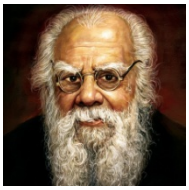
PERIYAR UNIVERSITY

Periyar Palkalai Nagar, Salem-636011

State University – NAAC Reaccredited A++ Grade – NIRF 63 – ARIIA 10



School of Professional Studies

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

M.Sc.

FOOD SCIENCE, TECHNOLOGY AND NUTRITION

[Choice Based Credit System (CBCS) and Outcome Based Education (OBE)]

REGULATIONS AND SYLLABUS 7.0

[2005-06 (1.0); 2008-09 (2.0); 2012-13 (3.0); 2014-15 (4.0); 2016-17 (5.0); 2018-19 (6.0); 2022-23 (7.0)]

(Effective from the academic year 2022-2023 and thereafter)

M. Sc. FOOD SCIENCE TECHNOLOGY AND NUTRITION

OBE REGULATIONS AND SYLLABUS

(With effect from the academic year 2022-2023 onwards)

Preamble

The Department of Food Science and Nutrition was established in the year 2005 and fosters learning, imparts job specific skills, execute society oriented research and extension activities in the major thrust areas like Food Science and Chemistry, Food Processing and Technology, Public Health and Clinical Nutrition.

Vision

Inculcation of knowledge, productive learning, life and entrepreneurship skills and employability among the youth related to Food Science, Technology and Nutrition

Programme Objectives and Outcomes

To inculcate the importance in developing Food and Nutritional Science among the budding Food Scientists, Nutritionists and Food Processing Industrialists, the *M.Sc., Food Science Technology and Nutrition* programme is proposed with the following objectives and outcomes.

Programme Educational Objectives

PEO1: To engineer the students on theoretical and practical aspects of the entire food business and value chain management
PEO2: To promote interactions with food industries and other societal organizations/institutions for learning, problem analyzing/solving and innovation
PEO3: To gain insight into the national/global nutritional problems and its management
PEO4: To generate evidence based nutrition knowledge through research and disseminate to the agrarian and general community

Programme Specific Objectives

PSO1: To upskill the learners on technical knowledge, practical experience and field expertise for discipline specific career opportunities in institutions, organisations, industries, laboratories, corporates and government sectors
PSO2: To ascertain the learners on theories, models and approaches in innovative research for new product development, food safety management and quality assurance, nutrition intervention in the community and nutrition care process of the individual
PSO3: To enable the learners to equip themselves on food and nutripreneurship skills
PSO4: To update the learners on emerging trends in food science, technology and nutrition and equip themselves emotionally and intellectually stronger

Programme Outcomes

The learners can able to explore and attain the following theoretical (T), experiential (Practical) (E), professional (Transferable) (P) and attitudinal (A) skills

PO(T): Define and recognise the terms and concepts in food science and technology, food safety and quality control, public health nutrition and personalised nutrition
PO(E): Apply the principles and perform the food science and quality control tests, biochemical

tests, data analysis, food safety experiments, diet planning for healthy and diseased individual

PO(P):

1. Disseminate and fulfil the job requirements in teaching and learning institutions, food industries, food testing laboratories, nutrition intervention programmes, fitness centres, diet clinics and hospitals
2. Develop innovative food products, business plan, food quality assurance system, nutrition care process model for a community and individual cases.
3. Evaluate the food products in the market, hygiene, sanitation and quality control in food manufacturing and catering establishments, performance/implementation of government nutritional programmes/schemes and nutritional profile of the community and individual
4. Educate the population on nutritional conservation, food safety measures and initiatives, nutrition and health care, eat right initiatives and food as medicine
5. Operate and create an enterprise in the domain of food, nutrition and dietetics

PO(A): The learners can also able to acquire the graduate attributes of

- Leading the team
- Execution of work in team
- Globally competitive
- Emotionally intelligent to counsel the individuals
- Communicate effectively
- Digitally literate
- Sense of inquiry
- Job creator instead of only a job seeker
- Identify and innovate a solution to the problem
- Educate individual and community

Mapping of Programme Educational Objectives (PEOs) with Programme Outcomes (POs)

Programme Educational Objectives (PEOs)	Programme Outcomes (POs)							
	Theoretical	Experiential	Professional					Attitudinal
	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)
PEO1	X	X		X			X	X
PEO2		X	X	X	X	X		X
PEO3	X	X		X		X		X
PEO4		X	X	X	X	X	X	X

Mapping of Programme Specific Objectives (PSOs) with Programme Outcomes (POs)

Programme Specific Objectives (PSOs)	Programme Outcomes (POs)							
	Theoretical	Experiential	Professional					Attitudinal
	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)
PSO1	X	X	X		X	X		X
PSO2		X		X				X
PSO3		X		X	X		X	X
PSO4	X	X	X	X	X	X	X	X

Programme Pattern

This programme is offered under Choice Based Credit system (CBCS). Students can earn 94 credits with mandatory credit to MOOC/SWAYAM courses as supportive course. The programme is integrated with NSDC courses from FICSI Sector Skill Council under Core Courses. Elective courses as optional are framed in the two different field of specialization such as Food Technology and Nutrition and Health Care.

Candidate's Eligibility for Admission

B.Sc. Degree in Nutrition and Dietetics/Food Science and Nutrition/Food Technology, B.Tech./B.Sc. (H) in Food Technology, B.Voc. in Food Science and Nutrition related discipline and B.Sc./B.A. Home Science approved by the Association of Indian Universities are eligible to seek admission.

Duration of the Programme

Two years with four semesters.

Structure of the Programme

The programme structure comprises of two parts.

Course Component	No. of Courses	Marks	Credits
Part A (Credit Courses)			
A. Core Courses	**25**	**2500**	**70**
Theory and Practical Courses	17	1700	54
Skill Courses	04	400	08
Research and Innovation	04	400	08
B. Discipline Specific Elective Courses (Optional)	**04**	**400**	**16**
Option 1: Food Technology	04	400	16
Option 2: Nutrition and Health Care	04	400	16
C. Supportive/Extra-disciplinary Courses	**02**	**200**	**06**
Supportive Courses	01	100	04
MOOC/SWAYAM Courses	01	100	02
D. Value Education Courses			
Human Rights	**01**	**100**	**02**
Total	32	3200	94
Part B (Self-Learning Extra Credit Courses)			
Internship in Food Establishments	01	S/US	01
Internship in Multispecialty Hospital	01	S/US	01
Add-on Course (Extension/Outreach) – Part I and II	02	S/US	02
Total	04	S/US	04

Semester I

S.No.	Course Code	Course Title	Hrs/ week	L	T	P	C
Part A							
Core Courses (C)							
Theory (T) and Practical (P) Courses							
1.	22FSTNCT01	Food Science and Chemistry	4	3	1	0	4
2.	22FSTNCT02	Food Processing Technology	4	3	1	0	4
3.	22FSTNCT03	Research Methodology	4	3	1	0	4
4.	22FSTNCP01	Food Science and Chemistry Practical	3	-	1	2	2
5.	22FSTNCP02	Data Management and Statistics Practical	3	-	1	2	2
Skill Courses (S)							
1.	22FSTNCS01	Food Regulatory Affairs Manager (FIC/N9011)	3	-	1	2	2
Research and Innovation (R)							
1.	22FSTNCR01	Part 1: Food Product Development and Quality Evaluation	5	-	1 (L)*	4	2
Elective Courses (E) (Optional)							
1.	22FSTNEA01	Technology of Non – Perishable Foods	4	3	1	-	4
2.	22FSTNEB01	Physiology of Nutrition					
SWAYAM course registration is mandatory							
		Total	**30**	**12**	**08**	**10**	**24**

Note:- L- Lecture, T-Tutorial/Demonstration, P- Practical, C- Credit; (L)* - Library

Semester II

S.No.	Course Code	Course Title	Hrs/ week	L	T	P	C
Part A							
Core Courses (C)							
Theory (T) and Practical (P) Courses							
1.	22FSTNCT04	Food Microbiology and Preservation	4	3	1	-	4
2.	22FSTNCT05	Food Safety and Quality Control	4	3	1	-	4
3.	22FSTNCP03	Food Safety and Quality Control Practical	3	-	1	2	2
4.	22FSTNCP04	Food Composition Analysis Practical	3	-	1	2	2
Skill Courses (S)							
1.	22FSTNCS02	Food Regulatory Affairs Manager (FIC/N9012 and FIC/N9013)	3	-	1	2	2
Research and Innovation (R)							
1.	22FSTNCR02	Part 2: Business Plan and Quality Assurance System for the New Product	5	-	1 (L)*	4	2
Elective Courses (E) (Optional)							
1.	22FSTNEA02	Technology of Semi-Perishable and Perishable Foods	4	3	1	-	4
2.	22FSTNEB02	Nutritional Medicine					
Supportive Course (S)							
2.	22FSTNS01	SWAYAM Course	1	-	1	-	2
Value Education Courses (V)							
1.	22FSTNV01	Human Rights (Self-learning through e-	1	-	1	-	2

		learning materials)					
2.	**Soft Skills (Non-credit learning)**		2	-	2	-	-
		Total	**30**	**09**	**11**	**10**	**24**
Part B Extra Credit Courses (Self-Learning)							
Add-on Courses (A) (Internship/Extension/Outreach)							
1.	22FSTNA01	Outreach Activity in Food Establishments	15 days	-	3	12	1
2.	22FSTNA02	Internship in Food Establishments	15 days	-	-	15	1
		Total	**30 days**	**-**	**3**	**27**	**2**

Note:- L- Lecture, T-Tutorial/Demonstration, P- Practical, C- Credit; (L)* - Library

Semester III

S.No.	Course Code	Course Title	Hrs/ week	L	T	P	C
Part A							
Core Courses (C)							
Theory (T) and Practical (P) Courses							
1.	22FSTNCT06	Nutritional Biochemistry	4	3	1	0	4
2.	22FSTNCT07	Nutrition in Life Cycle	4	3	1	0	4
3.	22FSTNCT08	Public Health Nutrition	4	3	1	0	4
4.	22FSTNCP05	Computer Aided Diet Planning Practical	3	-	1	2	2
Skill Courses (S)							
1.	22FSTNCS03	Sports Nutrition Practical (SAI Integrated)	3	-	1 (L)*	2	2
Research and Innovation (R)							
1.	22FSTNCR03	Part 3: Nutrition and Health Care Process of the Community	4	-	-	4	2
Elective Courses (E) (Optional)							
1.	22FSTNEA03	Food Testing and Certification	4	1	2	1	4
2.	22FSTNEB03	Nutrition Care Process					
Supportive Courses (S) (Interdepartmental)							
1.	22FSTNSA01	Food Safety Management (Theory + Practical)	4	1	2	1	4
	22FSTNSB01	Nutrition for the Community (Theory + Practical)					
		Total	**30**	**11**	**08**	**11**	**26**
Part B Extra Credit Courses (Self-learning)							
Add-on Courses (A) (Internship/Extension/Outreach)							
1.	22FSTNA03	Outreach activity in adopted village	15 days	-	3	12	1
		Total	**15 days**	**-**	**3**	**12**	**1**

Note:- L- Lecture, T-Tutorial/Demonstration, P- Practical, C- Credit; (L)* - Library

Semester IV

S.No.	Course Code	Course Title	Hrs/ week	L	T	P	C

Part A							
Core Courses (C)							
Theory (T) and Practical (P) Courses							
1.	22FSTNCT09	Clinical Nutrition I	4	3	1	-	4
2.	22FSTNCT10	Clinical Nutrition II	4	3	1	-	4
3.	22FSTNCP06	Biochemical Analysis Practical	3	-	1	2	2
4.	22FSTNCP07	Computer Aided Clinical Nutrition Practical	3	-	1	2	2
Skill Courses (S)							
1.	22FSTNCS04	Innovation and Startup Practical	3	-	1	2	2
Research and Innovation (R)							
1.	22FSTNCR04	Part 4: Nutrition Care Process of an Individual	5	-	1 (L)*	4	2
Elective Courses (E) (Optional)							
1.	22FSTNEA04	Foodpreneurship (Theory+Practical)	4	1	2	1	4
2.	22FSTNEB04	Nutripreneurship (Theory+Practical)					
Diet Counselling/Career Guidance (one hour to each)			4	-	-	4	-
		Total	**30**	**09**	**07**	**14**	**20**
Part B Extra Credit Courses (Self-Learning)							
Add-on Courses (A) (Internship/Extension/Outreach)							
1.	22FSTNA04	Internship in Multispecialty Hospital	15 days	-	-	15	1
		Total	**15 days**	**-**	**-**	**15**	**1**

Note:- L- Lecture, T-Tutorial/Demonstration, P- Practical, C- Credit; (L)* - Library

Credit Calculation

Method of teaching	Hours	Credits
Lecture	1	1
Tutorial/Demonstration/Activities	1	1
Practical	2	1
Internship/Apprenticeship/ Field Visit/Extension Activity	3 - 6	1

Scheme of Examinations

Semester I

S.No.	Course Code	Course Title	Hrs.	CIA	ESE	T	C
Part A							
Core Courses (C)							
Theory (T) and Practical (P) Courses							
1.	22FSTNCT01	Food Science and Chemistry	3	25	75	100	4
2.	22FSTNCT02	Food Processing Technology	3	25	75	100	4
3.	22FSTNCT03	Research Methodology	3	25	75	100	4
4.	22FSTNCP01	Food Science and Chemistry Practical	3	40	60	100	2
5.	22FSTNCP02	Data Management and Statistics Practical	3	40	60	100	2
Skill Courses (S)							
1.	22FSTNCS01	Food Regulatory Affairs Manager (FIC/N9011) (Theory + Practical)	3	40	60	100	2
Research and Innovation (R)							

1.	22FSTNCR01	Part 1: Food Product Development and Quality Evaluation (Viva Voce)	6	40	60	100	2
Elective Courses (E) (Optional)							
1.	22FSTNEA01	Technology of Non – Perishable Foods	3	25	75	100	4
2.	22FSTNEB01	Physiology of Nutrition					
SWAYAM course registration is mandatory							
		Total	**27**	**260**	**540**	**800**	**24**

Note:- CIA – Continuous Internal Assessment, ESE – End Semester Examination, T - Total, C- Credit

Semester II

S.No.	Course Code	Course Title	Hrs.	CIA	ESE	T	C
Part A							
Core Courses (C)							
Theory (T) and Practical (P) Courses							
1.	22FSTNCT04	Food Microbiology and Preservation	3	25	75	100	4
2.	22FSTNCT05	Food Safety and Quality Control	3	25	75	100	4
3.	22FSTNCP03	Food Safety and Quality Control Practical	3	40	60	100	2
4.	22FSTNCP04	Food Composition Analysis Practical	3	40	60	100	2
Skill Courses (S)							
1.	22FSTNCS02	Food Regulatory Affairs Manager (FIC/N9012 and FIC/N9013) (Theory + Practical)	3	40	60	100	2
Research and Innovation (R)							
1.	22FSTNCR02	Part 2: Business Plan and Quality Assurance System for the New Product (Viva Voce)	6	40	60	100	2
Elective Courses (E) (Optional)							
1.	22FSTNEA02	Technology of Semi-Perishable and Perishable Foods	3	25	75	100	4
2.	22FSTNEB02	Nutritional Medicine					
Supportive Courses (S)							
1.	22FSTNS01	SWAYAM Course (Online Platform)	3	-	100	100	2
Value Education Courses (V)							
1.	22FSTNV01	Human Rights (MCQ)	3	25	75	100	2
		Total	**30**	**260**	**640**	**900**	**24**
Part B Extra Credit Courses							
Add-on Courses (A) (Internship/Extension/Outreach)							
1.	22FSTNA01	Outreach activity in food establishments (Viva Voce)	6	-	-	S/US	1
2.	22FSTNA02	Internship in Food Establishments (Viva Voce)	6	-	-	S/US	1
		Total	**12**	**-**	**-**	**S/US**	**2**

Note:- CIA – Continuous Internal Assessment, ESE – End Semester Examination, T - Total, C- Credit

Semester III

S.No.	Course Code	Course Title	Hrs.	CIA	ESE	T	C

Part A							
Core Courses (C)							
Theory (T) and Practical (P) Courses							
1.	22FSTNCT06	Nutritional Biochemistry	3	25	75	100	4
2.	22FSTNCT07	Nutrition in Life Cycle	3	25	75	100	4
3.	22FSTNCT08	Public Health Nutrition	3	25	75	100	4
4.	22FSTNCP05	Computer Aided Diet Planning Practical	3	40	60	100	2
Skill Courses (S)							
1.	22FSTNCS03	Sports Nutrition Practical	3	40	60	100	2
Research and Innovation (R)							
1.	22FSTNCR03	Part 3: Nutrition and Health Care Process of the Community (Viva Voce)	6	40	60	100	2
Elective Courses (E) (Optional)							
1.	22FSTNEA03	Food Testing and Certification	3	25	75	100	4
2.	22FSTNEB03	Nutrition Care Process					
Supportive Course (S) (Interdepartmental)							
1.	22FSTNSA01	Food Safety Management (Theory + Practical)	3	40	60	100	4
	22FSTNSB01	Nutrition for the Community (Theory + Practical)					
		Total	**27**	**260**	**540**	**800**	**26**
Part B Extra Credit Courses							
Add-on Courses (A) (Internship/Extension/Outreach)							
1.	22FSTNA03	Outreach Activity in Adopted Village (Viva Voce)	6	-	-	S/US	1
		Total	**6**	**-**	**-**	**S/US**	**1**

Note:- CIA – Continuous Internal Assessment, ESE – End Semester Examination, T - Total, C-Credit

Semester IV

S.No.	Course Code	Course Title	Hrs.	CIA	ESE	T	C
Part A							
Core Courses (C)							
Theory (T) and Practical (P) Courses							
1.	22FSTNCT09	Clinical Nutrition I	3	25	75	100	4
2.	22FSTNCT10	Clinical Nutrition II	3	25	75	100	4
3.	22FSTNCP06	Biochemical Analysis Practical	3	40	60	100	2
4.	22FSTNCP07	Computer Aided Clinical Nutrition Practical	3	40	60	100	2
Skill Courses (S)							
1.	22FSTNCS04	Innovation and Startup Practical	3	40	60	100	2
Research and Innovation (R)							
1.	22FSTNCR04	Part 4: Nutrition Care Process of an Individual (Viva Voce)	6	40	60	100	2
Elective Courses (E) (Optional)							
1.	22FSTNEA04	Foodpreneurship (Theory+Practical)	3	25	75	100	4
2.	22FSTNEB04	Nutripreneurship (Theory+Practical)					
		Total	**24**	**235**	**465**	**700**	**20**
Part B Extra Credit Courses							

Add-on Courses (A) (Internship/Extension/Outreach)							
1.	22FSTNA04	Internship in Multispecialty Hospital (Viva Voce)	6	-	-	S/US	1
		Total	**6**	**-**	**-**	**S/US**	**1**

Note:- CIA – Continuous Internal Assessment, ESE – End Semester Examination, T - Total, C-Credit

Programme Guidelines

A. General

The students has to adopt the guidelines prescribed in the academic calendar of the University for the respective academic year and fulfil the minimum requisites to complete the programme.

B. Online Courses

The students are required to complete one mandatory course in the second semester by registering in the online education portal in the first semester itself (SWAYAM/e-skill). The completion certificate is recorded in the second semester marks statement. If they are not able to complete it in the first year, they are permitted to register for any other SWAYAM course/e-skill course in the third semester and can submit the completion certificate in the second year.

C. Extra Credit Courses (Self-Learning)

The students are required to undertake two internship courses (second and fourth semester break) in a reputed food industry/establishment/hospital/health centre mandatorily for 15 days. On completion of the course, the students are required to submit the report. The departmental committee will assess the student's performance on the basis of attendance certificate from the industry/establishment/hospital/health centre, training report and viva voce examination and will be awarded Satisfactory/Unsatisfactory grade.

D. NSDC Certification

The skill course (FIC/Q9002: Food Regulatory Affairs Manager, NSQF Level 6) taught in the first year is also assessed by the concerned Sector Skill Councils of NSDC or industrial partners by following the rules and regulations of NSDC and the separate certificate will be issued to the students certified by SSC of NSDC and the University.

E. Value Education Courses

The students are required to complete one mandatory course entitled 'Human Rights' in the second semester.

F. Co-Curricular Activities

1.Short –term Courses (e-Skill Courses)

The Department offers the following e-skill courses as value added course which can be learnt by the students and scholars from any discipline, industry personnel and common public through registration.

S.No.	Short term	Title of the course	Duration	L	T	P	C

	course Code		(Hours)				
1.	22FSTNST01	Food Safety Initiatives	42	6	12	24	1
2.	22FSTNST02	Quality Control in Food Establishments	42	6	12	24	1
3.	22FSTNST03	Nutrition Intervention	42	6	12	24	1

Modules for the short term courses (e-Skill Courses)

Food Safety Initiatives (22FSNeS01)

Objectives

1. To enable the students to learn on food safety initiatives of FSSAI and its implementation in food business operations

Learning Modules

Modules	L	T	P	Total hours
FSSAI Act, Rules and Regulations	1	2	6	9
FoSTaC and FICSI	1	2	6	9
Eat Right India Movement	-	1	2	3
Supply side Initiatives	-	1	6	7
Demand side Initiatives	-	1	6	7
Sustainability Initiatives	-	1	6	7
Total	**2**	**8**	**32**	**42**

Outcome

1. Students can able to implement FSSAI initiatives in food establishments, community and service enterprises and evaluate the progress.

Quality Control in Food Establishments (22FSTNeS02)

Objectives

1. To update the practical knowledge of the students on food quality control

Learning Modules

Modules	L	T	P	Total hours
Quality indicators of Perishable foods	1	2	4	7
Quality indicators of Non-Perishable foods	1	2	4	7
Quality indicators of Semi-Perishable foods	1	2	4	7
Food Quality Standards	1	3	-	4
Instrumental quality analysis	1	-	7	8
Quality control measures at food manufacturing units	-	-	3	3
Quality control measures at catering establishments/ institutional kitchens	-	-	3	3
Quality control measures at hospitals, orphanages, temples and old age homes	-	-	3	3
Total	5	9	28	42

Outcome

1. Students can able to perform quality checking and audits in compliance with FSSAI in various food establishments.

Nutrition Intervention (22FSTNeS03)

Objectives

1. To enable the students to learn on design thinking, material development and nutrition intervention in the selected village

Learning Modules

Sub Modules	L	T	P	Total hours
Identification of nutritional problems in a community	1	1	3	5
Nutrition diagnosis and PES Statement	1	1	6	8
Nutrition intervention Plan	1	1	12	14
Implementation steps of nutrition intervention	-	1	4	5
Monitoring the effectiveness of implementation	-	1	4	5
Feedback evaluation/follow-up and re-planning of implementation	-	1	4	5
Total	3	6	33	42

Outcome

1. Students can able to do nutrition intervention in a village/school/institution/group of individuals.

2. *UGC – NET/TN - SET Coaching*

The students have to undergo minimum 50 hours of learning in a year to empower them to appear and succeed in the UGC – NET/TN - SET examination.

3. Bridge Course

The first year students are oriented on curriculum framework, SWOT analysis of the Department, student welfare measures and the comprehensive contribution of the students for the growth and famine of the Department as bridge course on the starting three days of the programme.

G. Extra-Curricular Activities

1. Student Engagement Activities

The students are motivated to participate in the following activities of the University Departments or outside the University (minimum of 10 hours in a semester) and it is mandatory that the students have to submit two participation/winner certificate in any one of the activity every year to the Department.

a. NSS/NCC/YRC camps and its competitions
b. Inter-institutional/Inter-departmental competitions

c. Personality Development programmes
d. Student Seminar
e. Placement training
f. IAS coaching class
g. Typewriting class
h. Language coaching class
i. Paper presentation in conferences/seminar/workshop etc.

2. Remedial Coaching

In order to improve the knowledge, skills and linguistic proficiency of the students who need special attention, remedial coaching classes on

a. Basic laboratory techniques
b. Oral presentation skills
c. Notes taking and exam preparation techniques

is conducted for one hour in a weak. The hour will be mentioned in the time table to motivate the students to attend the remedial classes. The

3. Mentor-Mentee System

The students are facilitated by all faculty in the Department personally and professionally through peer mentor and mentee system under the umbrella of Food and Nutri Youth Club. All students will become the member of the Youth Club and can forecast the activities to build their graduate attributes. The cooperative learning groups are formed by electing peer mentor for each group comprising of 5 members will cooperatively learn on LSRW skills, computer skills, discipline specific software, learning platforms like foodtech pathshala, NPTEL, Coursera, e-Learning zone of FICSI etc. and e-magazines. The hour will be mentioned in the time table to motivate the students to organize mentor mentee activities.

4. Innovation/Incubation/Sponsored Projects/Consultancy

The students are motivated to participate in the following activities and it is mandatory that the students have to submit two participation/winner certificate in any one of the activity every year to the Department.

a. Innovation contests
b. Student projects
c. Startup/Industry consultancy projects
d. Pre-incubation/co-working activities at the incubation centre
e. Innovation and Entrepreneurship courses
f. Special trainings/internships on innovation and self-employment

H. Examinations

Examinations are conducted in semester pattern. The examination for the Semester I & III will be held in November/December and that for the Semester II and IV will be in the month of April/May. 75% attendance is mandatory to appear for the assessment of theoretical knowledge, practical experience, performing skills, field expertise and outreach activities.

Candidates failing in any subject (both theory, practical and skill) will be permitted to appear for such failed subjects in the same syllabus structure at subsequent examinations within next 5 years. Failing which, the candidate has to complete the course in the present existing syllabus structure.

I. Scheme for Evaluation and Attainment Rubrics

Evaluation will be done on a continuous basis and will be evaluated as per assessment matrices of OBE for Continuous Internal Assessment (CIA) and University End Semester Examination (ESE). CIA Evaluation may be by activities, assignments, seminars, e-learning material development, objective type questions, short answers, essays or a combination of these, and the end semester examination is by University norms with prescribed question paper pattern.

Attainment Criterion for Theory Courses (K1, K2, K3, K4, K5)

CIA ***(Max. Marks - 25)***

- Test documents in CO1, CO2, CO3, CO4 and CO5 - 10 Marks
- Presentation skill + e-material development (Student Seminar) – 05 Marks (Graduate attribute attainment assessment)
- Two activity/problem solving exercises (Assignment) (K3, K4, K5) - 10 (Each 5 Marks)

ESE ***(Max. Marks - 75)***
Question Paper Pattern (Theory) (Updated as per amendments by COE)

Section	Approaches	Mark Pattern	K Level	CO Coverage
A	One word (Answer all questions)	20X1 = 20 (Multiple Choice Questions)	K1, K2	CO1 – 20%, CO2 – 20%, CO3 – 20%, CO4 – 20 % and CO5 – 20%
B	100 to 200 words (Answer any three out of five questions)	3X5 = 15 (Analytical type questions)	K3, K4, K5	CO1 – 20%, CO2 – 20%, CO3 – 20%, CO4 – 20 % and CO5 – 20%
C	500 to 1000 words	5X8 = 40 (Essay type questions)	K1, K2	CO1 – 20%, CO2 – 20%, CO3 – 20%, CO4 – 20 % and CO5 – 20%

Attainment Criterion for Practical Courses (K3, K4, K5, K6)

CIA ***(Max. Marks-40)***

- Adopting Good Laboratory Practices - 05 Marks
- Standard Operating Procedure Creation - 10 Marks
- Performance evaluation of all mandatory experiments - 15 Marks
- Internal Tests (two tests: each 05 Marks) – 10 Marks
  Each test components are
  - Conduct of experiment (5 marks)
  - Precision of results (5 marks)
  - Result analysis and interpretation (5 marks)
  - Framing of SOP for an experiment proposed for the candidate (5 marks)

ESE ***(Max. Marks - 60)***
External examination components are

- Knowledge on GLP and SOP – ten multiple choice questions (10 marks) (K1)
- Understanding on handling of chemicals, glasswares and equipments – ten multiple choice questions (10 marks) (K2)
- Conduct of experiment (10 marks) (K3)
- Precision of results (10 marks) (K4)
- Result analysis and interpretation (10 marks) (K5)

- Framing of SOP for experiment proposed for the candidate (10 marks) (K6)

Note: Student can perform one experiment for 3 hours of examination from the learned experiments.

Attainment Criterion for Innovative Learning Courses/ Research (Part 1, 2, 3 and 4) (K5 and K6)

CIA ***(Max. Marks - 40)***

- First review - Problem Statement and Idea in Brief – 25% (10 marks)
- Second review - PoCs – 25% (10 marks)
- Third review - Prototype in Brief – 25 % (10 marks)
- Manuscript and Report on Idea/PoCs/Prototype Template of IIC – Yukti – 25 % (10 marks)

Research Review and Evaluation Committee Composition for ESE

1. Head of the Department
2. Research Colloquium Coordinator
3. Faculty Facilitators
4. IIC Representative (Internal Innovation Ambassador)

ESE ***(Max. Marks – 60)***

- Problem Statement and Idea in Brief – 10 marks
- PoCs – 10 marks
- Prototype in Brief – 10 marks
- Manuscript and Report on Idea/PoCs/Prototype Template of IIC – Yukti - 10 marks
- Pitching the idea – 5 marks
- Pitching the PoCs – 5 marks
- Pitching the Prototype – 10 marks

Research Review and Evaluation Committee Composition for ESE

1. Head of the Department
2. Research Colloquium Coordinator
3. Incubation CEO
4. Start-up/Industry Representative
5. IIC Representative (External Innovation Ambassador)

Attainment Criterion for NSDC Courses/Skill Component (02) (K1, K2, K3, K4, K5, K6)

CIA ***(Max. Marks - 40)***

- Two quiz based assessment in each NOS – 20 marks
- Creation of Templates for Performance Criteria – 5 marks
- Activity based Self Learning (e-content development) – 5 marks
- Field Project – 10 marks

ESE ***(Max. Marks - 60)***

- Multiple choice questions (Technical knowledge) – 20 marks
- Performing the exercises on acquired technical skills – 20 marks
- Performing the exercises on generic and professional skills – 20 marks

Attainment Criterion for Experiential Learning Courses/Field Visit and Internship (K4 and K5)

ESE ***(Max. Marks – 100) – graded as Satisfactory if secured 50%***

Criterion	Weightage	Rubrics

Attendance	20%	Based on the total number of days allotted and total number of days present
Involvement in execution of proposed activity	30%	Based on the total number of activities proposed and executed
Leadership responsibility	10%	Based on the volunteership and leadership quality
Submission of activity report on daily basis	20%	Based on quality of the daily report
Final report evaluation through viva voce	20%	Organogram – 5%, Governance – 5%, Workflow and Production Management – 5%, Case studies – 5%

J. Grading System

Evaluation of performance of students is based on ten-point scale grading system as given below.

Ten Point Scale			
Grade of Marks	**Grade points**	**Letter Grade**	**Description**
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
00-49	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

K. List of Measurable Verbs Used to Assess Learning Outcomes

Revised Bloom's Taxonomy of Educational Objectives (1956; Anderson, L. W. & Krathwohl, D.R., et al., **2001)**

Knowledge Level (K1): The successful student will recognize or recall learned information (K1).

list	record	underline
state	define	arrange
name	relate	describe
tell	recall	memorize
recall	repeat	recognize
label	select	reproduce

Comprehension Level (K2): The successful student will restate or interpret information in their own words (K2).

explain	describe	report
translate	express	summarize
identify	classify	discuss
restate	locate	compare
discuss	review	illustrate
tell	critique	estimate
reference	interpret	reiterate

Application Level (K3): The successful student will use or apply the learned information (K3).

apply	sketch	perform

use	solve	respond
practice	construct	role-play
demonstrate	conduct	execute
complete	dramatize	employ

Analysis Level (K4): The successful student will examine the learned information critically (K4).

analyze	inspect	test
distinguish	categorize	critique
differentiate	catalogue	diagnose
appraise	quantify	extrapolate
calculate	measure	theorize
experiment	relate	debate

Evaluation Level (K5): The successful student will assess or judge the value of learned information (K5).

review	appraise	choose
justify	argue	conclude
assess	rate	compare
defend	score	evaluate
report on	select	interpret
investigate	measure	support

Creation Level (K6): The successful student will create new models using the learned information (K6).

develop	revise	compose
plan	formulate	collect
build	propose	construct
create	establish	prepare
design	integrate	devise
organize	modify	manage

L. Assessment Metrics for OBE at the Completion of the Programme

The impact of OBE is assessed by evaluating the satisfactory remark achieved by the learners with respect to Applied Knowledge and Skills, Interpersonal abilities and Personal Attributes. A defined questionnaire framed by OECD, 2008.

S.No.	Criteria	Grades of Criteria		
		To great extent	To some extent	To a little extent
1.	Useful knowledge of facts			
2.	Good study habits			
3.	Cultural understanding			
4.	Tolerance			
5.	Job specific knowledge			
6.	Written communication skills			
7.	Oral communication skills			
8.	Analytical skills			
9.	Societal understanding			
10.	Numerical skills			

11.	Interpersonal skills			
12.	Innovation and Creativity			

The percentage of students reveal to each grade of criteria is summarized for assessing the impact of OBE.

Semester I Syllabus

Core Courses - Theory

Course Name	Food Science and Chemistry	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCT01	**Academic Year Introduced**	2022 - 23
Type of Course	Theory	**Semester**	I

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	define the role of colloidal system in daily diet
CO2:	differentiate the role of cereals, millets, pulses in cookery and complementary food preparation
CO3:	identify and define the serving principles of sugar, fruits and vegetables in the daily diet
CO4:	differentiate the nature of protein in the egg, meat, poultry, fish and its changes during cooking
CO5:	appraise the types of milk, fats and oils, spices based products and non-alcoholic beverages in the market

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1	1	1	1	2	3	1	1	3
CO2	3	1	1	1	1	1	1	2	3	1	1	3
CO3	3	1	1	1	1	1	1	2	3	1	1	3
CO4	3	1	1	1	1	1	1	2	3	1	1	3
CO5	3	1	1	1	1	1	1	2	3	1	1	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	**Objectives**	**Hours of Instruction TL+Ac+As = T**
Colloidal System	To provide learning on types and application of colloidal system	8+5+1=14
Cereals, Millets and Pulses	To impart knowledge on science and cooking principles of different cereals, millets and pulses and its complementary role	7+6+1=14
Sugars, Fruits and Vegetables	To illustrate the types, science in cooking of sugar, fruits and vegetables	8+5+1=14
Egg and Fleshy Foods	To elaborate the science and chemistry of fresh and cooked egg, meat, poultry and fish	5+5+1=11
Milk, Fats and Oils, Spices and Beverages	To inculcate the technical knowledge on the nature of milk protein, fats and oils, spices and non-alcoholic aromatic beverages	10+5+4=19
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Unit/Chapters	**Intended Learning Chapters**	**CO(s) Mapped**	**Cognitive Level / KD**	**Psychomotor domain activities**	**Psychomotor domain level**
UNIT 1: Colloidal System					
1.	Concept of food and nutrients, types of water in the food, structure and properties of water and ice	CO1	K1, F	List the 5 nutrient rich food for each nutrient	K4, S1
2.	Colloidal system in foods- Types & Properties	CO1	K1, F	Identify the type of colloidal system in our daily diet	K5, S1
3.	Sols - types and properties	CO1	K2, F	Demonstrate the nature of true solution with an example	K5, S1
4.	Gels-theory of gel formation and factors influencing gel formation	CO1	K2, F	Differentiate sol and gel	K5, S1
5.	Emulsion- types & nature, types of surface film & activity, common food emulsifiers, functions of emulsifying agents, emulsification capacity, factors affecting emulsion stability	CO1	K2, F	Identify the common emulsifying agents used in packed foods	K4, S1
6.	Foams- theory of foam formation, factors affecting foam formation, foaming capacity & stability	CO1	K2, F	List food foams available in the market	K5, S1
7.	Hydrocolloids	CO1	K2, C	Identify and list the thickeners & stabilizers in packed food	K5, S1
UNIT II: Cereals, Millets, Pulses, Nuts and Oil Seeds					
8.	Classification, nutritional composition, structure	CO2	K1, F	Prepare a scrap book of all the cereals, pulses, nuts and oilseeds with nutritional information	K6, S3

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating
Knowledge Dimension: F - Factual C - Conceptual P - Procedural MC - Meta Cognitive
Psychomotor Domain: S1-Imitation S2-Manipulation S3-Precision S4-Articulation S5-Naturalization

9.	Types of starch in cereals	CO2	K2, C	Tabulate the types of starch in cereals, pulses, millets, nuts and oilseeds	K3, S1
10.	Principles of starch cookery- gelatinization, gelation, retrogradation, syneresis & dextrinization	CO2	K2, P	Demonstrate the changes in rice flour on cooking and storage	K4, S2
11.	Starch uses in food systems	CO2	K1, C	List the food starches available in the market	K5, S4
12.	Toxic constituents in pulses	CO2	K2, F	Infograph the toxins present in the food	K5, S4
13.	Factors influencing cooking quality of pulses	CO2	K2, C	Identify the major factor affecting the cooking quality of any one pulse	K3, S1
14.	Complementary proteins	CO2	K2, C	Generate a list of food with complementary proteins	K6, S4
UNIT III: Sugars, Vegetable and Fruits					
15.	Sugars- sources, properties	CO3	K1, F	Tabulate the kinds of sugar as per its sources	K3, S3
16.	Stages of cookery, crystalline and non-crystalline candies	CO3	K2, C	Infer about the crystalline and non-crystalline candies in the market	K4, S3
17.	Sugar substitutes	CO3	K1, C	Interpret on each sugar substitute	K5, S4
18.	Vegetables and fruits- composition, classification	CO3	K1, C	Prepare a scrap book on fruits and vegetables in the local market	K6, S1
19.	Pigments, enzymes, tannins, pectin, acids & flavors	CO3	K2, C	Tabulate the presence of pigments, enzymes, tannins, pectin, acids and flavours in any one fruit and a vegetable	K3, S1
20.	Changes during the cooking, effect of cooking on pigments	CO3	K2, C	Demonstrate the effect of cooking on pigments any one fruit and a vegetable	K3, S1
21.	Enzymatic browning reaction in fruits and vegetables	CO3	K1, F	Catalogue the bioactive compounds responsible for enzymatic browning in any one fruit and a vegetable	K4, S1
22.	Ripening of fruits	CO3	K1, F	Criticize on different ripening agents used by a fruit industry	K4, S4
UNIT IV: Egg, Poultry, Meat and Fish					
23.	Egg - structure, composition	CO4	K1, F	Pictograph the different types of egg in the market	K3, S1
24.	Coagulation of egg protein, Factors effecting coagulation of egg protein, egg quality	CO4	K2, P	Experiment the fresh and coagulated egg quality using any one method	K4, S1
25.	Meat- structure, composition	CO4	K1, F	Tabulate the type of protein present in different meat	K3, S1
26.	Postmortem changes, tenderness of meat, changes during cooking	CO4	K2, P	Sketch on the tenderizers in meat preparation	K4, S1
27.	Poultry & fish- classification, composition, structure	CO4	K1, F	Picturize the poultry and fish varieties	K3, S1
UNIT V: Milk, Fat and Oils, Coffee, Tea and Cocoa beans					
28.	Milk- types, composition and physical and chemical properties	CO5	K1, F	Categorize different types of milk according to their nutritional content and source	K4, S2
29.	Effect of heat, acids & enzymes on milk component, non-enzymatic browning reaction	CO5	K2, C	Experiment on effect of various agents on milk component	K3, S1
30.	Milk substitutes	CO5	K2, C	Criticize on the commercial milk substitutes and its nutritional claims	K5, S3
31.	Fats and oils - sources, properties	CO5	K1, F	Differentiate fat and oil with examples	K3, S2
32.	Effects of heating on fat	CO5	K2, C	Flip chart the changes in fatty acids on continuous cooking of oil	K4, S4
33.	Rancidity & its prevention	CO5	K2, C	Collect the evidence based practice to prevent the rancidity of an oil	K5, S1
34.	Spices and condiments - types, uses & abuses	CO5	K1, F	Interpret the therapeutic role of any one spice or condiment	K5, S3
35.	Coffee, tea & cocoa beans- types and composition	CO5	K1, F	Compare the different brands of coffee, tea and cocoa beans in the market	K5, S2

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Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating
Knowledge Dimension: F - Factual C - Conceptual P - Procedural MC - Meta Cognitive
Psychomotor Domain: S1-Imitation S2-Manipulation S3-Precision S4-Articulation S5-Naturalization

1	Journal of Food Science and Technology, AFSTI Publication
2	Annals. Food Science and Technology, Valahia University Press
3	Food Science and Human Wellness, Beijing Academy of Food Sciences
4	Journal of Food, Agriculture and Environment, WFL Publisher Ltd.
5	Natural Products and Bioprospecting, Springer
6	Indian Journal of Dairy Science, Indian Dairy Association

Course Name	Food Processing Technology	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCT02	Academic Year Introduced	2022 - 23
Type of Course	Theory	Semester	I

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Adapt suitable techniques/methods for processing of cereals, millets and pulses/legumes and product development
CO2:	Infer the technical aspects of milk and egg processing and production of milk and egg products
CO3:	Select appropriate techniques for processing of fleshy foods and oil seeds and its product development
CO4:	Define suitable processing and preservation methods for fruits and vegetables and plantation products
CO5:	Define the appropriate technique for manufacturing of sugar, starch isolate, modified starch and spices

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	1	3	-	2	3	3	1	1	1
CO2	2	3	3	3	3	1	2	3	3	3	3	2
CO3	2	3	3	3	3	1	2	3	3	3	3	2
CO4	2	3	3	3	3	1	2	3	3	3	3	2
CO5	3	2	2	3	3	-	1	3	3	1	2	2

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As = T
Cereals, Millets and Pulses/legumes	To interpret the various steps and techniques involved in milling and processing of cereals, millets and pulses/legumes	7+6+1=14
Milk and Egg	To familiarize with different technologies applied in manufacturing of egg and dairy products	7+5+1=13
Fleshy Foods and Oilseeds	To illustrate the concepts involved in the processing of fleshy foods and oil seeds	8+5+1=14
Fruits, Vegetables and Plantation Products	To learn and adapt the various processing and preservation techniques of fruits and vegetables as well as processing of plantation products such as coffee, tea leaves and cocoa beans	7+6+1=14
Sugar, Starch and Spices	To impart the knowledge of raw sugar manufacturing, isolation and modification of starch and processing of spices	8+5+4=17
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Unit/Chapters	Intended Learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activities	Psychomotor domain level
UNIT I: Cereals, Millets and Pulses/legumes					
1.	Cereal Processing: Rice - preprocessing, parboiling, milling, by products of rice milling	CO1	K2, P	Visit to a modern and traditional rice milling unit, evaluate the process and report it	K5, S2
2.	Wheat- preprocessing, milling, by products of wheat milling; malting of cereals	CO1	K2, P	Picturize the byproducts of wheat milling in the local market	K3, S3
3.	Manufacture of breakfast cereals, extruded products, puffed and flaked cereals	CO1	K2, P	Video capture the manufacturing of puffed or flaked cereal	K3, S3
4.	Processing of millets - cleaning, decortication, milling and fractions	CO1	K2, P	Explore the different types of millets of Indian origin	K4, S5
5.	Pulse/legume processing– cleaning, decortication, splitting, grading, milling and germination	CO1	K2, P	Schematize the ways to enrich the nutrients in pulses/legumes and ways to reduce the anti-nutritional factors at home level and industrial level	K5, S2
UNIT –II: Milk and Egg					
6.	Milk Processing – preprocessing, separation, standardization, pasteurization, homogenization, sterilization, evaporation, drying, condensation, membrane fractionation	CO2	K2, P	Sketch the processing protocol in milk collection centre and milk processing industry	K4, S1
7.	Milk products-butter, ghee, cream, paneer, yoghurt and cheese	CO2	K2, P	Identify the most familiar brand of each milk product and compare with other brands	K5, S2
8.	Egg processing – preservation of egg by different methods, egg powder processing –	CO2	K2, P	Extrapolate the GMP for the manufacture of egg powder	K3, S1

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating
Knowledge Dimension: F - Factual C - Conceptual P - Procedural MC - Meta Cognitive
Psychomotor Domain: S1-Imitation S2-Manipulation S3-Precision S4-Articulation S5-Naturalization

	spray drying and foam mat drying				
UNIT - III: Fleshy Foods and Oilseeds					
9.	Meat – preprocessing, canning, dehydro freezing, drying, processed meat products – hamburgers, sausages and meat balls	CO3	K2, P	Collect the photographs of the processed meat products in the market	K4, S1
10.	Poultry - chemical treatments, microwave heating, IR heating, freeze drying and irradiation	CO3	K2, P	Identify the best video lesson on processing of poultry	K4, S1
11.	Fish - chilling, freezing, canning, smoking, salting and fish oil extraction	CO3	K2, P	Identify the best video lesson on fish oil capsule preparation	K4, S1
12.	Fats and Oils - Oil Seeds Processing– preprocessing, milling, extraction of oil and it's processing, production of meal concentrates and isolates	CO3	K2, P	Display different types of oils and define its characteristics	K5, S1
13.	Specialty fats from non-traditional oilseeds, modification of fat, fat substitutes and replacers and fat mimetics	CO3	K1, C	Identify the fat mimetics, replacers and other non-conventional fat sources in the market	K4, S1
UNIT – IV: Fruits, Vegetables and Plantation Products					
14.	Fruits and vegetables processing– preprocessing, drying and dehydration, juice extraction, concentrate preparation, minimal processing and hurdle technology, meat analogues and textured vegetable protein	CO4	K2, P	Exhibit the processed products of fruits and vegetables	K3, S2
15.	Production of mushroom and its processed products	CO4	K2, P	Visit and report on mushroom production unit	K5, S4
16.	Plantation products processing- processing of coffee, tea leaves and cocoa beans	CO4	K2, P	Document on coffee, tea and cocoa based beverages with preparation	K6, S4
UNIT V: Sugar, Starch and Spices					
17.	Sugar – manufacturing of sugar from sugarcane and palm, sugar cubes and powdered sugar	CO5	K2, P	Prepare a scrapbook on natural sweeteners	K5, S4
18.	Starch – starch isolation, modification of starch	CO5	K2, C	Develop an SOP on isolation of starch	K6, S2
19.	Manufacturing of food Hydrocolloids – CMC and gaur gum	CO5	K1, C	Exemplify the industrial application of hydrocolloids	K5, S1
20.	Spices technology – decortication, splitting, extraction of essentialoils and colors and masala products	CO5	K2, P	Design a pamphlet describing the health benefits of spices	K6, S3

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2	Innovative Food Science and Emerging Technologies, Elsevier
3	Journal of Food Science and Technology, Springer Nature
4	Journal of Food Process Engineering, Blackwell Publishing Inc.

Course Name	Research Methodology	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCT03	**Academic Year Introduced**	2022 - 23
Type of Course	Theory	**Semester**	I

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Conceptualize the steps in research
CO2:	Identify a new research problem, define objectives and frame hypothesis
CO3:	Formulate a research framework for the food science and nutrition research
CO4:	Adapt and validate various tools and techniques in sampling and collection of data
CO5:	Plan and justify the method of presentation of collected data in a research report

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	3	3	2	3	3	-	3	1	2
CO2	2	-	-	3	1	-	-	3	2	2	2	3
CO3	3	-	-	2	2	-	-	3	3	3	3	3
CO4	-	3	-	3	3	-	2	3	3	3	2	2
CO5	3	-	2	2	2	3	1	3	1	2	1	3

1- Slight, 2- Moderate, 3-Substantial

COURSE OBJECTIVES

Unit/Module	Objectives	Hours of Instruction TL+Ac+As = T
Research Process	To illustrate the types of research and steps in research process	5+4+1=10
Conceptualizing the Research Problem	To define research problem from research ideas	8+4+1=13
Research Design	To categorize and discriminate research designs in food science and nutrition research	10+4+1=15
Research Methods and Data Collection	To learn and compare various methods of sampling, collection and valid measurement of data	11+5+1=17
Processing of Data and writing a research report	To infer and experiment the processing and representation of data in a research report	8+5+4=17
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN:

S. No.	Intended Learning Chapters	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activities	Psychomotor domain level
UNIT 1: Research Process					
1.	Meaning of research	CO1	K1, C	Collect the various definitions of research	K3, S1
2.	Purpose of research	CO1	K2, C	Differentiate research, invention and innovation	K4, S3
3.	Types of research – Application Research; Objective Research; Mode of Enquiry Perspective based Research	CO1	K1, C	Ideate research questions in the field of food science, technology and nutrition on each type of research	K6, S2
4.	Steps in research process	CO1	K1, C	Prepare a story board on eight steps of research	K4, S3
Unit II: Conceptualizing the Research Problem					
5.	Identification and formulation of research problem	CO2	K2, C	List the problems in the field of food science, technology and nutrition to be solved	K6, S3
6.	Reviewing the literature and research gap analysis	CO2	K2, F	Schematize the systematic literature review for a research title with the list of key words used for search	K6, S3
7.	Conceptualization of research – from ideas to action	CO2	K2, MC	Learn on design thinking model for idea generation	K2, S4
8.	Research objectives	CO2	K2, C	Frame an objective for a research problem	K6, S1
9.	Identifying variables and constructing the hypothesis	CO2	K2, C	Formulate a null hypothesis for a research objective	K6, S5
UNIT III: Research Design					
10.	Qualitative Research Designs – key features, uses and limitations	CO3	K1, C	Collect a research article for each qualitative research design	K5, S4
11.	Types of Qualitative Research Design – case studies, ethnographic research, narrative research, action research	CO3	K1, F	Appraise the type of research design suitable for a research problem	K4, S4

12.	Quantitative Research Designs – key features, uses and limitations	CO3	K1, C	Collect a research article for each quantitative research design	K5, S4
13.	Types of Quantitative Research Design - Experimental and non-experimental research design	CO3	K1, C	Differentiate the experimental and non-experimental research	K4, S1
14.	Mixed research design – key features, uses and limitations	CO3	K2, C	Propose the research design for a given research problem using mixed research design	K6, S5
15.	Cross sectional and longitudinal studies	CO3	K1, F	Compare the features of cross sectional and longitudinal study	K4, S1
16.	Epidemiological methods	CO3	K1, F	Audit the advancement in studying nutrition epidemiology	K4, S3
UNIT IV: Research Methods and Data Collection					
17.	Research methods in food science and technology research– Good Laboratory Practices	CO4	K1, P	Demonstrate GLP among the peer learners	K4, S4
18.	Standard Operating Procedures (SOP) for laboratory experiments	CO4	K2, P	Collect SOP templates and create a feasible template	K6, S5
19.	NABL accredited laboratory	CO4	K2, F	Visit an NABL Accredited Laboratory and report it	K5, S5
20.	Research methods in Nutrition – Good Clinical Practice, Methods of collecting the data in qualitative and quantitative research	CO4	K1, C	• Frame a questionnaire for a nutrition survey using google form and validate it • Exemplify the GCP in nutrition counselling centre	K6, S3
21.	Primary and secondary data, measurement scales, construction of the research tools	CO4	K2, C	Conduct a pilot survey for pre-testing of questionnaire in the class room	K5, S5
22.	Reliability and validation of research tools, pilot testing	CO4	K2, C	Validate the pretested questionnaire using a discussion forum	K5, S3
23.	Sampling design – principles of sampling, sampling terminology	CO4	K2, C	Identify the sampling method for a research problem	K3, S2
24.	Types of sampling and calculating the sample size	CO4	K2, C	Calculate the sample size for a nutrition survey	K4, S3
25.	Ethical issues in data collection	CO4	K2, F	Frame the informed consent form and validate it	K5, S1
UNIT V: Processing of Data and Writing a Research Report					
26.	Editing and coding the data	CO5	K1, C	Code a Nutrition data of your choice	K4, S3
27.	Organization of data- Classification, meaning and objectives, types of classification	CO5	K1, C	Classify the given data using cross tabulation	K4, S1
28.	Tabulation – parts of a table, general rules of tabulation, types of tables	CO5	K1, C	Represent a research findings in a tabular format	K3, S3
29.	Representation of data – Diagrammatic and graphical representation, Significance of diagrams and graphs, General rules for constructing diagrams, types of diagrams and graphs	CO5	K1, C	Represent the a nutrition data using different forms of graphs	K3, S1
30.	Scientific writing – research article, review article, monographs, dissertation/thesis and reports, different referencing system and writing the bibliography	CO5	K2, C	Analyze the reference and bibliography in a research article using mendeley	K4, S3

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1.	Kothari, C.R., (2004), Research Methodology, Methods and Techniques, Second Revised Edition, New Age International Publishers, New Delhi.
2.	Ranjit Kumar, (2011), Research Methodology: a step-by-step Guide for Beginners, Third Edition, SAGE Publications, New Delhi.
3.	Beverley Moriarty, (2018), Research Skills for Teachers – From Research Question to Research Design, Allen & Unwin Publishers, Australia.
Reference Books	
1.	Rajendra Kumar, C. (2008), Research Methodology, APH Publishing Corporation, New Delhi
2.	Pagadala Suganda Devi (2017), Research Methodology: A Handbook for Beginners, Notion Press, Chennai
3.	Vijayalakshmi Ponnuraj and Sivaprakasam, C. (2008), Research Methods: Tips and Techniques, MJP Publishers
4.	Anantarayanan Raman and Jayashree Nimmagadda, (2006), A Handbook of Research Process, Macmillan Publishers.
5.	Gina Wisker, (2008), Post Graduate Research Handbook, Second Edition, Palgrave Macmillan, New York
Journals and Documents	
1.	International Journal of Social Research Methodology, Taylor and Francis
2.	International Journal of Science and Research Methodology, Human Journals
3.	Journal of Food, Agriculture and Environment, WFL Publisher Ltd.
4.	Journal of Innovation and Entrepreneurship, Springer
5.	The Journal of Global Entrepreneurship Research, Springer

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating
Knowledge Dimension : F - Factual C - Conceptual P - Procedural MC - Meta Cognitive
Psychomotor Domain : S1-Imitation S2-Manipulation S3-Precision S4-Articulation S5-Naturalization

Core Courses - Practical

Course Name	Food Science and Chemistry Practical	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCP01	**Academic Year Introduced**	2022 - 23
Type of Course	Practical	**Semester**	I

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	Determine the colloidal nature and chemical content of food items
CO2	Justify the reason for changes in chemical nature of food during cooking in different conditions
CO3	Interpret the reason for changes in structure and components of food on application of heat, acid, alkali, enzymes or any cooking additives

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	1	3	3	2	3	1	3	3	3	2	3	3
CO2	1	3	3	3	3	1	3	3	3	2	3	3
CO3	1	3	3	3	3	1	3	3	3	2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	**Objectives**	**Hours of Instruction TL+Ac+As = T**
Colloidal Properties	To understand colloidal nature of different food items	1+8+0 = 9
Carbohydrates	To gain knowledge on microscopic structure, gelatinization, retrogradation and pasting properties of flour/starches	1+8+3 = 12
Protein	To study the nature of protein in cereals, milk and meat; effect of tenderizers on meat protein	1+8+0 = 9
Fat	To apprehend the smoking point, iodine number and saponification number of various used and unused oils	1+5+3 = 9
Fiber	To perceive the content of soluble fiber (pectin) in different fruits	0.5+2.5+0 = 3
Food Pigments	To realize the effect of cooking on loss of pigments in fruits and vegetables and to conserve it	0.5+2.5+0 = 3
Phytochemicals and Enzymes	To seize the enzymes responsible for browning of fruits and vegetables	0.5+2.5+6 = 9
Total Hours of Instruction		54 (18x3)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Module No.	**Intended Learning Chapters**	**CO(s) Mapped**	**Cognitive Level / KD**	**Psychomotor domain activities**	**Psychomotor domain level**
Module I: Colloidal Properties					
1.	Least gelation concentration of flour	CO2	K4, P	Compare the least gelation concentration of any two flour	K5, S4
2.	Emulsification capacity of a natural emulsifier	CO1	K4, P	Define the concentration of a natural emulsifier to be added to food preparations	K5, S3
3.	Foaming capacity and foaming stability of egg white foam	CO1	K4, P	Measure the foaming capacity and stability of the different variant egg white	K5, S3
Module II: Carbohydrates					
4.	Microscopic examination of flour / starches	CO1	K4, P	Compare the microscopic structure of different starches	K5, S1
5.	Gelatinization and retrogradation properties of cereal / pulse flour *(Demonstration)*	CO2	K4, P	Demonstrate the gelatinization and retrogradation properties of the given sample using DSC	K3, S1
6	Pasting properties of cereal / pulse flour *(Demonstration)*	CO2	K4, P	Demonstrate and interpret the pasting properties of the flour using RVA	K3, S1
Module III: Protein					
7.	Gluten content in wheat flour	CO1	K4, P	Examine the variation in wet and dry gluten content in the different wheat flour variant	K5, S3
8.	Relative density and casein content in milk	CO1, CO2	K4, P	Justify the variation in relative density and casein content of milk before and after cooking	K5, S3
9.	Effect of tenderization of meat	CO3	K3, P	Identify the best tenderizer for meat	K5, S3
Module IV: Fat					
10.	Smoking point of oil *(Technical Knowledge)*	CO1	K4, P	Justify the reason for changes in smoking	K5, S4

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating
Knowledge Dimension: F - Factual C - Conceptual P - Procedural MC - Meta Cognitive
Psychomotor Domain: S1-Imitation S2-Manipulation S3-Precision S4-Articulation S5-Naturalization

				point of different oil and used oils	
11.	Iodine number of oil *(Technical Knowledge)*	CO1	K4, P	Compare the iodine number of different oil and used oils	K5, S4
12.	Saponification number of oil *(Technical Knowledge)*	CO1	K4, P	Compare the saponification number of different oil and used oils	K5, S4
Module VI: Fiber					
13.	Pectin content in fruits	CO1	K4, P	Test and Identify the fruits rich in pectin content	K6, S3
Module VII: Food Pigments					
14.	Effect of cooking and preprocessing on pigments in fruits and vegetables	CO2, CO3	K4, P	Define the best method of cooking and preprocessing to preserve pigments in fruits and vegetables	K6, S4
Module VIII: Phytochemicals and Enzymes					
15.	Enzymatic browning reaction in fruits and vegetables	CO3	K4, P	Define the best method to prevent browning in selected fruits and vegetables	K6, S3

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TEXTBOOKS	
1	Mohini Sethi and Eram S. Rao (2005), Food Science Experiments and Applications, CBS Publishers & Distributors, New Delhi.
2	Weaver, C. (1996), The Food Chemistry Laboratory: a Manual for Experimental Foods, Dietetics and Food Scientists. CRC Press, LLC.
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REFERENCE BOOKS	
1	Pomeranz, Y.(Ed), (1991), Functional Properties of Food Components, (2nd Edition), Academic press, New Delhi.
2	Bowers, J. (1992), Food Theory and Applications, (2nd Edition), Macmillan Publishing Co., New Delhi.
3	Wrolstad, R.E. (2012), Food Carbohydrate Chemistry**.** John Wiley & Sons, Inc., and Institute of Food Technologists.
4	American Association of Cereal Chemists (AACC), (2000), Approved Methods of the AACC Method 22-08.10th ed. St. Paul, MN.
5	Potter, N.N. and Hotchikiss, J.H. (2006), Food Sciences, Fifth edition, CBS publishers and Distributors, New Delhi.
6	Ranganna, S. (1986), Handbook of Analysis and Quality Control for Fruit and Vegetable Products, 2nd edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
JOURNALS AND DOCUMENTS	
1	Journal of Food Measurement and Characterisation, Springer Nature
2	Food Chemistry, Function and Analysis, Royal Society of Chemistry
3	Food Analytical Methods, Springer Nature

Course Name	Data Management and Statistics Practical	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCP02	Academic Year Introduced	2022 - 23
Type of Course	Practical	Semester	I

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	Manage the processing of collected data
CO2	Analyse the coded data statistically and interpret the results
CO3	Define the statistical quality control measures to be followed in food industries

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	1	3	3	2	3	1	3	3	3	2	3	3
CO2	1	3	3	3	3	1	3	3	3	2	3	3
CO3	1	3	3	3	3	1	3	3	3	2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As = T
Processing of data	To understand and apply the guidelines to edit, code, tabulate and organize the collected data	2+7+0 = 9
Descriptive Statistics	To perceive and practice the application of descriptive statistics in analyzing the data	1+2+3 = 6
Sampling distribution	To study the nature of distribution of collected data and testing of hypothesis	2+7+0 = 9
Correlation and Regression	To apprehend the role of correlation and regression in predicting the nature of collected data	1+5+6 = 12
Statistical Quality Control	To realize the need for statistical quality control in food processing industries/food service operations	2+12+6 = 18
Total Hours of Instruction		54 (18x3)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Module /Experiment No.	Intended learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activities	Psychomotor domain level
Module I: Processing of Data					
1.	Types and kinds of data, manual calculations, use of formulas and function wizard in calculations	CO1	K4, P	Create the nutrition datasheet indicating different types and kinds of data	K6, S4
				Exhibit the application of manual calculation, formulas and function wizard in Microsoft Excel	K3, S3
2.	Protecting the data, creating tables and charts	CO1	K4, P	Create different types of tables and charts using edited and coded data	K5, S3
3.	Creating pivot tables	CO1	K4, P	Create a pivot table for a nutrient database	K5, S3
4.	Use of commands like macro, database, goal seek and data analysis	CO1	K4, P	Calculate nutrient content of a product using commands like macro, database and goal seek	K4, S3
				Calculate the average and standard deviation using the food industry oriented and nutrition data	K4, S3
Module II: Descriptive Statistics					
5.	Measures of Central Tendency	CO2	K4, P	Calculate and interpret the results on mean, median and mode using Excel/SPSS	K5, S1
6.	Measures of Dispersion	CO2	K4, P	Calculate and interpret the results on mean deviation and standard deviation using Excel/SPSS	K5, S1
Module III: Sampling Distribution					
7.	Standard Error	CO2	K4, P	Calculate the standard error for the given data and interpret the results based on framed hypothesis using Excel/SPSS	K5, S3
8.	't' distribution	CO2	K4, P	Exhibit the application of suitable t test to test the framed hypothesis using Excel/SPSS	K5, S3
9.	Chi-square distribution	CO2	K4, P	Apply chi-square test and interpret the results on tested hypothesis using Excel/SPSS	K5, S3
10.	F- distribution	CO2	K4, P	Exhibit the application of suitable ANOVA test to test the framed hypothesis using Excel/SPSS	K5, S3
Module IV: Correlation and Regression					

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating
Knowledge Dimension: F - Factual C - Conceptual P - Procedural MC - Meta Cognitive
Psychomotor Domain: S1-Imitation S2-Manipulation S3-Precision S4-Articulation S5-Naturalization

11.	Types of correlation and its application	CO2	K4, P	Define the nature of correlation exist in the given data using Excel/SPSS	K4, S4
12.	Types of regression and its application	CO2	K4, P	Predict the value using regression equation of X on Y or Y on X	K5, S4
Module V: Statistical Quality Control ***(3 Day workshop certificate is mandatory)***					
13.	Forecasting models	CO3	K4, P	Demand/Sales forecasting of a product in a food industry and a restaurant	K6, S3
14.	Time series analysis	CO3	K4, P	Time series analysis for supply chain planning in Restaurants/Canteens	K4, S4
15.	Automation	CO3	K4, P	Visit a food industry/restaurant which is automated for production process and report on it	K3, S4
16.	Sampling plan	CO3	K4, P	Apply the suitable sampling plan to select the sample for testing the quality of raw material, intermittent products and finished products in a food industry/restaurant/canteen	K3, S3

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TEXTBOOKS	
1	Gupta, S.P. (2014), Statistical Methods, Sultan Chand & Sons, 43rd Edition.
2	Shukla, S.M. and Sahai, S.P. (2017), Statistical Methods, Sahitya Bhawan Publications.
3	Douglas C.Montgomery (2009), Introduction to Statistical Quality Control, Sixth Edition, John Wiley & Sons, Inc.
4	www.egyankosh.ac.in, IGNOU Chapters on Statistics.
5	Paul Singh R., (1996), Computer Application in Food Technology, Elsevier Science and Technology Books.
REFERENCE BOOKS	
1	Gupta A. (2009), Statistical Data Management. In: LIU L., ÖZSU M.T. (eds) Encyclopedia of Database Systems. Springer, Boston, MA. https://doi.org/10.1007/978-0-387-39940-9_1290
2	Md Ramim Tanver Rahman, Yuxia Tang, Qiangwei Wang and Nabil Qaid M. Al-Hajj, (2014), Short Review: Statistics and Different Departments of Food Industry, International Journal of Biological and Chemical Sciences, Vol.1(3): 41-47.
3	https://www.researchgate.net/publication/285219852_Demand_forecasting_for_production_planning_in_a_food_company
4	https://www.7shifts.com/blog/restaurant-forecasting-guide/
5	https://ieeexplore.ieee.org/document/9276872
JOURNALS AND DOCUMENTS	
1	Journal of Data, Information and Management, Springer
2	Statistics and Computing, Springer

Core Courses – Research and Innovation

Course Name	Food Product Development and Quality Evaluation	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCR01	**Academic Year Introduced**	2022 - 23
Type of Course	Part 1 Research	**Semester**	I

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	develop a concept for new food product using design thinking process
CO2	design a new food product with the application of systematic experimental research designs
CO3	standardise and generate the process flow chart for a new food product
CO4	evaluate the nutritional and sensory quality of a newly developed food product

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO 4
CO1	2	-	-	3	3	3	3	3	2	3	2	1
CO2	1	-	-	3	3	3	3	3	2	3	2	1
CO3	2	-	-	3	3	3	3	3	2	3	2	1
CO4	2	-	-	3	3	3	3	3	2	3	2	1

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Learning and CIA F+I+PR = T
Concept Development	To learn the design thinking process to develop a concept for new food product	1+8+0 = 9
Design a New Food Product	To perceive the market need and design a new food product by applying systematic experimental design	1+11+3 = 15
Process Flow Determination	To standardize and mind map the process flow for the production of newly developed food product	4+8+0 = 12
Quality Evaluation	To evaluate the nutritional and sensory quality of the newly developed food product	1+8+3 = 12
Scientific Writing	To become competent in manuscript preparation with relevant data analysis and presentation	1+5+0 = 6
Total Hours of Instruction		54 (18x3)

F – Facilitation, I – Innovation, PR – Progress Review, T – Total, CIA – Continuous Internal Assessment

COURSE PLAN

Module /Experiment No.	Intended Learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activities	Psychomotor domain level
1.	Concept Development	CO1	K3, P	Identify the market need and develop the new product concept using design thinking process	K5, S4
2.	Design a New Food Product	CO2	K4, P	Design a new food product and define the formula to meet the market need using systematic experimental designs	K6, S3
3.	Process Flow Determination	CO3	K4, P	Create a flow chart for the processing of ingredients and production of newly developed product as per the defined formula	K6, S3
4.	Quality Evaluation	CO4	K3, P	Determine the nutritional quality of new food product with defined formula and level of ingredients (Nutrify India Now App – ICMR NIN)	K4, S3
				Determine the sensory quality of the new food product	K4, S1
6.	Scientific Writing	CO6	K3, P	Preparation of competent manuscript in the designed template for publication	K5, S1

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2	https://core.ac.uk/reader/6909038, New Product Development using Experimental Design; https://nzifst.org.nz/resources/creatingnewfoods/documents/CreatingNewFoodsCh5.pdf; https://www.destechpub.com/wp-content/uploads/2015/01/Methods-for-Developing-New-Food-Products-preview.pdf, accessed on 23.07.2020

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating
Knowledge Dimension: F - Factual C - Conceptual P - Procedural MC - Meta Cognitive
Psychomotor Domain: S1-Imitation S2-Manipulation S3-Precision S4-Articulation S5-Naturalization

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4	Nutrify India Now App (NIN ICMR) installation through google playstore, https://bit.ly/32H5OGK, accessed on 23.07.2020
5	PDST, Sensory Analysis Teacher's Manual, Dublin, 2017; https://www.pdst.ie/sites/default/files/A4%20Sensory%20Analysis%20Manual.pdf
6	https://www.scimagojr.com/journalrank.php?category=1106&area=1100&page=1&total_size=301, accessed on 09.05.2020

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

Qualification Pack

Transforming the skill landscape

Food Regulatory Affairs Manager

QP Code: FIC/Q9002

Version: 1.0

NSQF Level: 6

Food Industry Capacity & Skill Initiative || Shriram Bharatiya Kala kendra, 3rd floor, 1, Copernicus Marg, Mandi House, New Delhi
Delhi 110001

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सत्यमेव जयते
GOVERNMENT OF INDIA
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& ENTREPRENEURSHIP

Qualification Pack

FIC/Q9002: Food Regulatory Affairs Manager

Brief Job Description

A Food Regulatory Affairs Manager is responsible for designing, developing, implementing and changing food regulatory systems in the organisation. S/he acts as a liaison between organisation and government regulatory agencies and authorities to ensure that the products produced and distributed comply with regulatory standards.

Personal Attributes

A Food Regulatory Affairs Manager must have the ability to read, write, communicate, mathematical ability to calculate, organizational & analytical skills, ability to plan, organize and prioritize, concentration, physical stamina, handling pressure, team work, mechanical aptitude and trouble shooting skills, understanding on food safety standards and requirements, personal and professional hygiene.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. FIC/N9011: Design, develop and implement regulatory system
2. FIC/N9012: Manage change in food regulatory system
3. FIC/N9013: Prepare representations to regulatory authorities and for new product registrations

Qualification Pack (QP) Parameters

Sector	Food Processing
Sub-Sector	Fruits and Vegetables, Food Grain Milling, Dairy Products, Meat and Poultry, Fish and Sea Food, Bread and Bakery, Alcoholic Beverages, Aerated Water/Soft Drinks, Soya Food, Packaged Foods
Occupation	Quality Assurance
Country	India
NSQF Level	6
Aligned to NCO/ISCO/ISIC Code	NCO-2004/NIL

Minimum Educational Qualification & Experience	Post Graduate (Food Technology/Food Science (Preferably)) with 5-10 Years of experience Minimum 8 years experience in a food processing unit in a food regulatory role
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	1. Food Safety Standards and Regulations (as per FSSAI)2. Total Quality Management3. Occupational Health & Safety Advisory Services4. Environmental Management System
Minimum Job Entry Age	30 Years
Last Reviewed On	03/08/2021
Next Review Date	31/03/2022
Deactivation Date	31/03/2022
NSQC Approval Date	03/08/2018
Version	1.0
Reference code on NQR	2018/FI/FICSI/02465
NQR Version	1.0

FIC/N9011: Design, develop and implement regulatory system

Description

This OS unit is about designing, developing and implementing regulatory systems in food processing units to ensure product compliance to national and international food regulatory system.

Scope

This unit/task covers the following:

Elements and Performance Criteria

Design and develop regulatory system for the organisation (for food products produced)

To be competent, the user/individual on the job must be able to:

PC1. understand food safety regulations and develop regulatory policies for the organisation with clear definitions to increase consistency, legal security and to provide high level of food safety

PC2. design regulatory system with focus on risk reduction, risk-based priorities, reflect integrated and economically feasible initiatives, and ensure high quality and transparency

PC3. design and develop regulatory system with intuitive approach to food safety such that problem are recognized, understood, dealt, and checked to ensure problem has been dealt efficiently and effectively

PC4. design regulatory system with contingency planning like product traceability and product recall in case of problems, procedures for handling containment, with clear attribution of roles like lines of authority and co-ordination mechanism across food chain (from procuring raw materials, production until product reaching consumers)

PC5. design regulatory system with improved communication on food safety information in marketing materials, product labels etc, providing science based information to clear up the unjustified fear among consumers

PC6. set food safety system involving food producers, processors, distributors, retailers and consumers to recognize their primary responsibility and to share a common goal of ensuring food safety at all stages

PC7. design food regulatory system involving GMP, GHP, and monitoring systems like HACCP

PC8. design regulatory system that improve efficiency and compliance, build consumer confidence in the safety and quality of food products produced, processed, marketed, distributed and sold

PC9. design and develop regulatory system ensuring food and health standards are followed in each stage of production and produce food products that meet national and international regulatory standards and protect the health of consumers

PC10. design regulatory system including provisions for the right of consumers to have access to accurate and sufficient information and make adequate choices

PC11. provide strategic advice and cost effective strategies on regulatory aspects/requirements to senior management and project managing teams throughout the development of a new product

Develop, monitor and audit regulatory system in the organisation (for food products produced)

To be competent, the user/individual on the job must be able to:

PC12. interpret regulatory standards and develop organisation standards meeting national and international food safety regulations like fssai, fda, eu food safety regulations, codex alimentarius etc for products produced, exported and imported, and labels of products packed by the organisation

PC13. develop and review standard operating procedures (sops) and ensure that they are in compliance with current regulatory requirements and provide regulatory support for corporate quality assurance efforts

PC14. develop organisation standards for labels of food products produced and packed, promotional marketing materials, products imported and exported by the organisation to meet national and international food regulatory

PC15. evaluate labels of packed food products to ensure it meets national and international food regulatory standards and provide approval or recommend changes

PC16. evaluate promotional and materials for regulatory impact and provide approval

PC17. provide support for review of essential documents, development and review of consent forms for submission to regulatory authorities for clearance

PC18. initiate and contribute to process improvements which have an impact on regulatory affairs, quality assurance and other departments

PC19. conduct audits on food processing unit for compliance with regulatory, safety and hygiene standards implemented and followed in the organisation

PC20. conduct periodic audits to evaluate haccp plans and their implementation in the organisation and ensure it meets the regulatory standards

PC21. review internal and external audit reports to check the effectiveness of the present regulatory system and recommend necessary changes in the policies and procedures to reduce failures in the future

PC22. identify reason for consumer cases in court related to non-compliance of food products to regulatory standards, collect relevant informations and documents transmitting evidence to produce in court to assist prosecution

PC23. monitor company progress toward fulfillment of regulatory commitments

Provide training on regulatory system (for food products produced)

To be competent, the user/individual on the job must be able to:

PC24. provide training to department managers on organisation policies on food and safety regulations, national and international food laws and regulations, methods and procedures for implementing regulations for procuring raw materials, producing food products, marketing and selling quality products to the consumers

PC25. provide training to all department managers on the importance of foodregulatory standards and need for its compliance, statutory and regulatoryrequirements for the products produced, labels of packed products andpromotional materials, and the consequences for not following theregulatory requirements

PC26. provide training on procedures for collecting evidence in case of problems/consumer complaints/consumer cases in court and handling them with technical and scientific approach

PC27. provide training to all department managers on methods to implement and monitor regulatory system in their area of function, writing reports with relevant information and data to present to local food regulatory authorities for any concerns raised / clarification required, methods to approach and maintain relationship with food regulatory authorities

PC28. provide training on upgradation and changes in the food regulatory system and methods to implement, monitor and achieve them

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. principles and processes of organization
KU2. organisaiton goals and policies
KU3. business processes of the organisation
KU4. food regualtory system related to the process and products produced in the organisation
KU5. policies and proecdures for designing regulatory system for the organisaiton
KU6. training system in the oganisation for implenting food regulatory system
KU7. research and project management techniques
KU8. code of business conduct
KU9. risk and information management
KU10. national and international legal and regulatory systems like FSSAI, FDA, CODEX alimentarius, EU food safety regulations etc, and GMP, GHP, HACCP, OHSAS etc
KU11. policies and procedures to be followed to meet the national and international regulatory requirements like GMP, GHP, HACCP etc
KU12. relevant legal requirements related to the products produced in the organisation
KU13. food microbiology and its standards and regulations for products produced in the organisation
KU14. current and emerging regulatory concerns and expectations on the organisation
KU15. methods to deal with current and emerging social concerns and expectations
KU16. processes for maintaining relevant policies and procedures and methods to ensure sustainability and effectiveness
KU17. methods to meet the consequence due to failure in policies and procedures and methods to review and take corrective action on people and policies
KU18. reporting and reviewing system to understand the effectiveness of the regulatory system implemented

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. note the information communicated
GS2. note the raw materials used for production and the finished products produced
GS3. note the readings of the process parameters and provide necessary information to fill the process chart
GS4. note down observations (if any) related to the process
GS5. write information documents to internal departments/ internal teams
GS6. note down the data for online ERP or as per applicability in the organization

GS7. read and interpret the process required for producing various types of products
GS8. read and interpret and process flowchart for all products produced
GS9. read equipment manuals and process documents to understand the equipments operation and process requirement
GS10. read internal information documents sent by internal teams
GS11. discuss task lists, schedules and activities
GS12. effectively communicate with team members
GS13. question in order to understand the nature of the problem and to clarify queries
GS14. attentively listen and comprehend the information given by the speaker
GS15. communicate clearly on the issues being faced
GS16. analyse critical points in day to day tasks through experience and observation and identify control measures to solve the issue
GS17. handle issues in case the manager is not available (as per the authority matrix defined by the organization)
GS18. plan and organize the work order and jobs received
GS19. organize raw materials and packaging materials required for all products
GS20. plan and prioritize the work based on the instructions received
GS21. plan to utilise time and equipment's effectively
GS22. organize all process/ equipment manuals so as to access information easily
GS23. support the manager in scheduling tasks for helper(s)
GS24. understand customer requirements and their priority and respond as per their needs
GS25. support manager in solving problems by detailing out problems
GS26. discuss the possible solutions with the manager for problem solving
GS27. apply domain information about maintenance processes and technical knowledge about tools and equipment
GS28. use common sense and make judgments on day to day basis
GS29. use reasoning skills to identify and resolve basic problems
GS30. use intuition to detect any potential problems which could arise during operations
GS31. use acquired knowledge of the process for identifying and handling issues

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Design and develop regulatory system for the organisation (for food products produced)	**16.5**	**27.5**	**-**	**-**
PC1. understand food safety regulations and develop regulatory policies for the organisation with clear definitions to increase consistency, legal security and to provide high level of food safety	1.5	2.5	-	-
PC2. design regulatory system with focus on risk reduction, risk-based priorities, reflect integrated and economically feasible initiatives, and ensure high quality and transparency	1.5	2.5	-	-
PC3. design and develop regulatory system with intuitive approach to food safety such that problem are recognized, understood, dealt, and checked to ensure problem has been dealt efficiently and effectively	1.5	2.5	-	-
PC4. design regulatory system with contingency planning like product traceability and product recall in case of problems, procedures for handling containment, with clear attribution of roles like lines of authority and co-ordination mechanism across food chain (from procuring raw materials, production until product reaching consumers)	1.5	2.5	-	-
PC5. design regulatory system with improved communication on food safety information in marketing materials, product labels etc, providing science based information to clear up the unjustified fear among consumers	1.5	2.5	-	-
PC6. set food safety system involving food producers, processors, distributors, retailers and consumers to recognize their primary responsibility and to share a common goal of ensuring food safety at all stages	1.5	2.5	-	-
PC7. design food regulatory system involving GMP, GHP, and monitoring systems like HACCP	1.5	2.5	-	-
PC8. design regulatory system that improve efficiency and compliance, build consumer confidence in the safety and quality of food products produced, processed, marketed, distributed and sold	1.5	2.5	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. design and develop regulatory system ensuring food and health standards are followed in each stage of production and produce food products that meet national and international regulatory standards and protect the health of consumers	1.5	2.5	-	-
PC10. design regulatory system including provisions for the right of consumers to have access to accurate and sufficient information and make adequate choices	1.5	2.5	-	-
PC11. provide strategic advice and cost effective strategies on regulatory aspects/requirements to senior management and project managing teams throughout the development of a new product	1.5	2.5	-	-
Develop, monitor and audit regulatory system in the organisation (for food products produced)	**13.5**	**27.5**	**-**	**-**
PC12. interpret regulatory standards and develop organisation standards meeting national and international food safety regulations like fssai, fda, eu food safety regulations, codex alimentarius etc for products produced, exported and imported, and labels of products packed by the organisation	1.5	2.5	-	-
PC13. develop and review standard operating procedures (sops) and ensure that they are in compliance with current regulatory requirements and provide regulatory support for corporate quality assurance efforts	1.5	2.5	-	-
PC14. develop organisation standards for labels of food products produced and packed, promotional marketing materials, products imported and exported by the organisation to meet national and international food regulatory	1.5	2.5	-	-
PC15. evaluate labels of packed food products to ensure it meets national and international food regulatory standards and provide approval or recommend changes	1	3	-	-
PC16. evaluate promotional and materials for regulatory impact and provide approval	1	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC17. provide support for review of essential documents, development and review of consent forms for submission to regulatory authorities for clearance	1	2	-	-
PC18. initiate and contribute to process improvements which have an impact on regulatory affairs, quality assurance and other departments	1	2	-	-
PC19. conduct audits on food processing unit for compliance with regulatory, safety and hygiene standards implemented and followed in the organisation	1	2	-	-
PC20. conduct periodic audits to evaluate haccp plans and their implementation in the organisation and ensure it meets the regulatory standards	1	2	-	-
PC21. review internal and external audit reports to check the effectiveness of the present regulatory system and recommend necessary changes in the policies and procedures to reduce failures in the future	1	2	-	-
PC22. identify reason for consumer cases in court related to non-compliance of food products to regulatory standards, collect relevant informations and documents transmitting evidence to produce in court to assist prosecution	1	2	-	-
PC23. monitor company progress toward fulfillment of regulatory commitments	1	2	-	-
Provide training on regulatory system (for food products produced)	**5**	**10**	**-**	**-**
PC24. provide training to department managers on organisation policies on food and safety regulations, national and international food laws and regulations, methods and procedures for implementing regulations for procuring raw materials, producing food products, marketing and selling quality products to the consumers	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC25. provide training to all department managers on the importance of foodregulatory standards and need for its compliance, statutory and regulatoryrequirements for the products produced, labels of packed products andpromotional materials, and the consequences for not following theregulatory requirements	1	2	-	-
PC26. provide training on procedures for collecting evidence in case of problems/consumer complaints/consumer cases in court and handling them with technical and scientific approach	1	2	-	-
PC27. provide training to all department managers on methods to implement and monitor regulatory system in their area of function, writing reports with relevant information and data to present to local food regulatory authorities for any concerns raised / clarification required, methods to approach and maintain relationship with food regulatory authorities	1	2	-	-
PC28. provide training on upgradation and changes in the food regulatory system and methods to implement, monitor and achieve them	1	2	-	-
NOS Total	**35**	**65**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	FIC/N9011
NOS Name	Design, develop and implement regulatory system
Sector	Food Processing
Sub-Sector	Fruits and Vegetables, Food Grain Milling, Dairy Products, Meat and Poultry, Fish and Sea Food, Bread and Bakery, Alcoholic Beverages, Aerated Water/Soft Drinks, Soya Food, Packaged Foods
Occupation	Quality Assurance
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	03/08/2021
Next Review Date	31/03/2022
Deactivation Date	31/03/2022
NSQC Clearance Date	03/08/2018

FIC/N9012: Manage change in food regulatory system

Description

This OS unit is about managing change in regulatory system in food processing unit to ensure product compliance to national and international food regulatory system.

Scope

This unit/task covers the following:

- Plan change in regulatory system (for food products produced)
- Lead to implement changes in regulatory system (for food products produced)
- Monitor changes implemented in regulatory system(for food products produced)

Elements and Performance Criteria

Plan change in regulatory system (for food products produced)

To be competent, the user/individual on the job must be able to:

PC1. identify procedures, systems, structures that need to be changed for effective implementation of food regulatory system

PC2. assess gaps in the current policies and procedures and analyze the future requirements

PC3. identify and assess barriers to change in regulatory system, develop strategies and plans to overcome those barriers

PC4. assess risks and benefits associated with the strategies and plans, and develop contingency arrangements

PC5. design new work processes, procedures, systems, structures and roles to achieve planned changes in regulatory system

PC6. ensure plan for change in regulatory system include short-term as well as longer-term deliverables

PC7. develop system for monitoring and assessing regulatory system to assess progress in changes implemented

PC8. develop reporting and communicating system to review the effectiveness of the changes in regulatory system and to obtain feedback

PC9. provide training and support to implement changes planned in regulatory system

Lead to implement changes in regulatory system (for food products produced)

To be competent, the user/individual on the job must be able to:

PC10. communicate reasons, importance and benefits of implementing change in regulatory system, future that can be achieved through implementing and following the change, to management and concerned employees

PC11. make the management and employees welcome change in regulatory system as an opportunity to deliver products of national and international quality

PC12. make the management and employees understand the need and importance for change in regulatory system, result expected out of change and its effect on the organisation

PC13. implement the strategies and plans for change in regulatory system with available resources

PC14. make the managers responsible for implementing change in regulatory system understand their responsibilities and commitment, and use their influence and power over employees to implement change

PC15. set and prioritize objectives for the change in regulatory system, identify and deal with obstacles to change, and support employees through the change process

PC16. communicate progress achieved thorough change in regulatory system to everyone involved, and make them understand and enjoy achievement

Monitor changes implemented in regulatory system(for food products produced)

To be competent, the user/individual on the job must be able to:

PC17. review reports on total quality management system to evaluate effectiveness of changes implemented in regulatory system of the organisation

PC18. organize internal and external audit on total quality management system to evaluate effectiveness of the changes implemented in regulatory system

PC19. monitor changes implemented in regulatory system , document and communicate the outcome of implemented change to the management

PC20. recognize and reward employees and teams for implementing regulatory system and achieving results thorough new policies and procedures

PC21. monitor and ensure changes implemented in regulatory system are effective and meet the requirements of the organisation and regulatory system laid by national and international regulatory bodies

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organisation goals and policies

KU2. organisation vision for future

KU3. food regualtory system related to the process and products produced in the organisation

KU4. critical activies related to food regulatory system of the organisation

KU5. strategy, policies, procedures and standards that need to be changed

KU6. national and international legal and regulatory requirements related to the products produced in the organisation like FSSAI, FDA, CODEX alimentarius, EU food safety regulations etc

KU7. current and emerging political, economic, social, technological,

KU8. current and emerging political, economic, social, technological, environmental and legal developments and their effect on the food regulatory system

KU9. methods to analyze strengths and weaknesses of the system for planning changes

KU10. methods for making and managing change effectively

KU11. analyzing strategy, procedures, policies and structure that need to be changed

KU12. reason for implementing changes, risks and benefits expected out of changes planned and implemented

KU13. methods to assess the benefits and risks associated with strategies and plans

KU14. methods to influence change process in the management

KU15. analyzing employees knowledge, skill and attitude to implement change

KU16. culture of the organization and its implication to change process

KU17. methods and procedures to monitor change

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. note the information communicated

GS2. note the raw materials used for production and the finished products produced

GS3. note the readings of the process parameters and provide necessary information to fill the process chart

GS4. note down observations (if any) related to the process

GS5. write information documents to internal departments/ internal teams

GS6. note down the data for online ERP or as per applicability in the organization

GS7. read and interpret the process required for producing various types of products

GS8. read and interpret and process flowchart for all products produced

GS9. read equipment manuals and process documents to understand the equipments operation and process requirement

GS10. read internal information documents sent by internal teams

GS11. discuss task lists, schedules and activities

GS12. effectively communicate with team members

GS13. question in order to understand the nature of the problem and to clarify queries

GS14. attentively listen and comprehend the information given by the speaker

GS15. communicate clearly on the issues being faced

GS16. analyse critical points in day to day tasks through experience and observation and identify control measures to solve the issue

GS17. handle issues in case the manager is not available (as per the authority matrix defined by the organization)

GS18. plan and organize the work order and jobs received

GS19. organize raw materials and packaging materials required for all products

GS20. plan and prioritize the work based on the instructions received

GS21. plan to utilise time and equipment's effectively

GS22. organize all process/ equipment manuals so as to access information easily

GS23. support the manager in scheduling tasks for helper(s)

GS24. understand customer requirements and their priority and respond as per their needs

GS25. support manager in solving problems by detailing out problems

GS26. discuss the possible solutions with the manager for problem solving

GS27. apply domain information about maintenance processes and technical knowledge about tools and equipment

GS28. use common sense and make judgments on day to day basis

GS29. use reasoning skills to identify and resolve basic problems

GS30. use intuition to detect any potential problems which could arise during operations

GS31. use acquired knowledge of the process for identifying and handling issues

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Plan change in regulatory system (for food products produced)	**12.5**	**30.5**	**-**	**-**
PC1. identify procedures, systems, structures that need to be changed for effective implementation of food regulatory system	1	4	-	-
PC2. assess gaps in the current policies and procedures and analyze the future requirements	1	4	-	-
PC3. identify and assess barriers to change in regulatory system, develop strategies and plans to overcome those barriers	1	4	-	-
PC4. assess risks and benefits associated with the strategies and plans, and develop contingency arrangements	1	4	-	-
PC5. design new work processes, procedures, systems, structures and roles to achieve planned changes in regulatory system	1	4	-	-
PC6. ensure plan for change in regulatory system include short-term as well as longer-term deliverables	1.5	2.5	-	-
PC7. develop system for monitoring and assessing regulatory system to assess progress in changes implemented	2	3	-	-
PC8. develop reporting and communicating system to review the effectiveness of the changes in regulatory system and to obtain feedback	2	3	-	-
PC9. provide training and support to implement changes planned in regulatory system	2	2	-	-
Lead to implement changes in regulatory system (for food products produced)	**13**	**20**	**-**	**-**
PC10. communicate reasons, importance and benefits of implementing change in regulatory system, future that can be achieved through implementing and following the change, to management and concerned employees	2	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. make the management and employees welcome change in regulatory system as an opportunity to deliver products of national and international quality	1.5	2.5	-	-
PC12. make the management and employees understand the need and importance for change in regulatory system, result expected out of change and its effect on the organisation	2	3	-	-
PC13. implement the strategies and plans for change in regulatory system with available resources	2	3	-	-
PC14. make the managers responsible for implementing change in regulatory system understand their responsibilities and commitment, and use their influence and power over employees to implement change	2	3	-	-
PC15. set and prioritize objectives for the change in regulatory system, identify and deal with obstacles to change, and support employees through the change process	2	3	-	-
PC16. communicate progress achieved thorough change in regulatory system to everyone involved, and make them understand and enjoy achievement	1.5	2.5	-	-
Monitor changes implemented in regulatory system(for food products produced)	**9.5**	**14.5**	**-**	**-**
PC17. review reports on total quality management system to evaluate effectiveness of changes implemented in regulatory system of the organisation	2	3	-	-
PC18. organize internal and external audit on total quality management system to evaluate effectiveness of the changes implemented in regulatory system	2	3	-	-
PC19. monitor changes implemented in regulatory system , document and communicate the outcome of implemented change to the management	2	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC20. recognize and reward employees and teams for implementing regulatory system and achieving results thorough new policies and procedures	1.5	2.5	-	-
PC21. monitor and ensure changes implemented in regulatory system are effective and meet the requirements of the organisation and regulatory system laid by national and international regulatory bodies	2	3	-	-
NOS Total	**35**	**65**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	FIC/N9012
NOS Name	Manage change in food regulatory system
Sector	Food Processing
Sub-Sector	Fruits and Vegetables, Food Grain Milling, Dairy Products, Meat and Poultry, Fish and Sea Food, Bread and Bakery, Alcoholic Beverages, Aerated Water/Soft Drinks, Soya Food, Packaged Foods
Occupation	Quality Assurance
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	03/08/2021
Next Review Date	31/03/2022
Deactivation Date	31/03/2022
NSQC Clearance Date	03/08/2018

FIC/N9013: Prepare representations to regulatory authorities and for new product registrations

Description

This OS unit is about preparing representations to regulatory authorities on existing food products and for new product registrations, liaison with food regulatory authorities, industrial and trade associations

Scope

This unit/task covers the following:

Elements and Performance Criteria

Prepare representation documents to regulatory authorities (for food products produced)

To be competent, the user/individual on the job must be able to:

PC1. prepare simple and complex regulatory documents in accordance with applicable FSSAI regulations by collecting, collating and evaluating scientific data that has been well researched on relevant aspects

PC2. review regulatory guidance and requirements pertaining to products produced in the organisation and prepare documents providing thoughtful and accurate comments

PC3. prepare regulatory documents to authorities that translate regulatory requirements into practical, workable plans with timelines for development and implementation

PC4. coordinate with food regulatory authorities to review disputed matters, negotiation and finalization on products and projects, and for comments and formal approvals

PC5. prepare documents that include check lists created and maintained to implement regulatory requirements, technical data, and declarations of conformity

PC6. interface with consultants, research organizations, partners, comanufacturers etc for preparation, review, compilation, finalization and submission of documents for regulatory approvals

PC7. prepare responses to communications and other requests from government food regulatory authorities

PC8. prepare safety reports and documents on raw materials, ingredients, additives, flavours etc used in the products produced and marketed by the organisation, for regulatory submissions and clearance

PC9. identify reasons related to non-compliance of food products to regulatory standards, collect relevant informations and data, prepare technical documents with scientific facts and supporting evidence, and submit to relevant authorities, respond to communications from government authorities, and follow up regularly to revoke product ban

Liaise with regulatory authorities (for food products produced)

To be competent, the user/individual on the job must be able to:

PC10. interact with various regulatory authorities during concept, development and industrialization stages of projects for clarification and approvals

PC11. interact with the notified bodies and competent authorities for developing and reviewing regulatory standards

PC12. coordinate with regulatory authorities for reporting, to comment on proposed regulations, and to represent companys interest in the development of standards and guidelines

PC13. discuss on the differences that exist in the regulations laid down by different governments and their interpretation by the regulatory agencies and ensure that efficient and economical regulatory standards are planned

PC14. identify possible threats or opportunities from upcoming regulations under fssai, consumer affairs, other government food policies and regulations and liaise with industry associations to tackle/manage them effectively

PC15. participate in seminar, workshops, conferences and meetings organised by fssai and other industry association, representing the organisation to maintain, strengthen and expand contacts

PC16. work closely with regulatory and trade associations like cii (confederation of indian industries), ficci (federation of indian chambers of commerce and industries), cifti (confederation of indian food trade and industry), aifpa (all india food processors association), assocham(the associated chambers of commerce of india) etc on national and international regulatory changes and challenges that have impact on food products produced in the organisation and to manage them proactively

New product registrations (forfood products produced)

To be competent, the user/individual on the job must be able to:

PC17. develop and write clear arguments and explanations for new product license

PC18. prepare and present registration documents to regulatory authorities and notified bodies for new product approvals

PC19. present written representation for new products and carry out negotiations with regulatory authorities to obtain necessary approvals for new product production and marketing

PC20. evaluate, prepare and submit new product registration applications and follow through the application during the evaluation phase to achieve favorable outcome

PC21. prepare responses to letter/e-mail communications and other requests from government food regulatory bodies on new product approval

PC22. provide regulatory and product compliance report in the area of advertising and label claims for new products

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. food regualtory system related to the process and products produced in the organisation

KU2. government food regualtory authorities and other regulatory bodies

KU3. national and internation relationship maintenance strategy with food regulatory authorities

KU4. formal procedures for handling legal and food regulatory requirements of the organisation

KU5. Government food regualtory authorities and other regulatory bodies

KU6. policies and procedures to be followed to meet the national and international regulatory requirements like GMP, GHP, HACCP, OHSAS etc

KU7. relevant legal requirements related to the products produced in the organisation

KU8. food microbiology and its standards and regulations for products produced in the organisation

KU9. methods and procedures to prepare regulatory documents

KU10. various government regulatory authorities and other relevant bodies handling food safety regulations

KU11. various trade associations and procedures to obtain membership

KU12. formal procedures to approach and liaise with government regulatory authorities and other relevant bodies

KU13. methods to evaluate and collect types and source of information required for resolving food regulatory issues

KU14. legal communications and methods and procedures to respond to them

KU15. procedures that apply for participating in meetings organized by regulatory authorities and trade associations

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. note the information communicated

GS2. note the raw materials used for production and the finished products produced

GS3. note the readings of the process parameters and provide necessary information to fill the process chart

GS4. note down observations (if any) related to the process

GS5. write information documents to internal departments/ internal teams

GS6. note down the data for online ERP or as per applicability in the organization

GS7. read and interpret the process required for producing various types of products

GS8. read and interpret and process flowchart for all products produced

GS9. read equipment manuals and process documents to understand the equipments operation and process requirement

GS10. read internal information documents sent by internal teams

GS11. discuss task lists, schedules and activities

GS12. effectively communicate with team members

GS13. question in order to understand the nature of the problem and to clarify queries

GS14. attentively listen and comprehend the information given by the speaker

GS15. communicate clearly on the issues being faced

GS16. analyse critical points in day to day tasks through experience and observation and identify control measures to solve the issue

GS17. handle issues in case the manager is not available (as per the authority matrix defined by the organization)

GS18. plan and organize the work order and jobs received

GS19. organize raw materials and packaging materials required for all products

GS20. plan and prioritize the work based on the instructions received

GS21. plan to utilise time and equipment's effectively

GS22. organize all process/ equipment manuals so as to access information easily

GS23. support the manager in scheduling tasks for helper(s)
GS24. understand customer requirements and their priority and respond as per their needs
GS25. support manager in solving problems by detailing out problems
GS26. discuss the possible solutions with the manager for problem solving
GS27. apply domain information about maintenance processes and technical knowledge about tools and equipment
GS28. use common sense and make judgments on day to day basis
GS29. use reasoning skills to identify and resolve basic problems
GS30. use intuition to detect any potential problems which could arise during operations
GS31. use acquired knowledge of the process for identifying and handling issues

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare representation documents to regulatory authorities (for food products produced)	**11.5**	**28.5**	**-**	**-**
PC1. prepare simple and complex regulatory documents in accordance with applicable FSSAI regulations by collecting, collating and evaluating scientific data that has been well researched on relevant aspects	1	4	-	-
PC2. review regulatory guidance and requirements pertaining to products produced in the organisation and prepare documents providing thoughtful and accurate comments	1	4	-	-
PC3. prepare regulatory documents to authorities that translate regulatory requirements into practical, workable plans with timelines for development and implementation	1	4	-	-
PC4. coordinate with food regulatory authorities to review disputed matters, negotiation and finalization on products and projects, and for comments and formal approvals	1	4	-	-
PC5. prepare documents that include check lists created and maintained to implement regulatory requirements, technical data, and declarations of conformity	1.5	2.5	-	-
PC6. interface with consultants, research organizations, partners, comanufacturers etc for preparation, review, compilation, finalization and submission of documents for regulatory approvals	1.5	2.5	-	-
PC7. prepare responses to communications and other requests from government food regulatory authorities	1.5	2.5	-	-
PC8. prepare safety reports and documents on raw materials, ingredients, additives, flavours etc used in the products produced and marketed by the organisation, for regulatory submissions and clearance	1.5	2.5	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. identify reasons related to non-compliance of food products to regulatory standards, collect relevant informations and data, prepare technical documents with scientific facts and supporting evidence, and submit to relevant authorities, respond to communications from government authorities, and follow up regularly to revoke product ban	1.5	2.5	-	-
Liaise with regulatory authorities (for food products produced)	**13**	**20**	**-**	**-**
PC10. interact with various regulatory authorities during concept, development and industrialization stages of projects for clarification and approvals	2	3	-	-
PC11. interact with the notified bodies and competent authorities for developing and reviewing regulatory standards	2	3	-	-
PC12. coordinate with regulatory authorities for reporting, to comment on proposed regulations, and to represent companys interest in the development of standards and guidelines	2	3	-	-
PC13. discuss on the differences that exist in the regulations laid down by different governments and their interpretation by the regulatory agencies and ensure that efficient and economical regulatory standards are planned	2	3	-	-
PC14. identify possible threats or opportunities from upcoming regulations under fssai, consumer affairs, other government food policies and regulations and liaise with industry associations to tackle/manage them effectively	1.5	2.5	-	-
PC15. participate in seminar, workshops, conferences and meetings organised by fssai and other industry association, representing the organisation to maintain, strengthen and expand contacts	1.5	2.5	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC16. work closely with regulatory and trade associations like cii (confederation of indian industries), ficci (federation of indian chambers of commerce and industries), cifti (confederation of indian food trade and industry), aifpa (all india food processors association), assocham(the associated chambers of commerce of india) etc on national and international regulatory changes and challenges that have impact on food products produced in the organisation and to manage them proactively	2	3	-	-
New product registrations (forfood products produced)	**10.5**	**16.5**	**-**	**-**
PC17. develop and write clear arguments and explanations for new product license	2	3	-	-
PC18. prepare and present registration documents to regulatory authorities and notified bodies for new product approvals	2	3	-	-
PC19. present written representation for new products and carry out negotiations with regulatory authorities to obtain necessary approvals for new product production and marketing	2	3	-	-
PC20. evaluate, prepare and submit new product registration applications and follow through the application during the evaluation phase to achieve favorable outcome	1.5	2.5	-	-
PC21. prepare responses to letter/e-mail communications and other requests from government food regulatory bodies on new product approval	1.5	2.5	-	-
PC22. provide regulatory and product compliance report in the area of advertising and label claims for new products	1.5	2.5	-	-
NOS Total	**35**	**65**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	FIC/N9013
NOS Name	Prepare representations to regulatory authorities and for new product registrations
Sector	Food Processing
Sub-Sector	Fruits and Vegetables, Food Grain Milling, Dairy Products, Meat and Poultry, Fish and Sea Food, Bread and Bakery, Alcoholic Beverages, Aerated Water/Soft Drinks, Soya Food, Packaged Foods
Occupation	Quality Assurance
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	03/08/2021
Next Review Date	31/03/2022
Deactivation Date	31/03/2022
NSQC Clearance Date	03/08/2018

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Element/ Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each Element/ PC.

2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.

3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.

4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).

5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.

6. To pass the Qualification Pack assessment, every trainee should score the Recommended Pass % aggregate for the QP.

7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
FIC/N9011.Design, develop and implement regulatory system	35	65	-	-	100	35
FIC/N9012.Manage change in food regulatory system	35	65	-	-	100	35
FIC/N9013.Prepare representations to regulatory authorities and for new product registrations	35	65	-	-	100	30
Total	**105**	**195**	**-**	**-**	**300**	**100**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
CIP	Clean In Place
COP	Clean Out Of Place
ERP	Enterprise Resource Planning
FIFO	First In First Out
FEFO	First Expiry First Out
FSSAI	Food Safety and Standards Authority of India
GMP	Good Manufacturing Practices
GHP	Good Hygiene Practices
HACCP	Hazard Analysis and Critical Control Point

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.

Semester II Syllabus

Course Name	Food Microbiology and Preservation	**Programme Name**	M.Sc. Food Science Technology and Nutrition
Course Code	22FSTNCT04	**Academic Year Introduced**	2022 – 23
Type of Course	Theory	**Semester**	II

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Classify microorganisms and identify its food sources
CO2:	Assess the microbial contamination in food items and perform control measures
CO3:	Execute preservation techniques and identify packaging methods
CO4:	Predict food poisoning by bacterial agents and non-bacterial agents
CO5:	Perform several isolation techniques of microorganisms and identify its morphology

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	2	3	1	1	1	3	3	3	2
CO2	3	1	2	2	3	2	1	2	3	3	2	2
CO3	3	2	3	3	2	1	3	3	3	2	3	3
CO4	3	1	2	2	3	-	-	2	2	1	1	2
CO5	3	1	2	2	3	-	-	2	2	1	1	2

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	**Objectives**	**Hours of Instruction TL+Ac+As=To**
Food microbiology and hazard	To learn morphology of microorganisms in food, growth of microorganisms in food	7+6+1=14
Microbial food contaminationand control (perishable and semi-perishable foods)	To elaborate the reason for spoilage of food items and predict the usage of food safety system in eliminating it	10+5+1=16
Microbial food contaminationand control (non-perishable foods)	To understand the role of processing and preservation in controlling the microbialcontamination	8+6+1=15
Food infection and intoxication	To learn the cause and effect of food infection and food intoxication	6+4+1=11
Isolation and detection of microorganisms in food	To familiarize the techniques in isolation, detection and exposure assessment of microorganisms in food	6+7+3=16
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Unit/ Chapter	**Intended learning Outcomes**	**CO(s) Mapped**	**Cognitive Level/ KD**	**Psychomotor domain activity**	**Psychomotor domain level**
Unit I: Food Microbiology and Hazard					
1.	Introduction, historical developments in food microbiology	CO1	K1, F	Create timeline for historical developments in food microbiology	K6, S2
2.	Classification of microorganisms based on its cellular characteristics: prokaryotes and eukaryotes	CO1	K2, C	Create a chart work depicting the difference between prokaryotes andeukaryotes	K6, S2
3.	Classification of microorganisms based on its nutritional requirements	CO1	K2, C	Pictograph the various kinds of microorganisms	K6, S2
4.	Sources of microorganisms in foods	CO1	K2, F	List the main sources of microorganisms in foods	K4, S1
5.	Microbial growth and its growth curve	CO1	K2, C	Illustrate the growth curve of a bacteria	K4, S3
6.	Factors affecting growth-intrinsic and extrinsic factors	CO1	K1, C	Mindmap the factors affecting the growth of microorganisms	K4, S2
7.	Microbial hazards in food and HACCP system in controlling microbiological hazards	CO1	K2, C	Picturize the microbial hazards in any one group of perishable food	K3, S1
UNIT II: Microbial Food Contamination and Control (Perishable and Semi-Perishable Foods)					
8.	Microbial spoilage of foods, cause of spoilage, classification of foods by ease of spoilage, factors affecting kinds and numbers of microorganisms in food	CO2	K2, C	Classify the microbes responsible for spoilage of foods.	K3, S3
9.	Microbiology of milk and milk products, contamination, spoilage and its control measures	CO2	K2, C	Analyse the control measures according to HACCP plan for any one milk product	K4, S3
10.	Microbiology of meat and meat products,	CO2	K2, C	Videograph the microbiology of fresh meat,	K6, S5

	contamination, spoilage and its control measures			cured meat and smoked meat	
11.	Microbiology of fish and fish products, contamination, spoilage and its control measures	CO2	K2, C	Evaluate the industrial measures to control the spoilage of fish	K5, S1
12.	Microbiology of fruits and vegetables, contamination, spoilage and its control measures	CO2	K2, C	Identify the microbes that are responsible for spoilage in fruits and vegetables and list it	K4, S1
13.	Microbiology of canned foods, kinds of spoilage of canned foods and its control measures	CO2	K2, C	Infograph the types of spoilage in canned foods	K4, S1
14.	Microbiology of poultry and eggs. Contamination, spoilage and its control measures	CO2	K2, C	Demonstrate the microorganisms responsible for poultry and egg	K3, S1
15.	Microbiological criteria of water and their significance	CO2	K2, F	Predict the permissible limits of microbes in water and soil	K3, S3
Unit III: Microbial Food Contamination and Control (Non-perishable Foods)					
16.	Cereal and cereal products - contamination, spoilage and preservation	CO3	K2, C	Enlist the type of spoilage in cereal and cereal products	K3, S4
17.	Contamination, spoilage and preservation of bread	CO3	K2, C	Infograph the mechanism to control the spoilage in bread	K6, S4
18.	Microbiology of sugar and sugar products - contamination, spoilage and preservation	CO3	K2, C	Pictograph the microorganisms responsible for spoilage and prevention of spoilage in sweets	K4, S1
19.	Microbiology of salts and spices - sources of contamination, spoilage and prevention	CO3	K2, C	Predict the microbiology of salts and spices	K3, S1
20.	Microbiology of fats and oils - sources of contamination, spoilage and prevention	CO3	K2, C	Infograph the kinds of microorganism leads to spoilage in spices	K6, S1
Unit IV: Food Infection and Intoxication					
21.	Food microbiology and public health, Indicators of food microbial quality and safety	CO4	K2, C	Summarize the tests adopted for coliform bacteria	K4, S1
22.	Definition of food poisoning and its types	CO4	K2, C	Compare and contrast food infection and food intoxication	K5, S2
23.	Food borne infections – outbreaks, signs and symptoms, diagnosis, prevention and control	CO4	K2, C	Report the incidence of food poisoning caused by bacterial infection	K5, S2
24.	Food borne intoxication – outbreaks, signs and symptoms, diagnosis, prevention and control	CO4	K2, F	Report the incidence of botulism intoxication	K4, S1
Unit V: Isolation and Detection of Microorganisms in Food					
25.	Detection of microorganisms in food (Conventional methods) – Standard plate count, membrane filter technique, Most Probable number method, Direct microscopic count, Electronic counter, dye reduction test	CO5	K2, C	GLP for detection of microorganisms in food	K3, S1
26.	Isolation and identification of food borne pathogens from spoiled food samples (Rapid methods) - ELISA assays, nutrient plates and agar plates and Nucleic acid based methods, biosensor based methods	CO5	K2, C	Schematize the SOP for isolation and identification of any one food borne pathogen	K6, S1

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Course Name	Food Safety and Quality Control	**Programme Name**	M.Sc. Food Science Technology and Nutrition
Course Code	22FSTNCT05	**Academic Year Introduced**	2022 - 23
Type of Course	Theory	**Semester**	II

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	infer the various criteria of food safety and quality
CO2:	choose appropriate quality assurance systems for a particular food business operation
CO3:	create awareness on various food safety initiatives of FSSAI
CO4:	apply the sampling plan, testing norms, method of testing the quality of food and statistical quality control
CO5:	evaluate and infer the sensory quality of food in compliance with BIS and ISO Standards

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1	1	1	1	2	3	1	1	3
CO2	3	2	1	1	1	1	1	2	3	1	2	3
CO3	3	2	2	2	2	1	1	2	3	2	2	3
CO4	3	1	1	1	2	1	1	2	3	2	1	3
CO5	3	2	1	1	1	1	1	2	3	1	2	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
Food Hazard and its Control	To understand and explain the terms related to food safety	7+6+1=14
Food Quality Assurance	To familiarize with different quality assurance systems followed in food industry	7+6+1=14
Food Safety Initiatives	To conquer the various food safety initiatives of FSSAI	8+5+1=14
Sampling and Quality Control	To apprehend on food sampling and quality control	8+5+1=14
Sensory Quality Evaluation	To intellect the mode of sensory analysis of foods	5+8+3=16
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Unit/Chapters	Intended learning Outcomes	CO(s) Mapped	Cognitive Level /KD	Psychomotor domain activity	Psychomotor domain level
UNIT I: Food Hazard and its Control					
1.	Define food hazard, contamination, adulteration, fortification and food allergen	CO1	K1, F	Compile the definitions of food safety terms by various agencies and authors	K3, S1
2.	Hazards in food – types, sources, detection and risk index analysis	CO1	K2, F	Analyse and report the risk index of five foods	K4, S3
3.	Contamination in food – types, contaminants, detection and its prevention	CO1	K2, C	Pictograph the contaminants in food	K6, S4
4.	Adulteration in food – types, adulterants, detection and its prevention	CO1	K2, C	Infograph the adulteration of any one food group	K6, S4
5.	Fortification in food – fortificants, method of fortification, premix, endorsement, fortified staples, FSSAI standards and Regulations - Food Safety and Standards (Fortification of Food) Regulation, 2018, fortificants testing protocol, Food Fortification Resource Centre (FFRC)	CO1	K2, C	Enlist the branded fortified food products in the market	K3, S1
UNIT II: Food Quality Assurance					
6.	FSSAI - functions and responsibilities	CO2	K1, F	Create a short video on Responsibilities of FSSAI using Powtoon, Kinemaster etc.	K6, S1
7.	Food Safety Act, 2006	CO2	K1, C	Prepare the quiz on Act using quizizz or kahoot	K6, S3
8.	List of Food Safety Rules and Regulations of FSSAI	CO2	K1, P	Prepare the flash card reflecting the gist of each rules and regulations of FSSAI	K6, S4
9.	Schedule IV – Food Safety and Hygiene Requirements	CO2	K1, C	Conduct of internal audit for implementation of Schedule IV in canteen or hostel	K5, S1
10.	Food quality assurance vs quality control mechanism	CO2	K1, C	Differentiate the quality assurance and quality control	K3, S1

11.	Food safety management system for quality assurance – GAP, GHP, GMP, GLP, HACCP and ISO 22000/FSSC 22000	CO2	K1, S1	Discuss on FSMS model plan available at FSSAI website and report the learning acquired	K3, S1
UNIT III: Food Safety Initiatives					
12.	Supply side initiatives : Cluster approach - FoSCoS, FoSTaC, Clean street food hub (CSFH), Clean fresh fruits and vegetables market, Blissful hygienic offering to God (BHOG), Eat Right Railway Stations	CO3	K2, C	Identify the implementation status of any one initiative at your place and report it	K4, S1
13.	Supply side initiatives : Hygiene rating - Restaurants and Catering Establishments, Clean and Safe Meat Shops, Clean and Safe Mithai Shops, Food Safety Audit	CO3	K2, C	Conduct hygiene rating audit or food safety audit in any one hotel or restaurant or canteen	K5, S2
14.	Demand side initiatives : Empowering customers – 1. Building Consumer Awareness - Eat Right Campus, Eat Right School, Eat Right Toolkit, 2. Addressing Adulteration - Food Safety on Wheels, Dart Book, Food Safety Magic Box, 3. Consumer Guidance Notes and Myth Busters, 4. Enabling Healthy Choices - Food Fortification, Reduction of Salt, Sugar and Fat, Trans Fat Free India @ 75 by 2022	CO3	K2, C	List your healthy choices and submit self-evaluation report	K3, S1
15.	Sustainability initiatives : 1. Jaivik Bharat - Organic Food Cultivation, 2. Save Food Share Food - Food Waste Management, 3. Safe and Sustainable Packaging in Food and Beverage Sector - Alternative Packaging and Plastic Waste Management, 4. Repurpose Used Cooking Oil (RUCO) - Feedstock for Manufacturing of Biodiesel and Soap	CO3	K2, C	Identify the implementation status of any one initiative at your place and report it	K4, S1
UNIT IV: Sampling and Quality Control					
16.	Food Safety and Standards (Laboratory and Sampling Analysis) Regulation, 2011	CO4	K1, F	Enlist the different methods of sampling	K4, S1
17.	Food Safety and Standards (Recognition and Notification of Laboratories) Regulation, 2018	CO4	K2, F	Visit an NABL accredited laboratory and define the documentation process for NABL Accreditation	K5, S1
18.	Food standards – FSSAI, BIS and ISO	CO4	K1, C	Collect the standards for any two foods in FSSAI, BIS and ISO website and describe the difference	K5, S1
19.	FSSAI Manuals for testing the quality of foods	CO4	K2, C	Infograph the quality control tests for any one food and food product	K5, S1
20.	BIS and ISO Standards for testing the quality of foods	CO4	K2, F	Write an SOP for any one quality control test as per BIS or ISO Standard	K4, S1
21.	Statistical quality control tests adopted in food industries	CO4	K2, F	Exemplify a statistical quality control test adopted by food industries	K4, S5
UNIT V: Sensory Quality Evaluation					
22.	Sensory quality attributes	CO5	K1, F	Identify your taste sensitivity threshold and report it	K4, S1
23.	Sensory panel - screening and selection methods and training for sensory panel	CO5	K2, C	List the requisites to act as a sensory panel in a food business operation	K5, S1
24.	Sensory quality evaluation tests – objective and subjective	CO5	K2, C	Frame a descriptive profile score card for any one food item	K6, S5
25.	BIS and ISO Standards for sensory quality evaluation	CO5	K1, F	Tabulate the standards for sensory evaluation of food	K3, S1
26.	Interpretation of sensory data using graphs and models	CO5	K2, C	Draw a spider plot for describing the sensory quality of a food product	K5, S1

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3	Journal of Food Safety, Wiley Periodicals, LLC
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5	Journal of Food Safety and Hygiene, Tehran University of Medical Sciences (TUMS) Journals Publishing House, Iran
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Course Name	Food Safety and Quality Control Practical	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCP03	Academic Year Introduced	2022-2023
Type of Course	Practical	Semester	II

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	analyse the physicochemical properties of food
CO2	test the microbiological quality of food
CO3	identify the taste sensitivity of an individual and determine the sensory characteristics of food
CO4	detect the adulterant in the food
CO5	identify the type of packaging material and different parts of the food label as per FSSAI regulations

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	1	3	3	3	3	1	3	2	3	2	3	2
CO2	1	3	3	3	3	3	3	2	3	2	3	3
CO3	2	3	3	3	3	2	2	2	3	2	3	3
CO4	2	3	3	3	3	1	2	2	3	2	3	2
CO5	2	3	3	3	3	1	2	2	3	2	3	2
1 – Slight, 2 – Moderate, 3 – Substantial												

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
Physicochemical characteristics of food	To determine the physicochemical characteristics of food using FSSAI/AOAC/IS/ISO methods	2+9+3=14
Food microbiology	To define the microbial quality of food using ISO standards	1+6+3=10
Sensory quality	To test the taste sensitivity of an individual and sensory characteristics of food products using ISO methods	1+9+3=13
Adulteration	To detect the presence of adulterant in the food	1+3+3=7
Packaging and labelling	To identify the type of packaging material and mandatory declaration parts of the label as per FSSAI regulations	1+6+3=10
Total Hours of Instruction		54 (18x3)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Module/Experiment No.	Intended learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
Module I: Physicochemical Characteristics of Food					
1.	Physical dimensions of food	CO1	K3, P	Determine the physical dimensions of one food from each food group and report it	K6, S1
2.	Bulk density, WAC and FAC of grain/flour	CO1	K3, P	Determine the bulk density, WAC and FAC of one grain and one cereal/pulse flour	K4, S2
3.	pH, titrable acidity and total soluble solids of fruit pulp	CO1	K3, P	Determine the pH, titrable acidity and total soluble solids of mango/apple/tomato pulp	K5, S2
Module II: Food Microbiology					
4.	Microbial load	CO2	K3, P	Determine the total microbial count in any food sample	K4, S1
5.	Antimicrobial and Antifungal activity	CO2	K3, P	Determine the antimicrobial and antifungal activity of any one functional food and evaluate its efficiency	K5, S1
Module III: Sensory Quality					
6.	Taste sensitivity	CO3	K3, MC	Differentiate the sensitivity of various tastes with different concentration	K4, S4
7.	Sensory attributes	CO3	K3, MC	Describe the descriptive profile of a food	K5, S4
8.	Sensory acceptability	CO3	K3, MC	Determine the sensory acceptability using hedonic rating scale	K5, S4
Module IV: Adulteration					
9.	Tests for adulterants	CO4	K3, C	Identify the adulterant in the various food and report it	K4, S3
Module V: Packaging and Labelling					
10.	Identification of packaging material	CO5	K1, F	Identify the type of packaging material used for primary, secondary and tertiary packaging	K5, S3
11.	Identification of parts of a food label	CO5	K1, F	Identify the parts of the label in different food packets	K3, S3

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

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2	George D.Sadler and Patricia A.Murphy (2010), pH and Titrable Acidity, Food Analysis (pp. 219-238)
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4	A Food Labeling Guide – Guidance for Industry (2013), Cerntre for Food Safety and Applied Nutrition, Food and Drug Administration
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1	www.fao.org
2	FSSAI Manual of Methods of Analysis of Foods – Fruits and Vegetables (2015)
3	FSSAI Manual on Quick Tests for some Adulterants in Food (2012)
3	https://www.iso.org/home.html
4	Microbial Enumeration Tests, (2019) The International Pharmacopoeia, Ninth Edition
5	Satoh-Kuriwada S, kawai M, Likubo M, Sekine Hayakawa Y, Shoji N, et al. (2014), Development of an Umami Taste Sensitivity Test and Its Clinical Use. PLOS ONE 9(4):e95177

Course Name	Food Composition Analysis	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCP04	Academic Year Introduced	2022 - 23
Type of Course	Practical	Semester	II

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	handle the chemicals, glasswares, equipments and other laboratory items in compliance with GLP and GFLP
CO2	analyse the proximate composition of a food
CO3	determine the prominent vitamin and mineral content of a food
CO4	identify the presence of sugars, aminoacids and phytochemicals in the food
CO5	check the quality of water, nutritional composition of a food and handle HPLC and AAS

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	-	3	-	-	2	3	-	-	-
CO2	1	3	-	-	3	-	-	2	3	-	-	-
CO3	1	3	-	-	3	-	-	2	3	-	-	-
CO4	1	3	-	-	3	-	-	2	3	-	-	-
CO5	1	3	-	-	3	-	-	2	3	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
GLP and GFLP	To know and practice the GLP and GFLP to be adhered by a food analyst	1+3+1=5
Proximate composition	To familiarize with the FSSAI/IS/AOAC procedures for estimation of proximate composition of a food	3+15+3 = 21
Micronutrients composition	To learn the FSSAI/IS/AOAC based analytical techniques for prominent vitamin and mineral in food	1+6+3 = 10
Qualitative profile	To test the presence of sugars, aminoacids and phytochemicals in food extract	1+6+3 = 13
Water and Advanced Analytical Methods	To determine the quality of water, familiarize on nutrical sheet and advanced instruments	1+4+0 = 5
Total Hours of Instruction		54 (18x3)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Module/Experiment No.	Intended learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
Module I: GLP and GFLP					
1.	Good Laboratory Practice of FDA and OECD guidelines	CO1	K2, P	Practice the guidelines during the conduct of experiment	K3, S3
2.	Good Food Laboratory Practice by FSSAI	CO1	K2, P	Analyse the GFLP in food analysis laboratory and report it	K4, S3
Module II: Proximate Composition Analysis					
3.	Total sugar by Lane and Eynon method	CO2	K2, P	Determine the total reducing sugar content in fruit drink	K4, S3
4.	Protein by Kjeldhal method	CO2	K2, P	Determine the protein content of protein rich food	K4, S3
5.	Fat by Soxhlet method	CO2	K2, P	Determine the fat content of any one oilseed	K4, S3
6.	Moisture by hot air oven method and moisture analyser	CO2	K2, P	Determine the moisture content of one perishable and non-perishable food	K4, S3
7.	Ash content by AOAC method	CO2	K2, P	Determine the ash content of mineral rich food	K4, S3
8.	Crude fiber by acid and alkali digestion method	CO2	K2, P	Determine the crude fiber content of any one fiber rich food	K4, S3
Module III: Vitamins and Minerals					
9.	Vitamin C by Redox Titration using Iodine Solution	CO3	K2, P	Determine the vitamin C content of any citrus fruit	K4, S3
10.	Iron by Colorimetric method	CO3	K2, P	Determine the iron content of any one iron rich food	K4, S3
Module IV: Qualitative Profile					
11.	Tests for the presence of sugars	CO4	K2, P	Evaluate the presence of different types of sugar present in the given sugar syrup	K5, S3
12.	Tests for the presence of aminoacids	CO4	K2, P	Evaluate the presence of different types of aminoacids present in the given protein extract	K5, S3

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

13.	Tests for the presence of phytochemicals	CO4	K2, P	Evaluate the presence of different phytochemicals present in the given extract	K5, S3
Module V: Water					
14.	TDS of water	CO5	K2, P	Evaluate the TDS of water obtained from different sources	K5, S3
Demonstration					
15.	Nutrical Sheet based food composition calculation	CO5	K2, P	Demonstrate on food composition calculation for a recipe using nutrical sheet	K4, S3
16.	Analysis of sugar fractions by HPLC	CO5	K2, P	Demonstrate on determination of sugar by HPLC	K4, S3
17.	Analysis of mineral content by AAS	CO5	K2, P	Demonstrate on determination of different mineral elements by AAS	K4, S3

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2	Good Food Laboratory Practice, https://fssai.gov.in/upload/uploadfiles/files/Manual_GFLP_06_09_2018.pdf
3	FSSAI Manual, https://fssai.gov.in/cms/manuals-of-methods-of-analysis-for-various-food-products.php
REFERENCE BOOKS	
1	BIS – IS Standards, https://standardsbis.bsbedge.com/
2	Qualitative tests for carbohydrates and sugars, http://www.chem.boun.edu.tr/wp-content/uploads/2014/04/Chem-415-Experiment-1.pdf
3	Qualitative tests for aminoacids, http://www.chem.boun.edu.tr/wp-content/uploads/2014/04/Chem-415-Experiment-2.pdf
4	Qualitative tests for Phytochemicals - https://www.researchgate.net/publication/339876937
5	Sadasivam, S and Manickam, A (1991), Biochemical methods, New Age International Pvt. Ltd, publishers, New Delhi, 2nd edition.
JOURNALS AND DOCUMENTS	
1	Journal of Food Composition and Analysis, Elsevier
2	Food and Nutritional Components in Focus, Royal Society of Chemistry
3	Journal of Micronutrient Analysis, Elsevier
4	Food Chemistry, Function and Analysis, Royal Society of Chemistry

Course Name	Business Plan and Quality Assurance System for New Food Product	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCR02	**Academic Year Introduced**	2022 - 23
Type of Course	Part 2 Research	**Semester**	II

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	design the innovative business plan for a newly developed food product
CO2	draw unique layout for the industry to manufacture the newly developed food product
CO3	prepare the GMP and GHP guidelines for the unique industry
CO4	develop HACCP plan for the manufacture of a newly developed food product

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO 4
CO1	2	-	-	3	3	3	3	3	2	3	2	1
CO2	1	-	-	3	3	3	3	3	2	3	2	1
CO3	2	-	-	3	3	3	3	3	2	3	2	1
CO4	2	-	-	3	3	3	3	3	2	3	2	1

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
Business Plan	To learn the application of business model canvas for a newly developed food product	1+8+0 = 9
Layout and Design	To perceive and design a layout for a food premise to manufacture newly developed product	1+2+3 = 6
Manufacturing Protocol	To educate on mind mapping the manufacturing protocol for the production of newly developed product	4+8+0 = 12
GMP and GHP	To apprehend the FSSAI guidelines for GMP and GHP and strategies to develop a new GMP and GHP requirements	1+8+3 = 12
HACCP	To acquire skill in HACCP plan development and its implementation	1+8+0 = 9
Scientific Writing	To become competent in manuscript preparation with relevant data analysis and presentation	1+5+0 = 6
Total Hours of Instruction		54 (18x3)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Module /Experiment No.	Intended learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
1.	Business Plan Model Canvas	CO1	K3, P	Create a Resource based business model to manufacture the newly developed product using word template	K6, S4
2.	Layout and Design	CO2	K4, P	Design a layout for an industry which manufacture newly developed product using draw.io software	K6, S3
3.	Manufacturing Protocol	CO3	K4, P	Create a flow chart on operational control with quality assurance and waste management process for the production of newly developed product	K6, S3
4.	GMP and GHP plan	CO4	K3, P	Generate sanitation and prerequisite guidelines for the designed industry with pictorial presentation according to FSSAI guidelines	K4, S3
				Design Infographics and Display Boards for the Industry using draw.io software	K6, S1
5.	HACCP Plan	CO5	K3, P	Develop a HACCP plan for the production of newly developed product	K6, S1
6.	Scientific Writing	CO6	K3, P	Preparation of competent manuscript in the designed template for publication	K5, S1

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2	https://neoschronos.com/download/business-model-canvas/docx/ - word template for creation of Business Model Canvas, Designed by: The Business Model Foundry (www.businessmodelgeneration.com/canvas). Word implementation by: Neos Chronos Limited (https://neoschronos.com). License: CC BY-SA 3.0

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Semester III Syllabus

Course Name	Nutritional Biochemistry	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCT06	**Academic Year Introduced**	2022 - 23
Type of Course	Theory	**Semester**	III

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Empathize the functions and distribution of water in the body and energy balance in the human body
CO2:	Describe the digestion, absorption and metabolism of carbohydrates and dietary fiber
CO3:	Comprehend the types and functions of protein, its digestion, absorption and metabolism
CO4:	Concede the types and functions of fats, its digestion, absorption and metabolism
CO5:	Understand the biochemical functions and interrelationship between vitamins and minerals

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	1	1	1	2	2	3	1	3	3
CO2	3	1	3	2	1	1	2	2	3	2	2	3
CO3	3	1	3	2	2	1	2	2	3	2	2	3
CO4	3	1	3	1	2	1	2	2	3	2	2	3
CO5	3	1	3	2	2	1	2	2	3	2	2	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
Water and Energy	To inculcate knowledge on the functions of water and importance of energy balance	7+5+1=13
Carbohydrates	To elucidate the types, functions and metabolism of carbohydrates and types of dietary fiber	9+5+1=15
Protein	To illustrate the types, functions and metabolism of food proteins and amino acids	10+3+1=14
Fats	To illuminate the learners on the type of fat and fatty acids, metabolism of fat, and energetics in fatty acid cycle	9+4+1=14
Vitamins and minerals	To impart technical know-how on the role of vitamins and minerals in metabolism and the relationship between vitamins and minerals	10+3+3=16
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Unit/ Chapter	Intended Learning Chapters	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activities	Psychomotor domain level
Unit I: Water and Energy					
1.	Body water and its distribution in the body	CO1	K1, F	Create a word wheel depicting the functions of water	K6, S1
2.	Functions of water in the body	CO1	K2, F		
3.	Water balance and its regulation	CO1	K2, C	Infograph the factors affecting water intake and output	K4, S2
4.	Energy value of food and its determination	CO1	K1, F	Prepare and exhibit a pyramid structure for foods with high calorie to low calorie	K5, S1
5.	Components of energy expenditure	CO1	K2, C	Pictorial representation of components of energy expenditure	K3, S2
6.	Energy balance	CO1	K2, C	Prepare energy balance chart for an individual	K6, S3
7.	Energy system in the body	CO1	K2, C	Prepare a scrap book about energy systems in human body	K6, S2
Unit II: Carbohydrates					
8.	Types of carbohydrates	CO2	K1, F	Infograph the types of carbohydrates	K4, S1
9.	Functions of carbohydrates	CO2	K2, F	Generate a peer instruction question on functions of carbohydrates	K6, S2
10.	Digestion and absorption of carbohydrates	CO2	K1, C	Download a best animated video on CHO digestion and present it	K2, S4
11.	Metabolism of carbohydrates	CO2	K1, C	Pictorialize the various pathways and cycles of CHO metabolism	K3, S2
12.	Energetics of carbohydrate metabolism	CO2	K1, C	Compare and present number of ATP molecules produced in different metabolic pathway	K5, S1
13.	Regulation of blood glucose level	CO2	K2, C	Infograph the classification of complex carbohydrates	K4, S1
14.	Classification of complex carbohydrates /	CO2	K1, F		

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

	Dietary fiber				
15.	Role of dietary fiber	CO2	K2, C	Generate peer instruction question on role of dietary fiber	K6, S1
16.	Requirements of dietary fiber	CO2	K1, F	Summarize the requirements of dietary fiber for each age group	K3, S1
17.	Effect of over consumption of fiber	CO2	K2, C	Prepare a word wheel on over consumption of dietary fiber	K6, S2
18.	Resistance starch	CO2	K2, C	Compare different types of RS	K5, S2
Unit III: Protein					
19.	Nutritional classification of proteins	CO3	K1, F	Tabulate the types of proteins	K3, S1
20.	Functions of proteins	CO3	K1, F	Generate the peer instruction question on functions of proteins	K6, S2
21.	Digestion and absorption of proteins	CO3	K2, C	Download a best animated video on protein digestion and present it	K2, S4
22.	Protein metabolism	CO3	K2, C	Pictograph various pathways and cycles of protein metabolism	K3, S2
23.	Nutritional classification of amino acids	CO3	K1, F	Sketch the various classes of amino acids	K4, S1
24.	Biologically active peptides	CO3	K2, C	List the food sources of biologically active peptides	K2, S2
25.	Amino acid balance in the diet	CO3	K2, C	Define the best food combination that reveal amino acid balance	K4, S1
26.	Synthesis of proteins in the human body	CO3	K2, P	Download a best animated video on protein synthesis and present it	K2, S4
27.	Protein requirements	CO3	K1, F	Justify the influence of age on protein need	K5, S1
Unit IV: Fats					
28.	Classification of lipids and fatty acids	CO4	K1, F	Tabulate the types of lipids	K4, S1
29.	Digestion and absorption of fats	CO4	K2, C	Download a video on fats digestion and present it	K2, S4
30.	Functions of lipids	CO4	K1, F	Word wheel about functions of lipids	K3, S4
31.	Lipid metabolism	CO4	K2, C	Poster presentation on metabolism of lipids	K3, S2
32.	Functions of lipoproteins	CO4	K1, F	Prepare Jingles on functions of lipoproteins	K6, S4
33.	Fat requirements	CO4	K1, F	Differentiate visible and invisible fat requirements	K4, S1
34.	Energetics of fatty acid cycle	CO4	K2, C	Summarize the ATP molecules produced/used in each cycle	K5, S2
Unit V: Vitamins and Minerals					
35.	Classification of vitamins, pseudo vitamins and minerals	CO5	K1, F	Pictorial representation on sources of vitamins and minerals	K5, S2
36.	Biochemical functions of vitamins, pseudo vitamins and minerals	CO5	K1, F	Prepare a short video on functions of each vitamin and mineral and present it	K6, S5
37.	Digestion, absorption and metabolism of vitamins, pseudo vitamins and minerals	CO5	K2, C	Poster presentation on metabolism of vitamins and minerals	K3, S1
38.	Interrelationship between vitamins, pseudo vitamins and minerals	CO5	K2, C	Propose a clinical question on interaction of vitamins and minerals using PICO Model	K6, S1

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5	American Journal of Biochemistry and Biotechnology, Science Publications, 15533468
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Course Name	Nutrition In Lifecycle	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCT07	Academic Year Introduced	2022 - 23
Type of Course	Theory	Semester	III

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	plan a balanced diet for normal individuals in different age groups
CO2:	describe the physiological changes in pregnancy and lactation and its influence on nutritional requirements
CO3:	act as a lactation consultant, define the feeding practices for an infant and preschool children
CO4:	assess the food habits and eating problems during school going age and adolescence and to recommend nutritional management
CO5:	appraise the importance of nutrition during adulthood and old age

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	1	3	3	3	3	3	3	3	3	3	3
CO3	3	1	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	3	3	3	3	3	3	3	3
CO5	3	2	3	3	3	3	3	3	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
Concept of Nutrition	To familiarize with the concepts of food groups, balanced diet plan, dietary guidelines and RDA in India	6+3+1=10
Nutrition during pregnancy and Lactation	To provide learning on physiological changes, nutritional needs and requirements during Pregnancy and Lactation	10+6+1=17
Nutrition in infants and Preschool children	To impart knowledge on importance of breastmilk and weaning foods during infancy and food habits in preschool children	9+5+1=15
Nutrition in School age and during Adolescence	To distinguish the nutritional requirements, food habits in different stages of childhood and adolescence	9+5+1=15
Nutrition in Adulthood and Old Adulthood	To recognize the importance of nutrition during adulthood and old age	9+5+1=15
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, To-Total Hours

COURSE PLAN

Unit/Chapters	Intended Learning Chapters	CO(s) Mapped	Cognitive Level/KD	Psychomotor domain activities	Psychomotor domain level
Unit I: Concept of Nutrition					
1.	Food groups	CO1	K1, F	Construct a food pyramid as per ICMR recommendations for each age group	K6, S2
2.	Portion size of Food groups and balanced diet (ICMR)	CO1	K2, C		
3.	Dietary Guidelines for Indians	CO1	K2, C	Timeline the modifications made in dietary guidelines for Indians	K5, S1
4.	RDA-Basic components required to derive RDA, Computation of allowances	CO1	K2, C	Exemplify the computation of allowances for different nutrients for different age group individual	K3, S2
5.	Basis for deriving RDA for energy, protein, fat, fiber, vitamins and minerals	CO1	K2, C	Infograph the basis for computing RDA for energy	K6, S5
6.	Principles and steps in menu planning in compliance with ICMR	CO1	K2, C	Design a weekly balanced menu plate for one meal	K6, S5
Unit II : Nutrition During Pregnancy and Lactation					
Nutrition During Pregnancy					
7.	Preconception nutrition – Underweight, Obesity, Female athlete triad, eating disorders, diabetes, polycystic ovary syndrome on fertility	CO2	K2, C	List the etiological factors for infertility among young adults	K3, S1
8.	Nutritional management and herbal	CO2	K2, F	Case scenario and nutrition based remedies to prevent	K5, S1

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

	remedies for fertility related problems			infertility among young adults	
9.	Stages of gestation	CO2	K1, F	Picturize the stages of gestation	K3, S1
10.	Nutrition, miscarriages and preterm delivery	CO2	K2, C	Picturise the reason for miscarriage and preterm delivery	K4, S1
11.	Maternal physiological adjustments	CO2	K2, F	Notice the physiological adjustments in any one of the pregnant women and specify your observation	K6, S4
12.	Weight gain during pregnancy	CO2	K2, F	Note the changes in weight of the women during pregnancy by using PHC data	K5, S4
13.	Nutritional requirements	CO2	K2, C	Calculate the nutritional requirements for a women in pregnancy	K4, S1
14.	Storage of nutrients	CO2	K2, C	Prepare statements on storage of nutrients	K6, S1
15.	Physiological cost of pregnancy	CO2	K2, C	Calculate the physiological cost for a pregnant women	K3, S5
16.	Health concerns of pregnancy	CO2	K2, C	Prepare a chart on common health issues in pregnancy	K4, S2
17.	Dietary supplements during pregnancy	CO2	K2, F	Collect the details on multivitamin, omega 3 fatty acids, minerals and herbal supplements prescribed during pregnancy	K4, S3
Nutrition During Lactation					
18.	Hormonal control and reflex action	CO2	K1, F	Download a video on reflex action and mechanism of milk secretion during lactation and present it	K3, S1
19.	Physiology of milk production	CO2	K1, F		
20.	Special food during lactation	CO2	K2, C	Collect information on lacto-secretogogues and galactogogues	K2, S1
21.	Nutritional requirements during lactation	CO2	K2, C	Calculate the nutritional requirement for a lactating women	K3, S1
UNIT III: Nutrition in Infants and Preschool Children					
Nutrition in Infants					
22.	Growth and development	CO3	K2, F	Download video on growth and development of male and female baby and interpret it	K3, S4
23.	Weight as the indicator – growth chart	CO3	K2, C	Analyze the growth chart followed by PHC and report on the data	K4, S1
24.	Breast Vs Bottle feeding	CO3	K2, C	Highlight the difference in nutritional composition of breast milk and bottle milk	K5, S1
25.	Breast milk substitutes				
26.	Nutritional requirements in infancy	CO3	K2, C	Calculate the nutritional needs of an infant as a case study	K5, S1
27.	Feeding premature and LBW infants	CO3	K2, C	Frame the daily feeding schedule for an premature and LBW infants	K6, S1
28.	Supplementary feeding	CO3	K2, C	Identify the supplementary foods available in the market	K3, S1
29.	Nutritional Components of colostrum, mature milk and weaning Foods	CO3	K2, C	Identify the weaning foods available in the market	K3, S1
30.	Infantile colic and maternal diet	CO2	K2, F	Review the literature and define the relationship of maternal diet for infantile colic	K5, S3
31.	National guidelines on infant and young child feeding	CO2	K1, P	Review the UNICEF guidelines and prepare a poster on any one chapter of the guideline	K5, S3
Nutrition in Preschool Children					
32.	Growth and development	CO3	K2, F	Download video on growth and development of male and female preschool children and interpret it	K3, S4
33.	Food Habits and feeding problems	CO3	K2, C	Analyze the food habits of a preschool children and record it as a case study	K4, S5
34.	Nutritional Requirements	CO3	K2, C	Calculate the nutritional requirements for a preschool children	K3, S1
35.	Dietary guidelines and physical activity recommendations	CO3	K1, C	Prepare the short educational videos on dietary guidelines and physical activity chart	K4, S3
36.	Supplementary Foods and dietary supplements	CO3	K2, C	Evaluate on supplementary foods in the market suitable for preschool children	K5, S3
UNIT IV: Nutrition in School Age and During Adolescence					
Nutrition in School Age					
37.	Growth and Development of early and middle childhood	CO4	K2, F	Download video on growth and development of male and female school children and interpret it	K3, S4
38.	Food habits and feeding problems	CO4	K2, C	Exhibit the most important food habits followed by school going children	K4, S5
39.	Nutritional needs	CO4	K2, C	Distribute the portions of food groups for a school going children as per their nutritional needs	K3, S3
40.	Packed lunch	CO4	K2, C	Design a packed lunch for a preschool and a school going boy and girl	K6, S5
41.	Dietary guidelines and prevention	CO4	K2, P	Plan a nutrition guideline for prevention of dental	K5, S3

	of common nutrition problems – iron deficiency anemia and dental caries			caries and iron deficiency anemia	
Nutrition in Adolescence					
42.	Physical growth	CO4	K1, F	Download video on growth and development of adolescent boy and girl; interpret it	K3, S4
43.	Pubertal changes	CO4	K1, F	Prepare an Infograph on pubertal changes in an adolescent boy and girl	K6, S5
44.	Nutritional requirements	CO4	K2, C	Calculate the nutritional requirements of an adolescent boy and girl	K3, S1
45.	Eating disorders-Anorexia nervosa and Bulimia nervosa	CO4	K2, C	Differentiate Anorexia Nervosa and Bulimia Nervosa	K4, S1
46.	Adolescent pregnancy and its complications	CO4	K2, C	Differentiate the nutritional needs for an adolescent pregnant girl and an adolescent women	K4, S1
Unit V: Nutrition in Adulthood and Old Adulthood					
Nutrition in Adulthood					
47.	Body composition changes in the adult	CO5	K1, P	Compare the body composition of adolescent, young adult, middle aged adult and late adult	K4, S3
48.	Type of work	CO5	K2, C	Calculate and compare the nutritional requirement for an adult using different methods	K5, S1
49.	Nutritional requirements	CO5	K1, C		
50.	Dietary guidelines and physical activity recommendations	CO5	K2, F	Calculate and compare the energy expenditure pattern for an adult man and woman	K5, S5
Nutrition in Old Adulthood					
51.	Process and theories of ageing	CO5	K1, F	Picturize the process of ageing	K5, S3
52.	Physiological and Psychological changes during old age	CO5	K1, F	Infograph the physiological and psychological changes during old age	K4, S5
53.	Nutritional requirements	CO5	K1, C	Pictograph the nutritional requirements in young, middle and old adulthood	K5, S5
54.	Factors affecting food intake	CO5	K2, C	Develop a video on factors affecting food intake	K6, S1
55.	Common nutritional and cognitive problems in old age	CO5	K1, C	Generate a case study report on age related problem (Parkinson, Alzheimer, eye degeneration, osteoporosis etc.) and analyze it	K6, S1
56.	Dietary guidelines and physical activity recommendations	CO5	K2, F	Prepare exercise guideline for older adult man and woman	K6, S1

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4	European Journal of Clinical nutrition, Nature Publishing Group, 9543007.
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6	Journal of Maternal and Child Nutrition, Blackwell Publishing Inc.
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Course Name	Public Health Nutrition	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCT08	Academic Year	2022 - 2023
Type of Course	Theory	Semester	III

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	Understand public health nutrition and its emerging trend
CO2	Interpret the global and Indian scenario on public health nutrition
CO3	Determine the nutritional status, dietary diversity and food security status of an individual and a community
CO4	Recognise the public health nutrition strategies for prevention of nutritional problems in India
CO5	Plan, implement and evaluate impact of a nutrition education programme for a community

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	3	3	2	3	3	3	3	**3**
CO2	3	1	2	1	3	3	2	3	3	3	3	3
CO3	3	1	2	2	3	3	2	3	3	3	3	3
CO4	3	1	2	2	3	3	2	3	3	3	3	3
CO5	3	2	3	3	3	3	3	3	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
Introduction to Public Health Nutrition	To impart knowledge on history, practice, future trend, behavioral and cultural aspects of public health nutrition	7+7+1=15
Public Health Nutrition Scenario	To understand the global and Indian scenario in public health nutrition	6+7+1=14
Nutritional Assessment and Surveillance	To illustrate the methods of assessing the nutritional status of a community	8+8+1=17
Public Health Nutrition Interventions and its Impact	To elaborate strategies of the public health nutrition for the prevention of nutritional problems	7+5+1=13
Nutrition Education	To appraise the methods and integration of ICT in imparting nutrition education by a public health nutritionist	6+6+1=13
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN:

Unit/Chapters	Intended learning Outcomes	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activity	Psychomotor domain level
UNIT I: Introduction to Public Health Nutrition					
1.	Definition of public health nutrition (PHN) – Academy of Nutrition and Dietetics and other organizations	CO1	K1, F	Infograph the definition of public health nutrition by different organisations	K3, S3
2.	History of public health nutrition in India	CO1	K1, C	Prepare the historical timeline on the public health nutrition	K6, S1
3.	Global public health nutrition practice and future trend of public health nutrition	CO1	K2, P	Develop a video glimpse on global public health nutrition practice using Renderforest app	K6, S3
4.	Core functions of public health and essential public health nutrition services	CO1	K1, C	List the key objectives of public health nutrition services	K3, S1
5.	Behavioral aspects of public health nutrition	CO1	K2, F	Define the behavioural aspects of ANM or ICDS or Mid day meal workers in the community	K4, S1
6.	Cultural aspects of public health nutrition	CO1	K2, F	Identify the regional difference through debate among the attitude and activities of ICDS or Mid day meal workers	K5, S3
7.	Roles and responsibilities of public health nutritionist and careers in public health nutrition	CO1	K2, MC	Case Study on A Public Health Nutritionist's Process for Increasing Access to Healthful Foods in Urban and Rural Communities With Mobile Food Markets	K5, S3
UNIT II: Public Health Nutrition Scenario					
8.	Global nutrition narrative	CO2	K2, C	Tabulate the recent prevalence rate of nutritional problems in India	K4, S3
9.	Nutrition transition in developing countries	CO2	K2, F	Picturize the nutrition transition in India	K3, S1
10.	National and international approaches to improve food security	CO2	K2, F	List the approaches to improve the food security status in India	K4, S2

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

11.	Global action and public policies on nutrition against micronutrient malnutrition and NCDs	CO2	K2, F	Summarize the public policies on nutrition against micronutrient malnutrition and NCDs	K5, S1
12.	Nutritional policies and legislation in India	CO2	K2, F	Illustrate the nutritional policies and legislation followed in India	K4, S2
13.	Nutrition and Epigenetics	CO2	K2, F	Comment on epigenetic diet	K5, S3
UNIT III: Nutritional Assessment and Surveillance					
14.	Nutrition Epidemiology – Principles and methods	CO3	K1, F	Tabulate the Nutritional epidemiological methods	K5, S4
15.	Direct methods of nutritional status assessment	CO3	K1, P	Pictograph on direct methods of assessing the nutritional status	K6, S1
16.	Indirect methods of nutritional status assessment	CO3	K1, P	Schematize on indirect methods of nutritional assessment	K2, S1
17.	Growth monitoring methods and body composition studies	CO3	K2, P	Analyze the growth chart of a child and report it	K4, S1
18.	Nutrition survey, KAP survey and Subjective Global Assessment index (SGA)	CO3	K2, F	Design a nutrition survey or KAP survey for assessing the nutritional need of an individual	K6, S1
19.	Nutrition indicators	CO3	K1, P	Enlist the nutrition indicators to determine the malnutrition	K4, S4
20.	Assessment and surveillance of nutrition status in emergency affected population	CO3	K2, F	Collect recent information on nutrition surveillance on an emergency situation occurred in India	K3, S5
21.	Dietary diversity and food security status assessment	CO3	K2, F	Calculate your dietary diversity and food security score	K3, S5
UNIT IV: Public Health Nutrition Interventions and its Impact					
22.	Public Food Distribution System – Global and Indian Scenario	CO4	K2, C	Interpret on e-PDS system vs PDS in India	K3, S3
23.	Micronutrient deficiency prevention programmes - Global and Indian Scenario	CO4	K1, C	Create an e-content on anemia mukt bharat scheme	K6, S5
24.	Nutrition Intervention Programmes – Poshan Abhiyan, National Nutrition Mission, ICDS, Mid-day Meal Scheme, SABALA, Eat Right India Movement	CO4	K1, C	Create an awareness on Eat right Campus inside the University campus	K6, S3
25.	Food Fortification Resource Centre initiatives	CO4	K1, C	Identity the fortified food in digital market and report it	K3, S1
26.	Sustainable Development Goals related to Nutrition	CO4	K1, C	Frame the strategy to address SDGs related to nutrition	K5, S3
UNIT V: Nutrition Education					
27.	Global and Indian nutrition education scenario	CO5	K1, F	Map the nutrition education scenario in Tamil Nadu	K4, S5
28.	Methods of nutrition education for an individual, community and in long term health care facilities	CO5	K2, F	Justify the role of ANM wives in nutrition education in PHC and Anganwadi Centres	K5, S2
29.	Nutrition education models, tools and displays	CO5	K1, C	Collect and display the nutrition and food models, tools and displays used for nutrition education with its price	K3, S1
30.	Nutrition education programme – planning, implementation and its impact evaluation	CO5	K1, C	Plan a nutrition education programme for institutional kitchen workers	K6, S1
31.	FSSAI Regulations on School Nutrition	CO5	K1, F	Prepare a flyer on FSSAI school nutrition regulations	K6, S1
32.	Integration of ICT in nutrition education	CO5	K2, C	Collect the research article on role of ICT in nutrition education and discuss it	K4, S1
33.	Nutrition education websites, Apps and E-resources	CO5	K2, C	Enlist the websites, Apps and E-learning resources on nutrition education	K4, S1

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2.	Suryataba Das (2018), Textbook of community nutrition, Academic Publishers, 3rd Edition.
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JOURNALS AND e-DOCUMENTS	
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2.	http://www.jblearning.com/samples/0763747602/47602_ch01_5165.pdf
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Course Name	Computer Aided Diet Planning Practical	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNCP05	**Academic Year Introduced**	2022 - 23
Type of Course	Practical	**Semester**	III

COURSE OUTCOMES:

On completion of the course, the students will be able to	
CO1	To apply the concepts of weights and measures of various food in raw and cooked form for better menu planning
CO2	To operate nutrical software for selecting a nutrient rich food item and analyse the planned menu as per RDA
CO3	To analyse, evaluate and design a diet for pregnant woman, lactating mother and infant for best nutritional care process
CO4	To analyse, evaluate and design a diet for preschool child, school going child, and adolescent boy and girl for best nutritional care process
CO5	To analyse, evaluate and design a diet for young, middle and older adult man and woman for best nutritional care process

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	3	3	3	2	3	3	3	3
CO2	2	3	3	3	3	3	3	2	3	3	3	3
CO3	2	3	3	3	3	3	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	2	3	3	3	3
CO5	2	3	3	3	3	3	3	2	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
Weights and Measures	To weigh and measure the food items to understand the quantification of foods	1+5+0 = 6
Selection of food items for menu planning	To illustrate the selection of nutrient rich sources using Nutrical software and food exchange list or ready reckoner followed in diet clinic	1+5+3 = 9
Diet planning for pregnant woman, lactating mother and infant	To impart skill to design a diet for pregnant woman, lactating mother and infant as per nutrient requirement and dietary guidelines	3+6+3 = 12
Diet planning for preschool, school children and adolescents	To educate the technical knowledge on designing a diet for preschool, school children and adolescents as per nutrient requirement and dietary guidelines	4+8+3 = 15
Diet planning for young, middle and older adulthood	To empower the technical skill to design a diet for young, middle and older adulthood as per nutrient requirement and dietary guidelines	3+6+3 = 12
Total Hours of Instruction		54 (18x3)

TL-Teaching and Learning, Ac-Activities, As-Assessment, To-Total Hours

COURSE PLAN

Module/ Experiment No.	Intended learning Outcomes	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activities	Psychomotor domain level
Module 1: Weights and Measures					
1.	Weights and Measures	CO1	K1, P	Compare the weights and measures of raw and cooked foods	K4, S1
Module 2: Selection of food items for menu planning					
2.	Nutrical sheet and Food Exchange list/Ready Reckoner	CO2	K1, P	Select nutrient rich food items using Nurtical sheet and Collect reliable food exchange list/Ready Reckoner	K3, S1
Module 3: Diet planning for pregnant woman, lactating mother and infant					
3.	Diet plan for pregnant woman	CO3	K2, C	Design a day's diet for a pregnant women in three trimesters by adopting NCP model	K6, S3
4.	Diet plan for lactating mother	CO3	K2, C	Design a day's diet for a lactating mother with exclusive breast feeding and weaning by adopting NCP model	K6, S3
5.	Diet plan for infants	CO3	K2, C	Design a weekly diet for an infant with breast feeding, infant formula and weaning foods	K6, S3
Module 4: Diet planning for preschool, school children and adolescents					
6.	Diet plan for preschool children	CO4	K2, C	Design a day's diet for a preschool child (underweight / obesity/ micronutrient deficiency) by adopting NCP model	K6, S3
7.	Diet plan for school children	CO4	K2, C	Design a day's diet for a school going child (underweight / obesity/ micronutrient deficiency) by adopting NCP model	K6, S3
8.	Diet plan for adolescent boy and girl	CO4	K2, C	Design a day's diet for an adolescent boy and girl (underweight / obesity/ micronutrient deficiency) by adopting NCP model	K6, S3
Module 5: Diet planning for young, middle and older adulthood					
9.	Diet plan for young adulthood	CO5	K2, C	Design a day's diet for young adult man and woman (underweight / obesity/ micronutrient deficiency) by adopting NCP model	K6, S3

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

10.	Diet plan for middle adulthood	CO5	K2, C	Design a day's diet for middle aged adult man and woman (underweight / obesity/ NCD) by adopting NCP model	K6, S3
11.	Diet plan for older adulthood	CO5	K2, C	Design a day's diet for old aged adult man and woman (underweight / obesity/ NCD) by adopting NCP model	K6, S3

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3	Dietary Guidelines for Indians – A Manual, (2011), 2nd Edition, National Institute of Nutrition, Hyderabad, India. https://www.nin.res.in/downloads/DietaryGuidelinesforNINwebsite.pdf
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3	https://www.nhlbi.nih.gov/sites/default/files/publications/WeekOnDASH.pdf
4	https://nin.res.in/NICE.html
5	https://wcd.nic.in/sites/default/files/Diet%20Chart%20For%20West%20India.pdf
6	https://www.tn.gov/content/dam/tn/didd/documents/divisions/health-services/therapeutic-services/Nutrition_Resource_Guide.pdf
7	https://www.selfstudys.com/sitepdfs/Rr4MhnbfIn3bru6vJ6Dz
FOOD EXCHANGE LIST AND READY RECKONER	
1	https://www.iitk.ac.in/hc/food-exchange-list
2	https://sagenutrition.org/wp-content/uploads/2020/09/Exchange-List-for-Meal-Planning-Packet-2020-8.pdf
3	https://www.nestle.lk/sites/g/files/pydnoa551/files/asset-library/documents/health-science/exchangelist.pdf
4	https://dtc.ucsf.edu/pdfs/FoodLists.pdf
5	https://egyankosh.ac.in/bitstream/123456789/72579/1/Practical-1.pdf, https://www.egyankosh.ac.in/bitstream/123456789/31102/1/Unit-2.pdf

Course Name	Sports Nutrition Practical	Programme Name	M.Sc. Food Science Technology and Nutrition
Course Code	22FSTNCS03	Academic Year Introduced	2022 – 23
Type of Course	Practical	Semester	III

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	Assess and screen the nutritional status of an athlete
CO2	Diagnose the nutritional adequacy, deficiencies and imbalances and reveal it in terms of PES statement
CO3	Develop and implement evidence-based nutrition interventions for athletes to optimize performance, recovery, and overall well-being
CO4	Monitor the food consumption and evaluate the adequacy of the proposed nutrition intervention

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	1	1	3	1	2	2	2	3	3	2	2	3
CO2	1	2	3	1	2	2	2	3	3	2	2	3
CO3	1	3	3	3	2	2	2	3	3	2	2	3
CO4	1	2	3	1	2	2	2	3	3	2	2	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
Nutrition Assessment	To understand the nutritional status assessment and to identify the nutritional imbalances and deficiencies of an athlete	6+12+3=21
Nutrition Diagnosis	To diagnose and categorize the nutritional issues and concerns of an athlete	2+4+3=9
Nutrition Intervention	To design and implement evidence-based nutrition interventions tailored to the specific needs of an athlete	4+8+3=15
Nutrition Monitoring and Evaluation	To learn a systematic approach to monitor and evaluate the effectiveness of nutrition intervention on athletes	2+4+3=9
Total Hours of Instruction		54 (18x3)

TL-Teaching and Learning, Ac-Activities, As-Assessment, To-Total Hours

COURSE PLAN

Unit/Chapters	Intended learning Outcomes	CO(s) Mapped	Cognitive Level /KD	Psychomotor domain activity	Psychomotor domain level
Module I: Nutrition Assessment					
1.	Body composition analysis of an athlete	CO1	K1, P	Conduct the body composition assessment using body composition analyzer for an athlete	K4, S3
2.	Physical fitness level of an athlete	CO1	K2, C	Determine the physical fitness level of an athlete using physical fitness tests, standing long jump tests, overhead power ball throw tests, 1000-meter run/walk tests	K5, S1
3.	Nutritional status screening	CO1	K2, P	Screen the nutritional status of an athlete using the SGA index	K5, S4
4.	Sweat rate and hydration index	CO1	K2, P	Determine the sweat rate and hydration index of an athlete	K5, S1
5.	Sports supplements and ergogenic aids	CO1	K2, F	Identify the sports supplements and ergogenic aids consumed by an athlete	K5, S3
6.	Nutrient intake and energy balance	CO1	K2, P	Assess the macronutrients, calcium, iron, vitamin C, essential amino acids and fatty acid intake and determine the energy balance status of an athlete	K5, S1
Module II: Nutrition Diagnosis					
7.	PES statement for an athlete	CO2	K2, P	Write a PES statement for an athlete based on the nutritional status assessment and nutritional adequacy in the diet	K6, S1
8.	Nutritional deficiency symptoms	CO2	K2, C	Diagnose the nutritional deficiency signs and symptoms prevailing among athletes by a clinical survey	K5, S1
9.	Nutritional and hydration requirements	CO2	K2, F	Determine the nutritional requirement and amount of water to be consumed by an athlete	K5, S3
Module III: Nutrition Intervention					
10.	Pre-event menu plan	CO3	K4, P	Design a pre-exercise meal plan (My plate method) by defining meal distribution and menu details with portion control for an athlete and assess its nutritional adequacy	K6, S5
11.	During event menu plan	CO3	K2, P	Create fueling plan during event for an athlete and	K5, S2

				assess its role on performance efficacy	
12.	Carbohydrate loading and post event menu plan	CO3	K2, P	Design a post-exercise recovery menu plan (My plate method) for an athlete to enhance carbohydrate loading	K6, S5
13.	Sports Drink/Supplement	CO3	K1, P	Prepare a sports snack/ drink/ powder and analyse its nutritional benefits	K4, S1
Module IV: Nutrition Monitoring and Evaluation					
14.	Nutritional adequacy	CO4	K1, P	Evaluate the nutritional adequacy of a pre-event menu, fueling plan and post-event menu followed by an athlete and suggest the dietary modification using nutrical sheet	K5, S4

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1	Physical Fitness Test: www.nsu.ac.in
2	Benardot, D. (2020), Advanced Sports Nutrition, Human Kinetics Publishers.
E-DOCUMENTS	
1	https://www.researchgate.net/publication/263344521_Sweat_Rate_Measurement_in_Athletes
2	https://www.scienceforsport.com/hydration-testing/ - Body weight change technique
3	https://www.nata.org/sites/default/files/FluidReplacementsForAthletes.pdf

Course Name	Food Safety Management	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNSA01	**Academic Year Introduced**	2022-23
Type of Course	Practical	**Semester**	III

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	Define the food hazards, temperature control in storing of food at home
CO2	Practice safe handling of food and personal hygiene in any food preparation area
CO3	Identify different parts of the label and differentiate different types of packaging materials
CO4	Identify the type of adulterant and food additives in the packed food
CO5	Educate the public on fortificants in the packed food

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	3	2	2	2	2	3	2	3	3
CO2	1	3	3	3	3	3	2	2	3	2	3	3
CO3	1	3	2	3	3	3	2	2	3	2	3	3
CO4	1	3	3	3	3	3	2	2	3	2	3	3
CO5	1	3	2	2	2	3	2	2	3	2	3	3

1- Slight, 2- Moderate, 3-Substantial

COURSE OBJECTIVES

Unit/Module	Objectives	Hours of Instruction TL+Ac+As = To
Hygienic handling of food and 7 C's control	To illustrate the types of hazards and measures to control the hazards	3+9+2=14
Good hygiene and sanitary practices	To gain practical experience on safe handling of food and its auditing mechanism as per FSSAI Rules and Regulations	2+8+2=12
Food label and Food Packaging	To notify the mandatory requirements of a food label and to illustrate the types of packaging material	2+6+2=10
Food Additives and Food Adulteration	To test common adulterants in food and to identify the food additives present in the packed food	2+8+2=12
Food Fortification	To identify fortified foods in market and create awareness on the importance of consuming fortified food as revealed by FFRC	1+3+2=6
Total Hours of Instruction		54 (18x3)

TL-Teaching Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Unit/ Chapters	Intended Learning Chapters	CO(s) Mapped	Cognitive Level/ KD	Psychomotor Domain Activities	Psychomotor domain level
Unit I : Hygienic Handling of Food and 7 C's Control					
1.	Type of hazard in food, signs of spoilage in food, food contaminants, food poisoning and infection, food allergens, common fault in handling of food, factors controlling food poisoning and keeping the food out of danger zone	CO1	K2, C	Determine the hazards and control measures in the given food sample	K4, S3
				Explore the effect of temperature and time on microbial growth	K4, S3
				Determine the fitness of food for consumption	K4, S3
				Recommend the 7 C's in control of contamination and control measures	K3, S1
				Specify the 5 F's for food infection and infestation	K3, S2
Unit II : Good Hygiene and Sanitary Practices					

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating
Knowledge Dimension : F - Factual C - Conceptual P - Procedural MC - Meta Cognitive
Psychomotor Domain : S1-Imitation S2-Manipulation S3-Precision S4-Articulation S5-Naturalization

2.	Do's and Dont's in Location, layout and facilities; material handling; food preparation; holding, packaging, distribution, serving and transportation; personal hygiene; support services	CO2	K1, F	Assess the hygiene and sanitary practices of street food vendor/institutional cafeteria	K5, S4
				Record self-evaluation track on good hygiene and healthy practices by a street food vendor/institutional cafeteria	K3, S2
Unit III : Food Label and Food Packaging					
3.	Components of food label and FSSAI regulations	CO3	K2, C	Identify the different parts of food label and define its significance in terms of food safety	K4, S1
	Packaging material identification symbols and FSSAI regulations	CO3	K2, F	Collect the types of packaging materials and define its nature using symbols	K6, S3
Unit IV : Food Additives and Food Adulteration					
4.	Common permitted additives added to food and its numbering system	CO4	K1, C	Detect the food additives added into food items using ingredients part of food label	K4, S3
	Common adulterants in food and its identification	CO4	K1,C	Perform common adulteration test in food	K5, S3
Unit V : Food Fortification					
5.	Fortification in food and government programmes on food fortification	CO5	K2,F	Examine the types of fortificants in food label	K4, S5

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2.	FSSAI and Food Fortification Resource Centre Team (2017), Large Scale Food Fortification in India.
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1.	FSSAI Manuals for Quality testing (www.fssai.gov.in), Accessed, 2020
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JOURNALS AND DOCUMENTS	
1.	Food Control, Journal of the European Federation of Food Science and Technology (EFFoST) and the International Union of Food Science and Technology (IUFoST). Elsevier Publications
2.	International Journal on Food System Dynamics, **A** Scopus indexed international peer-reviewed scientific journal

Course Name	Nutrition for the Community Practical	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNSB01	Academic Year Introduced	2022 - 23
Type of Course	Practical	Semester	III

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	measure the anthropometric parameters to assess their nutritional status
CO2	guide the community on nutritious food selection, preparation and inclusion in the diet
CO3	design a balanced menu plate for various meals
CO4	convince the community about the significance of food equity, budgeting and storage
CO5	recommend the conservation of nutrients at household level in the community

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	1	3	2	1	2	1	2	3	3	2	3	2
CO2	2	2	2	1	2	3	2	3	1	2	3	2
CO3	2	2	2	1	2	3	2	3	1	2	3	2
CO4	2	2	2	1	2	3	2	3	1	2	3	2

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
Nutritional Status Assessment	To empower the learners on assessing their nutritional status using anthropometric parameters	2+8+2 = 12
Food selection	To select the good quality, nutritionally sound and fresh food items for menu preparation	
Balanced Diet	To acquire skills on planning balanced menu plate for three main meals	1+8+3 = 12
Food Equity, Budgeting and Storage	To familiarize family food budgeting, purchase of good quality food and storage conditions	3+9+3 = 15
Nutritional Security and Nutritional Conservation	To impart technical know-how on conservation of nutrients during pre-preparation and preparation	1+8+6 = 15
Total Hours of Instruction		54 (18x3)

TL-Teaching Learning, Ac-Activities, As-Assessment, T-Total Hours

COURSE PLAN

Module/ Experiment No.	Intended learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
Module I: Nutritional Status Assessment					
1.	Assessment of nutritional status of an individual and family	CO1	K1, P	Assess and infer the Nutritional Status of an Individual and Family using anthropometric parameters a. Height (cm) b. Weight (kg) c. BMIs (kg/m^2) d. Waist Circumference (cm) e. Hip circumference (cm) f. Waist to Hip Ratio g. Height for Age h. Weight for Age i. Height for Weight j. Percent of abdominal fat according to W/H ratio k. Skin fold thickness (Triceps) (cm)	K5, S3
Module II: Food Selection					
2.	Selection criteria for good quality and nutritious food	CO2	K2, F	Selection criteria for raw materials for preparing the food at home	K5, S2
3.				Selection criteria for good quality energy yielding foods, body building foods and protective foods	K5, S3
Module III: Balanced Diet					
4.	Balanced diet and my plate design	CO3	K2, F	Individual daily meal analysis on concept of balanced diet (inclusion of basic five food groups)	K5, S1
5.		CO3	K2, P	Design an balanced menu plate for breakfast, lunch and dinner	K6, S4

Cognitive Process: K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

Module IV: Food Equity, Budgeting and Storage					
6.	Factors influencing economy of food budgeting, Food budgeting for a family using available resources, Storage method of food items and importance of KAP survey tool	CO4	K2, C	Analyze the factors influencing the (Nutritional Knowledge, Intelligent buying and Home Production and Processing) economy of food budgeting	K4, S2
7.		CO4	K2, P	Prepare a short term monthly budget based on balanced diet for an individual in the family	K6, S2
8.		CO4	K2, P	Conduct a KAP survey on storage method of perishable, semi-perishable and non-perishable foods and report it	K5, S2
MODULE V: Nutritional Security and Nutritional Conservation					
9.	Measures to nutritional security in a family	CO5	K2, C	Sketch the cooking methods to enhance nutritive value of food at household level	K4, S4
10.	Measures to enhance the nutritional conservation in a family	CO5	K2, C	Create, implement and evaluate the effectiveness of an awareness programme to minimize and prevent nutrient loss in food preparation at home or in an institution kitchen	K6, S4

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3	Nnakwe, N. (2012), Community Nutrition: Planning Health Promotion and Disease Prevention. Jones & Bartlett Publishers.
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1	Community, Environment, Disaster and Risk Management, Emerald publishers
2	Health and Social Care in the Community, Blackwell Publishers Inc.
3	Family and Community Health, Wolters Kluwer Health Publishers.

Elective Specialization I : Food Technology

COURSE 1 (22FSTNEA01): Technology of Non Perishable Foods
COURSE 2 (22FSTNEA02): Technology of Semi Perishable and Perishable Foods
COURSE 3 (22FSTNEA03): Food Testing and Certification
COURSE 4 (22FSTNEA04): Foodpreneurship

Technology of Non Perishable Foods

Course Name	Technology of Non Perishable Foods	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNEA01	**Academic Year Introduced**	2022 - 2023
Type of Course	Theory	**Semester**	I

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Define and determine the properties of non-perishable foods
CO2:	Value add the non-perishable foods by applying the suitable primary processing techniques
CO3:	Value add the non-perishable foods by applying the suitable secondary and tertiary processing techniques
CO4:	Prescribe, design and develop packaging and labelling as per FSSAI and suggest suitable storage conditions
CO5:	Provide consultancy on plant layout, production flow, instrumentation and process control and market strategy for a food product

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	3	3	1	3	2	3	1	1	1
CO2	3	1	1	3	3	1	3	2	3	1	1	1
CO3	3	1	1	3	3	1	3	2	3	1	1	1
CO4	3	1	1	3	3	1	3	2	3	1	1	1
CO5	3	1	1	3	3	1	3	2	3	1	1	1

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	**Objectives**	**Hours of Instruction TL+Ac+As=To**
Properties of non-perishable foods	To understand the physical, chemical and functional properties of non-perishable foods	10+3+1=14
Primary processing of non-perishable foods	To familiarize with different types of primary processing techniques, instrumentation and process control of non-perishable foods	10+3+1=14
Secondary and tertiary processing of non-perishable foods	To learn the secondary and tertiary processing techniques, instrumentation and process control on production of value added non-perishable food products	10+3+1=14
Packaging, labelling and storage of non-perishable foods	To gain knowledge and skills prescribe, design and develop packaging, labelling and storage technique of processed non-perishable foods	7+6+1=14
Production and market plan	To acquire professional knowledge about plant layout, production unit, logistic mechanism, market feasibility, viability and desirability of a food product from non-perishable foods	10+3+3=16
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, To-Total Hours

COURSE PLAN

Unit/Chapters	**Intended Learning Chapters**	**CO(s) Mapped**	**Cognitive Level/KD**	**Psychomotor domain activities**	**Psychomotor domain level**
UNIT I: Properties of Non-Perishable Foods					
1.	Introduction to non-perishable foods – cereals, millets, pulses, nuts, oilseeds, spices and condiments	CO1	K1, F	Exhibit the non-perishable foods	K3, S3
2.	Physical and Structural Properties	CO1	K2, C	Infograph on physical and structural properties of any one non-perishable food	K3, S3
3.	Chemical Properties	CO1	K2, C	Tabulate the rich source of chemical component of any one non-perishable food	K4, S3
4.	Mechanical and Thermal Properties	CO1	K2, C	Pitch on any one mechanical or thermal property of a food	K5, S4
5.	Rheological Properties	CO1	K2, C	Collect the video on determination of rheological properties of any one non-	K4, S1

				perishable food	
6.	Optical and Electromagnetic Properties	CO1	K2, F	Script on application of optical/electromagnetic property in designing a product	K2, S2
7.	Sensory Properties	CO1	K2, C	Picturize the sensory characteristics of any product objectively and subjectively	K5, S3
8.	Therapeutic Properties	CO1	K2, M	List the dietary supplements, nutraceuticals and functional foods from non-perishable foods	K4, S1
UNIT II: Primary Processing of Non-Perishable Foods					
9.	Instrumentation and process flow on post-harvest handling, cleaning and grading of raw materials	CO2	K2, F	Document the post-harvest farm practices of any one non-perishable food	K3, S1
10.	Instrumentation and process flow for preconditioning, decortication/dehulling of raw materials	CO2	K2, F	Videograph the preconditioning and Dehulling process of any one non-perishable food	K6, S1
11.	Instrumentation and process flow for size reduction/grinding and milling/oil expulsion of raw materials	CO2	K2, F	Videograph the milling/oil expulsion process of any one non-perishable food	K6, S1
12.	By-products management on milling/oil expulsion	CO2	K2, C	Mind map the handling of by-products on milling/oil expulsion of any one non-perishable food	K4, S1
13.	Industrial waste management from primary processing	CO2	K2, C	Pictograph the waste management from any one primary processing industry	K6, S1
UNIT III: Secondary and Tertiary Processing of Non-Perishable Foods					
14.	Introduction to secondary and tertiary processing of cereals, millets, pulses, nuts, oilseeds, spices and condiments	CO3	K1, C	Infograph the secondary and tertiary processed products from any one non-perishable food	K4, S4
15.	Manufacturing process, instrumentation and process control of fermented, germinated, baked, puffed, flaked, canned, fried, hydrogenated and extruded products from non-perishable foods	CO3	K2, C	Videograph the manufacturing process of any one secondary products	K6, S1
16.	Manufacturing process, instrumentation and process control of fortified foods, protein concentrates and isolates, coated, coloured and flavored products, composite and blended products, analogues and mimetics from non-perishable foods	CO3	K2, C	Videograph the manufacturing process of any one tertiary products	K6, S1
UNIT IV: Packaging, Labelling and Storage of Non-Perishable Foods					
17.	Packaging, labelling and storage of primary products from non-perishable foods	CO4	K1, F	Pictograph the storage mechanism of any one primary product	K4, S3
				Analyse and report the compliance of package and labelling of any one primary product	K4, S3
18.	Packaging, labelling and storage of secondary products from non-perishable foods	CO4	K1, F	Pictograph the storage mechanism of any one secondary product	K4, S3
				Analyse and report the compliance of package and labelling of any one secondary product	K4, S3
19.	Packaging, labelling and storage of tertiary products from non-perishable foods	CO4	K1, F	Pictograph the storage mechanism of any one tertiary product	K4, S3
				Analyse and report the compliance of package and labelling of any one tertiary product	K4, S3
UNIT V: Production and Market Plan					
20.	Plant design and layout for production of primary, secondary and tertiary products from non-perishable foods	CO5	K1, C	Infograph the plant layout of production of any one product from non-perishable foods	K4, S1
21.	Logistic mechanism of primary, secondary and tertiary products from non-perishable foods	CO5	K1, C	Mind map the logistic mechanism followed to distribute products locally, national and international wide	K4, S1
22.	Market potential of primary, secondary and tertiary products from non-perishable foods	CO5	K2, C	Evaluate and report the primary, secondary and tertiary products available in domestic/retail/digital market	K5, S1

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2	Annals. Food Science and Technology, Valahia University Press
3	Food Science and Human Wellness, Beijing Academy of Food Sciences
4	Journal of Food, Agriculture and Environment, WFL Publisher Ltd.
5	Natural Products and Bioprospecting, Springer.

Technology of Semi Perishable and Perishable Foods

Course Name	Technology of Semi Perishable and Perishable Foods	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNEA02	**Academic Year Introduced**	2022 - 2023
Type of Course	Theory	**Semester**	II

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Apply primary, secondary and tertiary processing of fruits and vegetables and manage its supply chain
CO2:	Process the meat, fish and poultry products and manage its supply chain
CO3:	Process the sugar cane into various products and manage its supply chain
CO4:	Manage the process flow of milk from farm to fork
CO5:	Manage the production of alcoholic and non-alcoholic beverages and its supply chain

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	3	3	1	3	2	3	1	1	1
CO2	3	1	1	3	3	1	3	2	3	1	1	1
CO3	3	1	1	3	3	1	3	2	3	1	1	1
CO4	3	1	1	3	3	1	3	2	3	1	1	1
CO5	3	1	1	3	3	1	3	2	3	1	1	1

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
Processing and supply chain management of fruits and vegetables	To understand the possible methods of processing of fruits and vegetables and management of its supply chain	10+3+1=14
Processing and supply chain management of meat, fish and poultry products	To familiarize with instrumentation and process control of processing of meat, fish and poultry products and its supply chain	10+3+1=14
Processing and supply chain management of sugar cane	To learn the primary, secondary and tertiary processing techniques, instrumentation and process control on production of value added products from sugar cane and its supply chain	10+3+1=14
Processing and supply chain management of milk and milk products	To gain knowledge and skills required to process, package, store and distribute the milk and milk products	7+6+1=14
Processing and supply chain management of alcoholic and non-alcoholic beverages	To acquire professional knowledge about processing and supply chain of alcoholic and non-alcoholic beverages.	10+3+3=16
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, T-Total Hours

Cognitive Process : K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

COURSE PLAN

Unit/Chapters	Intended Learning Chapters	CO(s) Mapped	Cognitive Level/KD	Psychomotor domain activities	Psychomotor domain level
UNIT I: Processing and Supply Chain Management of Fruits and Vegetables					
1.	Introduction to properties of fruits and vegetables – physical nature, pH and water activity	CO1	K1, F	Infograph on physical and structural properties of any one fruit or vegetable	K3, S3
2.	Primary processing/minimal processing, instrumentation and packing	CO1	K2, C	Visit a fruit stall or a vegetable mandy and repot on its management	K3, S3
3.	Secondary processing, instrumentation and its packing – dried and dehydrated products, fruit juices, sauce, ketchups, crystallised and glazed fruit, pulp, puree and pastes, chutneys, jam, jelly, marmalade, leathers, preserves, pickles, candies and toffees, cordial, nectar, RTS beverages, fruit and vegetable powders	CO1	K2, C	Tabulate the suitable secondary processing techniques of any one fruit and vegetable	K4, S3
4.	Tertiary processing, instrumentation and its packing – fruits and vegetable wafers and soup powders	CO1	K2, C	Pitch on any one tertiary processing industry	K5, S4
5.	Transportation, distribution and marketing trend of primary, secondary and tertiary processed products in compliance with regulations	CO1	K2, C	Schematise the supply chain management of any one fruit or vegetable	K4, S1
6.	Management of fruits and vegetable wastes	CO1	K2, C	Evaluate the problems prevailing in the fruits and vegetable processing units	K5, S1
UNIT II: Processing and Supply Chain Management of Meat, Fish and Poultry Products					
7.	Primary processing of meat, fish and poultry - stunning, slaughtering, butchering, inspection and grading, cuts of meat, packing and distribution	CO2	K2, F	Video document the primary processing practice	K3, S1
8.	Collecting, packing and distribution of egg	CO2	K2, F	Pictograph the primary processing of egg	K6, S1
9.	Secondary processing, instrumentation, packing, storing and distribution – cured, salted and dried products, hamburgers, sausages, meat balls, canned and smoked products, egg powders	CO2	K2, F	Enlist the meat, fish, poultry and egg products available in the market with its image	K6, S1
10.	Tertiary processing, instrumentation, packing, storing and distribution – Ready to Eat and Ready to Serve frozen and airline meals	CO2	K2, MC	Visit an airline catering unit and report on RTS or RTE foods based on meat, fish, poultry and egg	
11.	Meat, fish, poultry and egg waste management	CO2	K2, C	Mind map the handling of waste from meat, fish, poultry and egg	K4, S1
UNIT III: Processing and Supply Chain Management of Sugar Cane					
12.	Primary processing, instrumentation, packing, storing and distribution of sugar cane juice	CO3	K1, C	Visit a sugar cane juice extraction petty shop and pictograph the unit of operations	K4, S4
13.	Secondary processing, instrumentation, packing, storing and distribution – jaggery or ghur, candy, high fructose corn syrup, crystal sugar – white and brown, brown sugar powder	CO3	K2, C	Develop process flow video for the manufacturing process of any one secondary product	K6, S1
14.	Tertiary processing, instrumentation, packing, storing and distribution – sugar cubes, powdered icing sugar	CO3	K2, C	Videograph the manufacturing process of any one tertiary product	K6, S1
15.	Industrial byproducts and waste management of sugar cane processing industry	CO3	K1, C	Mindmap the utilization of by products from sugarcane processing industry	K5, S1
UNIT IV: Processing and Supply Chain Management of Milk and Milk Products					
16.	Primary processing, instrumentation, packing, storing and distribution – pasteurized milk, skimmed milk, toned milk, homogenized milk and fortified milk	CO4	K1, F	Evaluate the availability of different types of milk in the market and list it with brand	K5, S3
17.	Secondary processing, instrumentation, packing, storing and distribution – Butter, cream, ghee, paneer, curd, buttermilk, yoghurt, cheese, milk powders	CO4	K1, F	Visit any one milk industry and report on any one secondary product process and supply chain	K4, S3

18.	Tertiary processing, instrumentation, packing, storing and distribution – whey protein concentrate, flavoured and coloured milks, lactose hydrolysed milk and milk shakes	CO4	K2, C	Schematise the process flow and supply chain of any one tertiary product	K4, S3
19.	Industrial byproducts and waste management of sugar cane processing industry	CO4	K2, C	Mindmap the waste management in a milk processing industry	K5, S1
UNIT V: Processing and Supply Chain Management of Alcoholic and Non Alcoholic Beverages					
20.	Processing, instrumentation, packing, storing and distribution of alcoholic beverages – Fermented: beer, wine, rice wine; Distilled: Sprits, Liqueurs - brandy, whisky, rum, gin, cognac, vodka, tequila, pisco and Bitters	CO5	K2, C	Infograph the plant layout of production of any one alcoholic beverages	K6, S1
21.	Processing, instrumentation, packing, storing and distribution of non-alcoholic beverages – energy drinks, sports drinks, stimulating beverages – tea and coffee; Water beverages – soda, spring, sparkling, purified and mineral water; nourishing beverages – Boost, Complan, Horlicks; Refreshing beverages – aerated and non-aerated drinks	CO5	K2, C	Visit and report on mineral water, aerated drink and soda manufacturing industry	K4, S1
22.	Processing, instrumentation, packing, storing and distribution of cocktails or mocktails	CO5	K2, C	Evaluate and report the cocktails or macktails served in hotels and restaurants	K5, S1

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JOURNALS AND DOCUMENTS	
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3	http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/food_technology/technology_of_meat%2C_poultry%2C_fish_and_sea_foods/21._methods_of_preservation_of_poultry_meat/lm/269_lm_21_lm.pdf
4	http://cbseacademic.nic.in/web_material/Curriculum/Vocational/2015/Fluid_milk_processing_XII/Dairy-products-theory%20XII.pdf
5	https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000015FT/P000357/M002940/ET/1472445881Pp07Mdl35TextRevised.pdf
6	http://niftem.ac.in/site/pmfme/processingnew/sugarcaneprocessing.pdf
7	https://www.researchgate.net/publication/325077033_Non-alcoholic_beverages_-_Market_potential_and_opportunities

Food Testing and Certification

Course Name	Food Testing and Certification	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNEA03	**Academic Year Introduced**	2022 - 2023
Type of Course	Theory	**Semester**	III

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Comply with FSSAI rules and regulations, codex alimentarius commission and WTO
CO2:	Assist to obtain NABL accreditation of food testing laboratory
CO3:	Recognize the clauses in laboratory quality management system (ISO/IEC 17025:2017)
CO4:	Define the types of parameter meant for assessing the quality of a food item
CO5:	Adopt quality assurance mechanism in food testing laboratory as a food analyst

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	3	3	1	3	2	3	1	1	1
CO2	3	1	1	3	3	1	3	2	3	1	1	1
CO3	3	1	1	3	3	1	3	2	3	1	1	1
CO4	3	1	1	3	3	1	3	2	3	1	1	1
CO5	3	1	1	3	3	1	3	2	3	1	1	1

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	**Objectives**	**Hours of Instruction TL+Ac+As=To**
Food Standards and Regulations (FSSAI) for Food Analysis	To impart learning on FSSAI rules and regulations, codex alimentarius commission, AGMARK and WTO role in assuring food safety and quality	10+8+1=19
NABL Accreditation for Food Testing Laboratory	To familiarize on procedures and legal regulations adhered for NABL accreditation of a food testing laboratory	5+5+1=11
ISO/IEC 17025:2017 – Laboratory Quality Management System	To sensitize on clauses in laboratory quality management system as per ISO/IEC 17025:2017	5+5+1=11
Physical, Chemical and Instrumental Analysis of Food	To define the parameters to be adopted for testing the quality of a food item	9+8+1=18
Quality Assurance and Quality Control in Food Testing Laboratory	To introduce the measures adopted in NABL accredited laboratory to ensure the quality control and assurance	6+6+1=13
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, To-Total Hours

COURSE PLAN

Unit/Chapters	**Intended Learning Chapters**	**CO(s) Mapped**	**Cognitive Level/KD**	**Psychomotor domain activities**	**Psychomotor domain level**
UNIT I: Food Standards and Regulations (FSSAI) for Food Analysis					
1.	Food Safety and Standards (Laboratory and Sampling Analysis) Regulation, 2011	CO1	K1, F	Interact with FSSA Food Safety Officer on sampling and submit the report	K3, S3
2.	Food Safety and Standards (Recognition and Notification of Laboratories) Regulation, 2018	CO1	K1, F	Visit a FSSA laboratory and analyse the compliance of the laboratory	K4, S3
3.	Food Safety and Standards (Food Products Standards and Food Additives) Regulation, 2011	CO1	K2, F	Analyse the compliance of standards for a prepacked food	K4, S3
4.	Food Safety and Standards (Contaminants, Toxins and Residues) Regulation, 2011	CO1	K2, F	List the possible contaminants, toxins and residues of a food item	K3, S4
5.	Food Safety and Standards (Approval for Non-Specific Food and Food Ingredients) Regulation, 2017	CO1	K2, F	Identify one industry who got the FSSAI license according to this regulations and specify its products	K4, S1
6.	Food Safety and Standards (Organic Food) Regulation, 2017	CO1	K2, F	Exemplify the organic food in the market	K3, S1
7.	Food Safety and Standards (Alcoholic Beverages) Regulation, 2018	CO1	K2, F	Exemplify the alcoholic beverages with FSSAI license	K3, S1
8.	Food Safety and Standards (Fortification of Food) Regulation, 2018	CO1	K2, F	Identify the fortificants in the prepacked food	K3, S1
9.	Food Safety and Standards (Foods for Infant Nutrition) Regulations, 2020	CO1	K2, F	List the infant formula in the market with FSSAI number	K4, S1
10.	Food Safety and Standards (Ayurveda Aahara) Regulations, 2022	CO1	K2, F	Identify the Ayurveda aahara in the market with FSSAI license number	K4, S1

Cognitive Process : K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

11.	Food Safety and Standards (Vegan Foods) Regulations, 2022	CO1	K2, F	Identify the vegan food in the market with FSSAI license	K4, S1
12.	Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, Functional Food and Novel Food) Regulations, 2016	CO1	K2, F	Tabulate the industrial perspective of these specific foods in Tamil Nadu	K5, S3
13.	Food Safety and Standards (Packaging) Regulation, 2018	CO1	K2, F	Identify the different types of packaging prevailing in the market	K5, S3
14.	Food Safety and Standards (Labelling and Display) Regulations, 2020	CO1	K2, F	Define the level of compliance of packed food to the mandatory requirements in this regulation	K5, S4
15.	Agricultural Produce Act, 1937 (Grading and Marketing)	CO1	K2, C	Grade any one raw material as per AGMARK standard	K5, S1
16.	Export (Quality Control & Inspection), Act, 1963 and Rules	CO1	K2, F	Develop a one minute video on Export rules using Render forest App	K6, S1
17.	Bureau of Indian Standards relevant to Food Safety (Water, Infant Formula etc.)	CO1	K2, C	List the IS standards relevant to food safety	K3, S5
18.	Legal Metrology Act, 2009	CO1	K2, F	Develop one minute video on features of legal metrology act using powtoon or canva or prezi	K6, S3
19.	CODEX Alimentarius Commission: History, Members, Standard setting and Advisory mechanisms: JECFA, JEMRA, JMPR	CO1	K2, F	Discuss about advisory mechanisms of Codex Alimentarius Commission	K4, S1
20.	WTO agreements: SPS/TBT	CO1	K2, F	Debate on the salient features of the WTO agreements and report it	K4, S1
21.	Role of OIE, IPPC	CO1	K2, C	List the role of OIE and IPPC for protecting the plants and animals	K3, S3
UNIT II : NABL Accreditation for Food Testing Laboratory					
22.	Understand the requirements for setting up a laboratory for the legal defensibility of analytical data	CO2	K2, F	List the requirements for NABL accreditation of a laboratory	K3, S3
23.	The ideal structure design, environment, layout for chemical and microbiological testing, Air handling, etc. of a food testing laboratory	CO2	K2, P	Design a food testing laboratory as per NABL accreditation	K6, S5
24.	Different accreditation bodies (NABL, APLAC, ILAC)	CO2	K2, F	Develop an one minute self-explanatory video on different accreditation bodies	K6, S4
25.	Laboratory safety: Personnel and laboratory hygiene, emergency planning, General hazards in a food laboratory, safety equipment, storage of chemicals, acids, flammables etc, handling compressed gases, centrifuge, chemical and biological spills and waste disposal.	CO2	K2, P	Prepare a safety posters for a food testing laboratory	K6, S1
26.	Good Food Laboratory Practice (FSSAI)	CO2	K2, F	Develop an e-content for a course entitled “Good Food Laboratory Practice”	K6, S5
UNIT III: ISO/IEC 17025:2017					
27.	Terms and Definitions, General Requirements – Impartiality and Confidentiality	CO3	K2, F	Identify the suitable clause for the given scenario	K3, S1
28.	Structural Requirements	CO3	K2, F	Identify the clauses with respect to the requirements of document, procedure and records.	K4, S1
29.	Resource Requirements – general, personal, facilities and environmental conditions, equipment, metrological traceability, externally provided products and services	CO3	K2, F	Relate the clause to each one of the listed scenario	K3, S1
30.	Process Requirements - Review of requests, tenders and contracts, Selection, verification and validation of methods, Sampling, Handling of test and calibration items, Technical records, Evaluation of measurement uncertainty, Ensuring the validity of results, Reporting of results, Complaints, Non-conforming work, Control of data and information management	CO3	K2, F	Define the conformity and non-conformity of the said clause for the different scenario in an NABL accredited laboratory	K5, S5
31.	Management System Requirements -	CO3	K2, F	Define the conformity and non-conformity of	K5, S5

	Options in management system requirements, Management system documentation (Option A), Control of management system documents (Option A), Control of records (Option A), Action to address risks and opportunities (Option A), Improvement (Option A), Corrective actions (Option A), Internal audits (Option A), Management reviews (Option A)			the said clause for the different scenario in an NABL accredited laboratory	
UNIT IV: Physical, Chemical and Instrumental Analysis of Food					
32.	Sampling and Sample Preparation - types of sample, sampling plan, subsampling, designing a sampling plan, concept of sample size and representative. Sample preparations – particle size, homogeneity, dissolution technology and decomposition, storage of samples. Solid Phase Extraction- sorbents, matrix solid phase dispersion and applications.	CO4	K2, C	Tabulate the sample preparation method for proximate composition analysis	K4, S1
33.	Classical analytical techniques - Gravimetry, Titrimetry, Refractometry and Polarimetry, UV-Visible and Fluorescence Spectrometry, Raman spectroscopy, Chromatographic techniques, Mass Spectrometry, Hyphenated Techniques, Atomic absorption Spectroscopy, Atomic emission spectroscopy, ICP-MS, Biological Techniques, Measurements of Rheological properties	CO4	K2, C	Justify the type of tests adopted for analyzing the quality of any one food item in each food group	K5, S4
Unit V : Quality Assurance and Quality Control in Food Testing Laboratory					
34.	Introduction to quality control in analytical chemistry	CO5	K2, C	Prepare SOP for proximate composition analysis of a food item	K6, S1
35.	Terminology in analytical measurements: True value, Measured value, Accuracy, Precision, Uncertainty, Random errors	CO5	K2, P	Pictograph the terminologies in analytical measurements in a food testing laboratory	K6, S5
36.	Sample traceability, Internal quality control, Certified reference materials, Spiked reference samples	CO5	K2, P	Differentiate certified and spiked reference samples	K4, S3
37.	Recovery studies, Method validation/verification (LOD, LOQ, specificity, selectivity, linearity, range, robustness, repeatability, reproducibility	CO5	K2, F	Differentiate the LOD and LOQ	K4, S3
38.	External and internal standards, Control chart	CO5	K2, F	Exemplify a control chart for a food processing unit	K4, S5
39.	Proficiency testing, z scores	CO5	K2, F	Enlist the role of z score in testing the proficiency of a chemical in food testing laboratory	K4, S3

REFERENCES

e-TEXTBOOKS AND WEB RESOURCES	
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4	https://fssai.gov.in/cms/manuals-of-methods-of-analysis-for-various-food-products.php
5	https://www.bis.gov.in/
6	https://www.citac.cc/CITAC_EURACHEM_GUIDE.pdf
7	https://www.fao.org/input/download/standards/11357/cxg_072e.pdf
E-RESOURCES AND DOCUMENTS	
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2	https://www.chromatographyonline.com/view/precision-internal-standard-and-external-standard-methods-high-performance-liquid-chromatography
3	https://www.azolifesciences.com/article/Understanding-Quality-Control-in-Analytical-Chemistry.aspx
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Elective Specialization II: Nutrition and Health Care

COURSE 1 (22FSTNEB01): Physiology of Nutrition
COURSE 2 (22FSTNEB02): Nutritional Medicine
COURSE 3 (22FSTNEB03): Nutrition Care Process
COURSE 4 (22FSTNEB04): Nutripreneurship

Physiology of Nutrition

Course Name	Physiology of Nutrition	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNEB01	**Academic Year Introduced**	2022 - 2023
Type of Course	Theory	**Semester**	I

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Integrate homeostasis of the body with nutrient assimilation and utilization
CO2:	Inculcate the role of cells in nutrient metabolism and defense mechanism of the human body
CO3:	Apply the knowledge on respiration, neuromuscular interaction and neurotransmitters on health and wellbeing of the individual
CO4:	Manage the body fitness and disease conditions by applying the knowledge on cardiovascular, gastrointestinal and excretory system
CO5:	Define the role of senses in food and nutrient intake, hormones in nutrient metabolism and puberty

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	1	1	2	3	1	1	1	3	3
CO2	2	1	1	1	1	2	3	1	1	1	3	3
CO3	2	1	1	1	1	2	3	1	1	1	3	3
CO4	2	1	1	1	1	2	3	1	1	1	3	3
CO5	2	1	1	1	2	2	3	1	1	1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	**Objectives**	**Hours of Instruction TL+Ac+As=To**
Homeostasis and Blood	To understand the homeostasis throughout the body, thermoregulation, water, electrolyte and acid base balance	12+2+1=15
Cells, Integumentary and Immune System	To familiarize with cells, integumentary system, lymphatic system and immune mechanism of the body	15+1+1=17
Respiratory, Nervous and Muscular System	To visualize the parts, functions and interactions of respiratory, nervous and muscular system for effective signaling towards health and wellbeing	11+1+1=13
Cardiovascular, Gastrointestinal and Excretory System	To mind map the fitness of cardiovascular, gastrointestinal and excretory system for better assimilation and utilization of nutrients in the body	10+2+1=13
Senses, Endocrine and Reproductive System	To acquire physiological nature of senses, hormones secreted by endocrine glands and its integration with reproductive system, genetics and nutrition	10+2+2=14
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, To-Total Hours

COURSE PLAN

Unit/Chapters	**Intended Learning Chapters**	**CO(s) Mapped**	**Cognitive Level/KD**	**Psychomotor domain activities**	**Psychomotor domain level**
UNIT I: Homeostasis and Blood					
1.	Structural organisation of the human body, functions of human life, requirements for human life	CO1	K1, F	Self-identify the structural organization of your body	K4, S3
2.	Introduction to homeostasis, pathways that alter the homeostasis and maintenance of homeostasis	CO1	K1, C	Schematize the mechanism of homeostasis	K5, S1
3.	Thermoregulation	CO1	K2, C	Test and document the changes in body temperature on hourly basis and justify on it	K4, S4
4.	Body composition	CO1	K1, F	Analyse your body composition	K4, S1
5.	Body fluid distribution	CO1	K1, F	Identify your body fluid distribution	K4, S2
6.	Water balance	CO1	K2, C	Determine your one day water balance status	K4, S3
7.	Electrolyte balance – sodium, potassium, calcium and phosphate balance	CO1	K2, M	Identify the electrolyte powders and formulas available in the market	K4, S1
8.	Acid-Base balance	CO1	K1, F	List the food that regulates the acid – base	K3, S4

Cognitive Process : K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

				balance of your body as per 24 hour dietary recall information	
9.	Blood composition	CO1	K1, F	Evaluate your blood composition	K5, S1
10.	ABO group system and Haemostasis	CO1	K1, P	Determine your blood group with Rh factor	K4, S1
UNIT II: Cells, Integumentary and Immune System					
11.	Cell structure, parts of the cell, cell junctions and function	CO2	K2, F	Demonstrate the cell structure and its function using existing models	K3, S1
12.	Cell building blocks, nutrient sensing, metabolism and cell growth control	CO2	K2, F	Pictorial presentation on any one nutrient sensing and cell growth control	K6, S1
13.	Dynamic adaptation of nutrient utilization in humans	CO2	K2, M	Documenting the Behavior changes before and after a food	K4, S4
14.	Skin layers and functions, types of hair, nail structure and parts of the fingernail	CO2	K1, F	Picturize the clinical symptoms of integumentary system and its linkage with nutrient deficiency	K6, S1
15.	Exocrine glands – sudoriferous (sweat glands), sebaceous, ceruminous and mammary glands	CO2	K1, F	Infograph the glands and its secretions	K6, S1
16.	Role of integumentary system in homeostasis	CO2	K2, C	Calculate sweat rate of a day	K4, S1
17.	Lymphatic system – lymph, lymphatic vessels and ducts, pathways and functions	CO2	K1, F	Exhibit the changes in the lymphatic system during infection with one example (Video mode)	K3, S3
18.	Organs, tissues and cells of the immune system	CO2	K1, F	Presentation on types of immunity	K6, S3
19.	Three defences against infection and immune response pathways	CO2	K2, C	Interpret on biochemical parameters during infection	K5, S1
20.	Nutrition and immune system	CO2	K2, C	List the nutrients involved in immune system	K2, S1
UNIT III: Respiratory, Nervous and Muscular System					
21.	Structure and functions of the respiratory system	CO3	K1, C	Exhibit the parts of the lungs using a lung specimen	K3, S3
22.	Lung capacity, breathing and lung mechanics, stimulation of breathing and regulation of blood pH	CO3	K2, C	Determine your lung capacity	K4, S1
23.	Homeostasis and gas exchange – internal, external and cellular respiration	CO3	K1, F	Temperature changes in the body before and after breathing exercise	K5, S5
24.	Central, peripheral and autonomous nervous system	CO3	K1, F	Exhibit the parts of the nervous system using video	K3, S1
25.	Structure and functions of nervous tissues	CO3	K1, F	Demonstrate the reflex action of a nervous tissue using an animated video	K3, S1
26.	Structure and parts of the brain	CO3	K1, F	Exhibit the parts of the brain using a brain specimen	K3, S3
27.	Limbic system of the brain, memory and learning	CO3	K2, C	Conduct a memory test which describes your limbic system	K4, S4
28.	Muscular system and mechanics of muscle contraction	CO3	K2, C	Identify the body actions related to muscle contraction and relaxation	K6, S1
29.	Neuromuscular junction and neurotransmitters	CO3	K2, C	List the neurotransmitters related to hunger and appetite	K2, S1
UNIT IV: Cardiovascular, Gastrointestinal and Excretory System					
30.	Structure of the heart, circulatory system and cardiovascular pathways	CO4	K1, F	Animate the blood circulation throughout the body from and to the heart	K6, S5
31.	Cardiac cycle and ECG	CO4	K1, F	Determine your heartbeat before and after any one exercise	K5, S1
32.	Digestive system, layers of GI tract and accessory organs	CO4	K1, F	Pictograph on mechanism of digestion in the gastrointestinal tract	K3, S1
33.	Sites of absorption of nutrients in the gastrointestinal tract	CO4	K2, C	Poster presentation on nutrient absorption from a food in the gastrointestinal tract	K6, S1
34.	Hunger, appetite and satiety, circadian rhythm of salivary, gastric, pancreatic and glucocorticoid secretions	CO4	K3, F	Self-detect the factors influencing your sleep-wake cycle	K6, S1
35.	Organs and functions of urinary system	CO4	K1, F	Interpret the composition of urine	K5, S1
36.	Formation of urine and maintenance of water salt balance	CO4	K1, F	Experiment the water intake vs frequency of urination	K4, S3
UNIT V: Senses, Endocrine and Reproductive System					
37.	Sense of taste, smell, vision/sight, hearing, touch and space and its role in food intake	CO5	K1, C	Demonstrate on any one mindful eating exercise	K4, S5
38.	Endocrine glands and its hormones	CO5	K1, F	Differentiate exocrine and endocrine glands	K4, S1
39.	Interrelationship between nutrients and hormone signaling	CO5	K2, P	Schematize the relationship between a nutrient and a hormone	K3, S2

40.	Male reproductive system – structure, function and puberty	CO5	K1, C	Compare the pubertal changes in male and female	K3, S1
41.	Female reproductive system – structure, function and puberty	CO5	K1, C		
42.	Nutritional determinants of timing of puberty	CO5	K1, C	Food facts and myths on timing of puberty	K5, S5

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Nutritional Medicine

Course Name	Nutritional Medicine	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNEB02	**Academic Year Introduced**	2022 - 2023
Type of Course	Theory	**Semester**	II

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Integrate theory of knowledge, history, methods, validity, scope, and distinction of nutritional medicine
CO2:	Inculcate the importance of nutritional medicine in the health and wellness industry holistic nutrition integration
CO3:	Analyse the role of immune system and its relationship with nutrients and phytoprotectants in food
CO4:	Apply and understand the nexus between Nutrition, Inflammation and Health management
CO5:	Evaluate the role of different naturopathic and yogic diet followed from ancient period in maintaining health and curing diseases

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	1	1	2	3	1	1	1	3	3
CO2	2	1	1	1	1	2	3	1	1	1	3	3
CO3	2	1	1	1	1	2	3	1	1	1	3	3
CO4	2	1	1	1	1	2	3	1	1	1	3	3
CO5	2	1	1	1	2	2	3	1	1	1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction TL+Ac+As=To
Basics of Nutritional medicine	To understand the Knowledge, History, Methods, Validity, Scope, and Distinction of nutritional medicine	12+2+1=15
Nutrition and Wellness	To familiarize the students with the importance of nutritional medicine in health and wellness industry and holistic health management	15+1+1=17
Immunonutrition	To develop a critical understanding of the relationship between nutrition, immune system and wellness of an individual	11+1+1=13
Nutrition and Inflammation	To inculcate professional understanding on the relationship between nutrition, inflammation and health and anti-inflammatory diet	11+1+1=13
Naturopathic and Yogic Diet	To understand the evolution, philosophy and history of naturopathic and	10+2+1=13

	yogic diet followed from ancient period	
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, To-Total Hours

COURSE PLAN

Unit/Chapters	Intended Learning Chapters	CO(s) Mapped	Cognitive Level/KD	Psychomotor domain activities	Psychomotor domain level
UNIT I: Basics of Nutritional Medicine					
1.	Introduction to the concept of nutritional medicine	CO1	K1, F	Identify the perspectives on nutritional medicine	K4, S3
2.	History of nutritional medicine	CO1	K1, C	Schematize the historical development of Nutritional medicine as an infographic	K6, S1
3.	Nutritional medicine in the 21st century	CO1	K2, C		
4.	Epistemological basis of nutritional medicine	CO1	K1, F	Analyze the pros and cons of nutritional medicine	K4, S1
5.	Practising nutritional medicine in the new paradigm	CO1	K2, M	Identify the current nutritional medicine practices followed by nutritionists	K4, S1
6.	Scope of nutritional medicine in the health and wellness industry	CO1	K2, F	Identify the career scope of nutritional medicine by browsing through online job portals	K5, S1
UNIT II: Nutrition and Wellness					
7.	Biological rhythms and nutrition	CO2	K1, C	Identify the best timing for eating food and sleeping as per biological clock	K4, S1
8.	My healthy plate and mindful eating	CO2	K2, F	Design your healthy plate for a day	K6, S1
9.	Dietary guidelines for Indians	CO2	K1, C	Develop one minute video on dietary guidelines for one age group	K6, S1
10.	Healing through nutrition – all planes of being	CO2	K2, C	Tabulate the role of each nutrient for health and well-being of an individual	K4, S3
11.	Nutrients for skin and hair health	CO2	K2, F	Pictorial presentation on various affordable food sources for skin and hair health available in the market	K6, S1
12.	Anti-aging potential of nutrients	CO2	K2, M	Document clinically proven anti-ageing foods and their mechanism of action	K4, S4
13.	Introduction to nutrition and wellness industries	CO2	K2, C	Create an exhaustive list of wellness clinics in your area	K4, S1
14.	Holistic Nutrition, Role of Integrative and Holistic Professionals	CO2	K2, M	Create a story board on one holistic nutritionist	K6, S1
UNIT III: Immunonutrition					
15.	Immune system of the body – Parts and functions of the immune system	CO3	K1, F	Picturize the role of different immune mechanism on viral infection	K5, S1
16.	Role of nutrients in immune promotion	CO3	K2, MC	Formulate an immune boosting diet for any one age group of individual	K6, S3
17.	Role of specific nutrients in immune suppression	CO3	K2, MC	List the sources of nutrients which suppress the immune system	K2, S3
18.	Immunonutrition supplements	CO3	K2, P	Identify the immunonutrition supplements prevailing in the market	K3, S3
19.	Immunonutrition regimens and recommendations for communicable diseases – bacterial and viral infections	CO3	K2, MC	Infograph the traditional immunonutrition regimens followed in India	K5, S1
20.	Immunonutrition as a novel therapy	CO3	K2, MC	Collect the research based evidence on immunonutrition therapy advised to cure certain diseases	K5, S1
UNIT IV: Nutrition and Inflammation					
21.	Introduction to inflammation	CO4	K1, C	Exhibit the inflammation cascade in humans	K3, S3
22.	Pathophysiology of inflammation and repair	CO4	K1, F	Identify the YouTube video explaining pathophysiology of inflammation	K3, S1
23.	Etiology of inflammation	CO4	K2, C	Determine the commonly consumed free radical-inducing foods	K4, S1
24.	Inflammatory indices and biomarkers	CO4	K1, F	Enlist the inflammatory indices and biomarkers with the method of determination	K5, S5
25.	Anti-inflammatory foods and diet	CO4	K2, C	List the nutritional counter measures targeting ROS	K3, S3
26.	Precision nutrition in chronic inflammation	CO4	K1, F	Sketch the nutrition intervention models to counterfeit the chronic inflammation	K5, S1
27.	Role of Nutrition on Meta-inflammation: Insights and potential targets in communicable and chronic disease management	CO4	K1, F	Collect the research article and discuss the salient points	K3, S3
28.	Dietary Intake of AGEs and ALEs and Inflammation	CO4	K2, C	List the sources of AGEs and ALEs	K3, S1

UNIT V: Naturopathic and Yogic Diet					
29.	Nutritional and naturopathic perspective of the organ systems detoxification	CO5	K1, F	Infograph the detoxification methods practiced in naturopathic and yoga centres	K6, S5
30.	Naturopathic nutritional assessment	CO5	K1, F	Report on your health status using naturopathic health assessment questionnaire	K5, S1
31.	Gut Microbiology - Probiotics and Prebiotics	CO5	K2, C	Identify the potential way to improve the gut microbiome	K3, S1
32.	Philosophy, Evolution and History of Naturopathic Diet - Eliminative diet, Soothening diet and Constructive diet	CO5	K1, F	Differentiate Eliminative diet, Soothening diet and Constructive diet	K3, S1
33.	Philosophy, Evolution and History of Juice Therapy (Fasting Therapy)	CO5	K1, F	Write a note on nobel prize winning fasting therapy	K3, S1
34.	Philosophy, Evolution and History of Yogic Diet - Sattvic Diet, Rajasic Diet, Tamasic Diet, TriDosha & Food, TriGunas & Food	CO5	K1, F	Compare the nutritional contribution through different yogic diets	K5, S3

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Nutrition Care Process

Course Name	Nutrition Care Process	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	22FSTNEB03	**Academic Year Introduced**	2022 - 2023
Type of Course	Theory	**Semester**	III

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Apply four dimensions of Nutrition Care Process Model at home, clinical and health care units
CO2:	Assess the nutritional status of an individual and screen the nutritional profile using suitable tools
CO3:	Diagnose the nutrition scenario of an individual and write PES statement
CO4:	Design most effective nutrition intervention care plan according to nutrition diagnosis
CO5:	Monitor and evaluate the effectiveness of nutrition intervention plan and modify the plan to improve its efficiency

Mapping of COs with POs, PSOs

COs / POs & PSOs	PO(T)	PO(E)	PO(P1)	PO(P2)	PO(P3)	PO(P4)	PO(P5)	PO(A)	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	1	1	2	3	1	1	1	3	3
CO2	2	1	1	1	1	2	3	1	1	1	3	3
CO3	2	1	1	1	1	2	3	1	1	1	3	3
CO4	2	1	1	1	1	2	3	1	1	1	3	3
CO5	2	1	1	1	2	2	3	1	1	1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction

Cognitive Process : K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

		TL+Ac+As=To
Introduction to Nutrition Care Process and Model	To understand the historical development and four dimensions of nutrition care process	7+5+1=13
Nutrition Assessment	To familiarize the importance of nutritional status assessment and its screening among the individual	8+8+1=17
Nutrition Diagnosis	To diagnose the nutritional profile in terms of nutrition diagnostic terminology and write a PES statement	7+5+1=13
Nutrition Intervention	To impart professional skills on the different types of nutrition intervention and its implementation process	7+7+1=15
Nutrition Monitoring and Evaluation	To educate the nutrition care process based monitoring and evaluation mechanism	7+6+1=14
Total Hours of Instruction		72 (18x4)

TL-Teaching and Learning, Ac-Activities, As-Assessment, To-Total Hours

COURSE PLAN

Unit/ Chapters	Intended Learning Chapters	CO(s) Mapped	Cognitive Level/KD	Psychomotor domain activities	Psychomotor domain level
UNIT I: Introduction to Nutrition Care Process (NCP) and Model (NCPM)					
1.	Definition of NCPM by Academy of Nutrition and Dietetics (ADA)	CO1	K1, F	Prepare a poster revealing the definitions of NCPM	K4, S3
2.	Historical perspective in the development of NCPM	CO1	K1, C	Pictograph the timeline development in NCPM	K6, S1
3.	Distinction between Medical Nutrition Therapy and NCPM	CO1	K2, C	Tabulate the difference between MNT and NCPM	K4, S3
4.	Evidence based practice and the NCPM	CO1	K1, P	Exemplify the evidence based practice in NCPM	K5, S1
5.	Integration of NCPM in dietetic curriculum and clinical care – International and Indian Scenario	CO1	K2, M	Exhibit the outcome of the integration of NCPM in dietetic curriculum	K5, S1
6.	Overview of ADA - NCPM	CO1	K2, F	Group debate on ADA and its role in designing the NCPM	K5, S1
7.	NCP terminology (NCPT) and important links	CO1	K1, F	Frame one NCP terminology	K6, S5
UNIT II: Nutrition Assessment					
8.	ABCDE approach to assess the nutritional status	CO2	K1, C	Assess your ABCDE profile and report it	K4, S1
9.	Lifestyle pattern assessment	CO2	K2, F	Assess your life style pattern and report it	K4, S1
10.	Nutritional screening tools and techniques – Tools specifically developed for the elderly hospital population, Tools developed for the general (adult) hospital population, Nutrition screening tools developed to predict clinical outcome	CO2	K1, C	Schematise on the nutrition screening tools	K5, S1
11.	Interpreting assessment data and identifying nutrition-related problems	CO2	K2, C	Identify your nutrition related problem and report it	K4, S3
12.	Case studies on practical application of nutrition assessment skills	CO2	K2, F	Complete a case report about yourself nutrition assessment profile	K6, S1
UNIT III: Nutrition Diagnosis					
13.	Nutrition Diagnostic terminology	CO3	K1, F	Identify the suitable nutrition diagnostic terminology based on yourself nutrition assessment	K5, S1
14.	Writing a perfect PES Statement	CO3	K2, P	Write PES statement based on yourself nutrition assessment	K6, S3
15.	Nutritional requirements calculation	CO3	K2, MC	Calculate yourself nutritional requirement and report it	K3, S3
16.	Collection of dietetic evidences and formulations – Evidence Analysis Library and Manual	CO3	K2, P	Collect the dietetics evidences and formulations needed for yourself nutrition care process	K3, S3
17.	Health and nutritional claim analysis of food	CO3	K2, MC	Identify the suitable processed food in the market which supports yourself nutritional requirement	K5, S1
18.	Diet Ready Reckoner and Food exchange lists	CO3	K2, P	Collect the diet ready reckoner available in the hospitals	K5, S1
19.	Traditional dietary practices and nutrition therapies	CO3	K2, MC	Document any two ancient dietary practices and nutrition therapies	K6, S1
UNIT IV: Nutrition Intervention					
20.	Determining the type of nutrition intervention – behavioral intervention, fortification, supplementation, regulatory interventions	CO4	K1, C	Define your nutrition intervention strategy	K3, S3
21.	Nutrition intervention terminology	CO4	K1, F	Identify the suitable nutrition intervention terminology for self nutrition care process	K3, S1

Cognitive Process : K1 - Remembering K2 - Understanding K3 - Applying K4 - Analyzing K5 – Evaluating K6 - Creating

22.	Critical thinking skills required for nutrition intervention	CO4	K1, C	Identify your critical thinking skills for nutrition intervention	K4, S5
23.	Nutrition intervention plans – food and nutrient delivery, nutrition education, nutrition counselling, coordination of nutrition care	CO4	K2, C	Frame yourself nutrition intervention plan	K4, S1
24.	Nutrition prescription	CO4	K1, F	Prescribe a diet for yourself nutrition care process	K6, S5
25.	Randomized Clinical Trials on nutrition interventions	CO4	K2, C	Differentiate Randomized Controlled trials and Randomized Clinical trials	K4, S3
UNIT V: Nutrition Monitoring and Evaluation					
26.	Key determinants of nutrition intervention outcomes – food and nutrition related history outcomes, anthropometric measurement outcomes, biochemical data, medical tests and procedure outcomes, nutrition focused physical finding outcomes	CO5	K1, F	Enlist yourself nutrition intervention outcomes	K5, S5
27.	Critical thinking skills required for nutrition monitoring and evaluation	CO5	K1, F	Identify your critical thinking skills for nutrition monitoring and evaluation	K4, S1
28.	Techniques for monitoring the progress of nutrition interventions – case studies	CO5	K2, C	Identify the best technique to monitor and evaluate the progress of yourself nutrition intervention	K5, S1
29.	Evaluating the effectiveness of nutrition care plans – case studies	CO5	K2, F	Evaluate the effectiveness of yourself nutrition care plan and report it	K5, S1
30.	Nutrition intervention monitoring apps and software	CO5	K1, F	Frame the modules for yourself nutrition care process App	K6, S1
31.	Practice based evidence model for improved nutrition care process	CO5	K1, P	Generate an evidence for yourself nutrition care process based on the sustainable practice	K6, S5

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