "Statistical Methods", Sultana Chand and Sons, New Delhi, India

References

1. Devadas .R.P., 1989.,"A Handbook on Methodology of Research"., Sri Ramakrishna Vidhyalaya, Coimbatore
2. Ramakrishnan, P., 2001., "Biostatistics", Sara Publication., India.

193FN2A3CP	CORE PRACTICAL: CLINICAL NUTRITION AND TECHNIQUES	SEMESTER III

Total Credits: 4
Total Instructions Hours: 72 h

S.No	Contents
	ANALYSIS OF BLOOD FOR-
1	Glucose
2	Haemoglobin and Iron
3	Cholesterol
4	Pyruvic Acid
5	Serum AG Ratio
6	Serum Phospholipid
7	Serum Protein
8	Serum Alkaline Phosphatase
	ANALYSIS OF URINE FOR-
9	Creatinine
10	a Urea and Total Nitrogen
11	Calcium and Phosphorus
12	Vitamin-C

Note: Out of 12 – 10 Mandatory

193FN2A3CQ	CORE PRACTICAL: THERAPEUTIC NUTRITION	SEMESTER III

Total Credits: 2
Total Instructions Hours: 48 h

S.No	CONTENTS
1	Normal diet, regular diet, light diet, soft diet, full liquid diet, clear liquid diet and bland diet
2	Pre operative diet and post operative diet
3	Diet for anemia, PEM, iron deficiency
4	Diet for diabetes and diabetes with CVD
5	Diet for obesity, under weight, chronic obstructive pulmonary Disorder
6	Diet for diseases of the GI tract – peptic ulcer, diarrhea, and constipation
7	Diet for Cardio-vascular diseases- atherosclerosis, hypertension
8	Diet for diseases of the kidney –kidney stones, renal failure, nephritic and nephrotic syndrome. Diet before and after dialysis.
9	Diet for febrile conditions - dengue, chickungunya, swineflu, typhoid, COVID-19.
10	Diet for liver diseases – Viral hepatitis, cirrhosis and hepatic coma
11	Diet for burns
12	Diet for trauma

Note: Out of 12 - 10 Mandatory

Course Code	Course Name	Category	L	T	P	Credit
193FN2A3CD	FOOD ADDITIVES AND CONTAMINANTS	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Gain insight about the food additives
- The significance of food additives
- The seriousness of contaminants

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Elaborate the role of Food additives	K3,K4
CO2	Explicate the regulatory aspects of food additives	K3,K4
CO3	Illustrate the principle and applications of food additives in food processing sectors	K3,K4
CO4	Summarize the importance of flavours in foods and its significance as food additives.	K5,K6
CO5	Illuminate the harmness of adulteration and contaminants and explicate the Consumer Protection Act	K5,K6

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A3CD	FOOD ADDITIVES AND CONTAMINANTS	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Food additives 10 h

Definitions, classification and functions, preservatives, antioxidants, colours and flavours, emulsifiers, sequesterants, humectants, hydrocolloids, sweeteners, acidulents, buffering salts, anticaking agents, etc. – chemistry, food uses and functions in formulations, indirect food additives; toxicological evaluation of food additives. Proteins, starches and lipids as functional ingredient; isolation, modification, specifications, functional properties and applications in foods.

Unit II Functionality of food additives 10 h

Regulatory and legal aspects, sensory properties of foods objectives of additives, functional classification of additives, additives of natural origin, synthetic additives. Health and safety aspects of food additives. Present status of various food additives.. Controversial food additives Saccharin, history, function, controversy status, aspartame, nitrite and nitrate compounds, nitrosamines.

Unit III Additives to improve acceptability 10 h

Permitted food colors, natural and artificial, food flavours, natural and artificial, sweeteners natural and artificial. acidulents, antimicrobials, aerating agents, anti-staling agents, bodying agents, clouding agents, curing agents clarifiers, dietary supplements, dietary fiber , emulsifiers, enzymes, fat replacers, gelling agents, leavening agents, stabilizers, surfactants, tenderizers, texturizers, thickeners, vitamins, neutraceuticals, viscosity modifiers, whipping agents.

Unit IV Flavor technology 8 h

Types of flavours, flavours generated during processing – reaction flavours, flavor composites, stability of flavours during food processing , analysis of flavours, extraction techniques of flavours, flavours emulsions; essential oils and oleoresins; authentication of flavours etc.

Unit V Food adulteration 10 h

Food adulteration, definition, reasons for food adulteration, methods of adulteration, and methods of detection. Consumer's responsibilities, consumer organizations. The prevention of food adulteration Act, 1954. The consumer protection Act 1986, normal food adulterants in coffee, tea leaves, edible oil, milk, ·eals, spice powders

Text Books

1. Branen, A.L., Davidson PM & Salminen S. 2001. Food Additives. 2nd Ed. Marcel Dekker.
2. Gerorge, A.B. 2006. Encyclopedia of Food and Color Additives. Vol. III. CRC Press

References

1. Madhavi, D.L., Deshpande, S.S & Salunkhe, D.K. 2006. Food Antioxidants: Technological, toxicological and Health Perspective. Marcel Dekker
2. Nakai S &Modler HW. 2000. Food Proteins. Processing Applications. Wiley VCH
3. Manualof Laboratory Techniques. Raghuramulu, N., Madhavan Nair, K., and Kalyanasundaram, S. Ed.1983.National Institute of Nutrition, ICMR, Hyderabad.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A3DA	INSTRUMENTATION IN FOOD INDUSTRY	DSE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The instruments used for food analysis.
- The working principle and instrumentation of various instruments used in food analysis
- commonly used process measurement devices, control methods and strategies, and the proper selection, identification, design, installation and operation of instrumentation

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Elaborate the working principle of basic instruments used for food analysis.	K3,K4
CO2	Explicate the instrumentation of Rheological analysis	K3,K4
CO3	Illustrate the working principle and applications of spectroscopic analysis of food components.	K3,K4
CO4	Evaluate the instrumentation and applications of chromatographic techniques in food	K5,K6
CO5	Illuminate the instrumentation and applications of isotopic and immune techniques in food..	K5,K6

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A3DA	INSTRUMENTATION IN FOOD INDUSTRY	SEMESTER III

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Nature and Concept of Food analysis, 7 h

Basic instrumentation: Principle for pH meter, Dialysis, ultra filtration, Reverse osmosis. Principle for Centrifugation, Ultracentrifugation, Calorimetry: Bomb calorimeter.

Unit II Principle of Rheological Analysis 7 h

Rheological parameters, rheological methods, instruments and application, Refractometry.

Unit III Spectroscopic analysis of food components 7 h

Principle, instrumentation & application of Colorimetric (colorimeter, UV-Vis spectrophotometer, NMR.

Unit IV Chromatographic analysis of food components 8 h

Theory & Principle, chromatographic parameter components of chromatography & types (paper, thin layer, partition) Advance chromatography: GC,HPLC,HPTLC(principle, instrumentation &application). Separation technique & analysis: Electrophoresis: Paper & gel electrophoresis

Unit V Isotopic &immune techniques 7 h

Principle & theory of isotopic method, types, measurement &detection of radioactivity, Different immuno techniques of antigen detection in food sample.

Text Books

1 Fennema, O.R. Ed. 1976 ,"Pinciples of Food Science" Part-I Food Chemistry. Marcel Dekker, New York.

2 Joslyn, M.A. Ed. 1970.,"Methods in Food Analysis" Academic Press, New York.

References

1 King, R.D., 1978, "Developments in Food Analysis Techniques-1. Applied Science", Ed Publishers Ltd., London.

2 C.J. and Morris, P. 1976, "Separation Methods in Biochemistry", 2nd Ed Morris, PitmanPub., London.

3 Raghuramulu, N., Madhavan Nair, K., and Kalyanasundaram, S. 1983, "Manual of Laboratory Techniques", National Institute of Nutrition, ICMR, Hyderabad.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A3DB	CONVENIENCE FOODS	DSE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- An overview and importance of convenience foods
- Composition and nutritive value of convenience foods
- Acquire knowledge on food processing technique

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Develop new products and plan a strategy for marketing the developed products	K3,K4
CO2	Categories the processing techniques and inspect the quality of the processed foods. Recommend innovative food products	K4, K5
CO3	Prioritize the convenience food in IMF and hurdle technology. Infer the types of DRDO designed foods	K4, K5
CO4	Criticize the RTE Products and rate the feasibility and reliability of RTE in India	K4, K5
CO5	Perceive the extrusion techniques in trend Appraise the applications of extruded products	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	M	M
CO4	S	S	S	M	M
CO5	S	S	S	M	M

S Strong M Medium L Low

193FN2A3DB	CONVENIENCE FOODS	SEMESTER III

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Food product development 08 h

Development of new product, need for developing new products, Developing marketing strategy for new product, Strategies in product development, success and failure factors for new products.

Unit II Snack foods Popped snacks 07 h

Popcorn –popping procedures, loss during popping, measurement of expansion, factors affecting quality of popcorn, storage. Puffed snacks – Puffable materials, extrusion methods, drying, addition of flavours and colours, Simulated popcorn. Baked snacks –Proportion and role of ingredients; Sweet based –plain cookies, wire-cut cookies; Salt based soda crackers and cheese crackers.

Unit III Convenience foods for defense services 07 h

IMF and Hurdle Technology-Principles, Processing of dehydrated vegetables, vegetable powder, IMF fruit slices, IMF fruit bars, fruit- milk, soup powders. Foods designed by DRDO for defense services –list and principle of processing applied.

Unit IV Ready-to-eat foods 06 h

Principle of retort processing, technique, production, merits and demerits. Commercial availability, marketing and future prospects in India.

Unit V Extruded foods 0 8 h

Principle of extruders, Production of pasta-noodle and macaroni products, Common extruders used in food industry, Merits and demerits of extruder technology, Uses of extruded foods, physico-chemical changes in extruded products

Text Books

1 Subbulakshmi and Udipi.S., 2001., "Food processing and Preservation Technology"., New Age Publications., New Delhi, India.

2 Khader.V, 2001., "A Textbook of Food Processing Technology", ICAR, New Delhi, India

References

1 Sivashankar. B., 2002.,Food Processing and Preservation", PHI, New Delhi, India.

2 NIIR Board, 2002, "Modern Technology of Food Processing and Agro Based Industry", 2nd Edition, Asia Pacific Business Press.

Course Code	Course Name	Category	L	T	P	Credit
193FN2A3DC	FOOD MICROBIOLOGY	DSE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The interactions between microorganisms and the food environment, and factors influencing their growth and survival.
- Effects of fermentation in food production and the microbiological quality of the food product.
- The role of microorganisms in food safety

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Intricate the Factors affecting the growth of microorganisms in food– pH, temperature, moisture, oxidation.	K1,K2
CO2	Illustrate the role of Microorganism in Food Safety. Outline the GMP and Explain HACCP	K2
CO3	Summarize and Identify the Fermented food – Bread, dairy products, beverage, fish and meat products	K2,K3
CO4	Explain the Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.	K2, K3
CO5	Evaluate the Food borne diseases . Investigation of food poisoning outbreaks of Bacterial and Mycotoxins.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	M	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A3DC	FOOD MICROBIOLOGY	SEMESTER III

Total Credits: 3
Total Instruction Hours: 36 h

Syllabus

Unit I Food and Microorganisms 07 h

Important microorganisms in food (List of Bacteria, Mold and yeasts); Factors affecting the growth of microorganisms in food – pH, moisture, oxidation – Reduction potential, Nutrient content and Inhibitory substances and biological structure.

Unit II Elementary knowledge on Fermented & Semi fermented food 07 h

Bread, pickle, fermented fish and meat products – Fermented dairy products – Yoghurt and cheese. Fermented beverages: Wine and beer.

Unit III Spoilage and preservation of food 07 h

Vegetables, fruits, Meat, Fish, Poultry, egg and milk – canned foods.

Unit IV Bacterial Food borne diseases 08 h

Food poisoning and Food borne infections – Salmonella, E.coli, Staphylococcus, Clostridum, Listeria, Shigella, Campylobacter, Yersinia, Vibrio, Aeromonas, Mycobacterium and Bacillus.

Unit V Non Bacterial Food borne illness 07 h

Mycotoxins, Parasites, Viruses, Biohazards and other hazards - Investigation of food poisoning outbreaks.

Text Books

1. Frazier. W.C and D.C Westhoff. 1978, "Food Microbiology".,3rd ed. Tata Macgraw Hill publishing Co., New Delhi.
2. Adams M.R. and Moss M. O., 2000. "Food Microbiology", 2nd edition. Panima Publishers.

References

1. Roger.Y.Stainer. 2003. "Basic Food Microbiology", 2nd edition, CBS Publishers.
2. Jay,J.M . 1991," Modern Food Microbiology" 4th edition. Van Nostra and Rainhokdd Co.

193FN2ASSA	SELF STUDY: COMPOSITE HOME SCIENCE	SEMESTER III

Total Credits: 1

Syllabus

Unit I Food and Nutrition

Food Science and Quality Control, Macro and Micro – Nutrients, Human Nutritional Requirements, Assessment of Nutritional Status, Food Biotechnology

Unit II Institutional Management and Dietetics

Advanced Management and Organization, Management of Human Resources, Experimental Quantity Cookery, Financial and Profit Management, Quantity Food Preparation Techniques, Food Service and, Delivery Systems Marketing, Therapeutic Dietetics

Unit III Child and Human Development

Human Development – Rights perspective, Principles and Theories of Human Development. Early Childhood Care and Development – Strategies, Monitoring and Supervision. Children with special needs and Children at Risk (Child Labour, Street Children, Child Abuse, Chronically Sick); Intervention Programs. Socialization in various family contexts across different cultures. Advances in Assessment of Children.

Clothing and Textiles- Textile Chemistry – Fibers and dyes. Dyeing, printing and finishing of fibers yarns and fabrics. Textile and Apparel Industry – Fundamental of business, specifications, quality control agencies and marketing. Historic and Traditional Textiles of world with emphasis on India. Curriculum and Teaching in clothing and textiles, analysis and development of curriculum; teaching methods and aids. Consumer and Textiles and Clothing. Recent developments in Textile and Clothing.

Unit IV Home and Community Resource Management

Concept of Home management, System approach to family, Input, Output and feedback. Family Resources – Management of Resources like time energy and money; Basic characteristics of Resources; Efficient methods of utilization of Resources. Family Life Cycle – Demands upon resources like time, energy and money. Concept of Ergonomics – its importance and application in home. Concept of Communication process and its importance in family; Barriers in Communication process; Measures for Effective Communication. Concept of Work Simplification – its importance in home; Simple pen and pencil technique. Consumer Education – Laws protecting consumer; Role of consumer society in

protecting consumer; Kinds of adulteration; Identification of adulteration.

Unit V Home Science Extension Education

Curriculum Development for Formal Education in Home Sciences. General and Special Methods of Teaching Home Science. Media and Materials for promoting Home Science in Formal / Non – formal / Adult / Extension Education. Non – formal and Adult Education in Home Science. Extension Education in Home Science. Women in Changing India and Plans for their development. Self – Employment and Entrepreneurship through Home Science. Programs of extension in Home Science. Measurement and Evaluation including monitoring and supervision for Formal / Non – formal / Adult Education / Extension Education.

Text Books

1 Premlata Mullick, 2012."Textbook of Home science", Kalyani publications

2 Serena Shekar, 2013, "Text book of Home science", Extension education

References

1 Suchi rastogi, 2016, "UGC NET/SET, JRF& LS, Home science"

193FN2ASSB	SELF STUDY: DIET COUNSELING	SEMESTER III

Total Credits: 1

Syllabus

Unit I Practical consideration in giving dietary advice and counselling

a) Factors affecting and individual food choice b) Communication of dietary advice c) Consideration of behaviour modification d) Motivation.

Unit II Counselling and educating patient

a) Introduction to nutrition counselling b) Determining the role of nutrition counseller c) Responsibilities of the nutrition counseller d) Practitioner v/s client managed care, e) Conceptualizing entrepreneur skills and behavior, f) Communication and negotiation skills.

Unit III Teaching aids used by dietitians

charts, leaflets, posters etc., preparation of teaching material for patients suffering from Digestive disorders, Hypertension, Diabetes, Atherosclerosis & Hepatitis and cirrhosis.

Unit IV Use of Computers in Counseling

a) Use of computers by dietitian b) Dietary computations, c) Dietetic management d) Education/ training e) Information storage, f) Administrations g) Research

Unit V Computer applications for counseling

a) Execution of software packages b) Straight line, frequency table, bar diagram, pie chart, Preparation of dietary charts for patients c) Statistical computation- mean, median, standard deviation, conclusion and regression test.

Text Books

1 Premlata Mullick Joshi .Y .K , 2003, "Basic Clinical Nutrition", JAYPEE Brothers, New Delhi.

2 Mahan.K and Escott.S., 2000., "Food Nutrition and Diet Therapy", 11th Edition.,W.S. Saunder's Company, Philadelphia, USA.

References

1 Gibney.M.J, 2004., "Public Health Nutrition" , 1st Edition, Black Well Scientific Publications, Oxford.

2 Wadhwa.A, 2003, "Nutrition in the Community", 1st Edition, Elite Publications, New Delhi.

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fourth Semester										
193FN2A4CA	CORE-XI	Community Nutrition	4	-	-	3	25	75	100	4
193FN2A4CB	CORE-XII	Food Safety and Quality Management	4	-	-	3	25	75	100	4
193FN2A4CV	CORE-XIII	Project Work and Viva Voce	-	-	16	3	80	120	200	8
193FN2A4DP	DSE- IV	Food Quality Control	-	-	6	3	40	60	100	3
193FN2A4DQ		Nutrition in Health and Wellness								
193FN2A4DR		Shelf life Analysis of food								
		Total	**8**	**-**	**22**				**500**	**19**
		TOTAL							**2500**	**90**

Course Code	Course Name	Category	L	T	P	Credit
193FN2A4CA	COMMUNITY NUTRITION	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- to enable students to learn the concepts of community nutrition
- to enable the students to assess the health status of the community
- to organize and conduct nutrition education in the community.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Develop the knowledge about malnutrition and Measures to overcome malnutrition in community	K4
CO2	Evaluate the communicable disease and relation to nutritional status importance of sanitation and hygiene in health	K4
CO3	Analyze the nutritional status of community	K4 ,K5
CO4	Infer the Nutrition education of community	K4 ,K5
CO5	Distinguish the various Nutrition programmers national and international organizations improving the health care of the community	K4 ,K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A4CA	COMMUNITY NUTRITION	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Community Nutrition 10 h

Community Nutrition –meaning and concept of community nutrition, relationship between health and nutrition. Malnutrition-Definition, Strategies To Overcome Malnutrition Relation of nutrition to national development; Consequences of malnutrition; IMR, NMR,MMR and prevalence of common nutritional problems-PEM, Vitamin A Deficiency Diseases, Anaemia, Iodine Deficiency Disorders and Fluorosis. Determinants and indicator of health status.

Unit II Communicable Disease 10 h

Relation to nutritional status importance of sanitation and hygiene in health.

Definition of epidemiology - causes, signs and symptoms, treatment and prevention of communicable diseases, respiratory infections, intestinal infections, Other infections- dengue, filariasis. Types of immunity- active, passive and herd-group protection Immunization agents- vaccines, immunoglobulins Immunization schedules (SS) - Active- National and WHO Expanded Programme on Immunization- Universal Passive, Combined, Chemoprophylaxis, non-specific measures

Unit III Nutritional Status 9 h

Nutritional status- definition, Methods of assessments- anthropometry, clinical, biochemical and biophysical assessment. Diet surveys- food Weighment survey, 24 hour recall, food dairy and food frequency, Food surveillance and Security status.

Unit IV Nutrition Education 9 h

Nutrition Education- objectives and methods used, integration of nutrition education with extension work, when to teach, whom to teach and who is to teach.Principles of planning, executing and evaluating, nutrition education programmes, problems in conducting nutrition education programmes.

Unit V	Nutrition programmes national and international organizations	10 h

National organization – ICAR, ICMR, NIN, CFTRI, DFRL, NIPCCID, NFI and FSSAI- Food Fortification Resource Center, Eat Right India Movement, E-Public Distribution System.

International Organizations - WHO, FAO, UNICEF, World Bank, FFHC, WFP; Voluntary organizations – Global Alliance for Improved Nutrition(GAIN), Micronutrient Initiatives, CARE, CRS, AFPRO, IDA; Concepts of Community Health Health care of the community

Nutrition Intervention programmes - Nutritious Noon Meal Programme. ICDS, Anemia Mukt Bharat, Poshan Abhiyan and National Nutrition Mission.

Text Books

1 Nnakwe , 2017, "Community Nutrition ", III Edition , Jones & Bartlett Learning,USA.

2 Surya tapa Das,2019, "Text book of Community" Nutrition,IV Edition,Academic Publishers , West Bengal, INDIA

References

1 Swaminathan. M, 2007, "Essentials of Food and Nutrition". An Advanced Textbook Vol.I, The Bangalore Printing and Publishing Co. Ltd, Bangalore

2 Park A, 2007, Park"s "Textbook of Preventive and Social Medicine" XIX Edition M/S Banarasidas, Bharat Publishers, 1167, Prem Nagar, Jabalpur, 428 001(India)

3 Bhatt D.P, 2008, "Health Education", Khel Sahitya Kendra, New Delhi

4 Bamji M.S, Prahlad Rao. N and Reddy .V 2004, " Textbook of Human Nutrition" II Edition, Oxford and PBH Publishing Co. Pvt. Ltd , New Delhi

Course Code	Course Name	Category	L	T	P	Credit
193FN2A4CB	FOOD SAFETY AND QUALITY MANAGEMENT	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- to gain knowledge on food safety
- to study about quality control and common food standards
- to gain knowledge on food laws

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Develop the knowledge about the quality control and quality assurance program in food industry	K2K3
CO2	Explain various Government regulations and its applications in quality control	K3K4
CO3	Justify the importance of the role of Central and State Government in imparting quality control	K3K4
CO4	Infer the food standards and explain the importance of patents for food products	K4,K5
CO5	Evaluate the importance of food safety	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193FN2A4CB	FOOD SAFETY AND QUALITY MANAGEMENT	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Quality control and Food quality assurance 10 h

Quality control – Objectives, Importance, functions of quality control, Stages of quality control in food industry. Food quality assurance – HACCP –, structured approach, principles, benefits and limitation. Managing quality in supply chain and marketing of food products.

Unit II Government regulations in quality control 9 h

FAO/WHO codex Alimentarious commission, AGMARK, BIS, ISO Certification.

Consumer Protection Act (CPA) ,European Committee for Standardization, American Standards Commission The Pan American Standards Commission (COPANT), EFSA (European Food Safety Authority)

Unit III Food standards 10 h

Food standards – cereals and products – bread, biscuits, cakes, pasta products.Fruit products – jam, juices, squashes, ketchup, sauce, Oils and fats – coconut oil, groundnut oil, palm oil, sunflower oil, vanaspati. Milk and products – Skimmed milk powder, partly skimmed milk powder, condensed sweetened milk. Other products-coffee, tea, sugar, honey, toffees

Unit IV Regulations in quality control 9 h

Role of Central and State Government in imparting quality control – Role of central food laboratory and state food laboratories. FSSAI

Patent – definition, requirements, patent laws in India, administrator, need for patent system, advantages, and precautions to be taken by applicants, patent procedures, non-patentable.

Unit V Food safety 10 h

Structure of Food Law, Food Regulations, Laws and Regulations to Prevent Adulteration and Cross Contamination, Microbial Contamination, Hygienic Practice, Chemical and Environmental Contamination, Food Additives, Labeling, Food Laws and Regulations at the International Level for Harmonization.

Text Books

1 A. Y. Sathe, 1999, "A First Course in Food Analysis" ,New Age Publications,. India.

2 Potter.N.N and Hotchkiss.J.H.,1996., "Food Science" CBS Publishers., India.

References

1 Swaminathan.M , "Food Science, Chemistry and Experimental Foods" , Bappco Publishers.India..

2 Desrosier and Desrosier, 1999, "Technology of Food Preservation" ,4th Edition, CBS Publishers.India..

3 Andres Vasconcellos J, 2005. Quality Assurance for the Food industry - A practical approach. CRC press.

4 Naomi Rees and David Watson, 2000. International standards for food safety, An Aspen Publications

193FN2A4CV	PROJECT WORK AND VIVA VOCE	SEMESTER IV

Total Credits: 8

Total Instruction Hours: 192 h

Syllabus

OBJECTIVES

To initiate research work and gain knowledge in industrial and community sector

CONTENTS

Project can be done in any specialized area

1. Food Processing
2. Food Analysis
3. Clinical nutrition
4. Community nutrition
5. The students could work with NGOs / Government agencies / International agencies/ Hospitals / Food Industries etc.

RULES

- The students should submit the research work in soft and hard copy with minimum 100 pages, Times new roman, font size 12, 1.5 line spacing.
- The students will be guided and supervised by a member of the teaching faculty of the concerned department. The dissertation in which the research culminates should reflect the student's own work.
- Minimum one research publication in peer reviewed/reputed journals.
- Research work should be presented during External Viva voce.

193FN2A4DP	DSE PRACTICAL: FOOD QUALITY CONTROL	SEMESTER IV

Total Credits: 3
Total Instructions Hours: 72 h

S.No	List of Experiments
1	Estimation of titrable acidity in fruits
2	Estimation of total solids in milk
3	Estimation of lactose in milk
4	Determination of Methylene Blue Reduction Test & Detection of adulteration in milk by using Lactometer
5	Estimation of specific gravity in foods
6	Qualitative test of pectin in fruit
7	Estimation of tannins in tea
8	Determination of chlorophyll & anthocyanin pigment
9	Test for rancidity in oils – Kries test
10	Determination of citric and acetic acid
11	Determination of total pectin as calcium pectate
12	Food adulteration – Test to detect adulteration

Note: Out of 12 – 10 Mandatory

References

1 srivastava.R.P and Sanjeev kumar, 2002, " Fruit and Vegetable preservation-principle and practices" (volume –III Edn.) New Delhi:CBS publishers and Distributors.

193FN2A4DQ	DSE PRACTICAL : NUTRITION IN HEALTH AND WELLNESS	**SEMESTER** IV

Total Credits: 3
Total Instructions Hours: 72 h

S.No	List of Experiments
1	Menu planning for pregnant mother carrying twins
2	Menu planning for preterm delivery & miscarriage
3	Menu planning for lactating mother carrying twins
4	Menu planning for adolescents , Adult & Geriatrics
5	Menu planning for mountaineering & sea voyage
6	Menu planning for physically challenged
7	Menu planning for IT professionals
8	Menu planning for soldiers
9	Menu planning for swimmers
10	Menu planning for weight lifters
11	Menu planning for racer & athletes
12	Menu planning for astronauts

Note: Out of 12 – 10 Mandatory

193FN2A4DR	DSE PRACTICAL-SHELF LIFE ANALYSIS	SEMESTER IV

Total Credits: 3
Total Instructions Hours: 72 h

S.No	List of Experiments
1	Microbiological analysis of water and air
2	Determination of water activity
3	Preparation of Culture media Pure culture techniques (spread plate, streak plate and pour plate methods)
4	Pure culture techniques (spread plate, streak plate and pour plate methods)
5	Instrumentation in Microbiology laboratory and their function (Microscope, Autoclave, Hot air oven).
6	Microbiological evaluation of milk and milk products
7	Isolation of spoilage organisms from different food commodities
8	Determination of bacteria and viable microbes by different techniques
9	Microbiological analysis of fruits and vegetables,
10	Microbiological analysis of cereals and canned foods
11	Microbiological analysis of meat and fish
12	Prebiotic and probiotic growth in rice porridge and Microscopic examination of bread on mold and slimy nature

Note: Out of 12 -10 mandatory

28/11/20

BoS Chairman/HoD
Department of Food Science & Nutrition
Dr [illegible] College
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