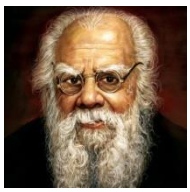
PERIYAR UNIVERSITY

Periyar Palkalai Nagar, Salem-636011
(Reaccredited with 'A' Grade by the NAAC)

School of Professional Studies



DEPARTMENT OF FOOD SCIENCE AND NUTRITION

M.Sc. DEGREE

FOOD SCIENCE, TECHNOLOGY AND NUTRITION

[Choice Based Credit System (CBCS)]

OBE REGULATIONS AND SYLLABUS

(Effective from the academic year 2018-2019 and thereafter)

M. Sc. FOOD SCIENCE TECHNOLOGY AND NUTRITION

OBE REGULATIONS AND SYLLABUS

(With effect from the academic year 2018-2019 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 generate evidence based nutrition knowledge through research and disseminate to the agrarian and general community
PEO4: To gain insight into the national/global nutritional problems and its management

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, experiential (Practical), professional (Transferable) and attitudinal skills

PO(T): Able to define and recognise the terms and concepts in food science and technology, food safety and quality control, nutrition for the community and personalised nutrition

PO(E): Able to apply the principles and perform the food science and quality control tests using simple and advanced analytical techniques, biochemical tests, data analysis, statistical tests, food safety experiments, diet planning for healthy and diseased individual

PO(P):

1. Able to 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. Able to develop innovative food products, business plan, food quality assurance systems, nutrition care process model for a community and individual cases.
3. Able to evaluate the food products in the market, safety handling and quality control in food manufacturing and catering system, performance/implementation of government nutritional programmes/schemes and nutritional profile of the community and individual
4. Able to educate the population on nutritional conservation, food safety measures and initiatives, nutrition and health care, eat right initiatives and food as medicine
5. Able to 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

- Leadership
- Team work
- Global citizenship
- Emotional intelligence
- Communication
- Digitally literacy
- Sense of inquiry
- Job creation
- Problem solving
- Policy making
- Community education

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 more credits than the stipulated minimum of 90 credits, through Extra Credit Courses (includes courses under FoSTaC, Massive Open Online Courses (SWAYAM) and Interdisciplinary (Supportive) Courses).

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, B.Sc./B.A. Home Science, B.Sc. Catering Science, B.Sc. Life Science (Biotechnology/Microbiology/Biochemistry) and UG Degree in Allied Health Sciences (B.Sc. Nursing) approved by the Association of Indian Universities are eligible to seek admission.

The first order of preference for eligibility is

a. B.Sc. Nutrition and Dietetics
b. B.Sc. Food Science and Nutrition
c. B.Sc. and B.Sc. (H) Food Technology/Food Science and Technology
d. B.Sc. Clinical Nutrition and Dietetics
e. B.Sc. Nutrition, Food Service Management and Dietetics
f. B.Sc. Nutrition and Health Education
g. B.Voc. Food Science and Nutrition
h. B.Voc. Food Process Engineering
i. B.Voc. Food Processing Technology
j. B.Voc. Food Processing and Quality Control
k. B.Tech. Food Technology

The second order of preference for eligibility is

a. B.Sc. Home Science
b. B.Sc. Catering Science/Catering
c. B.Sc. Biotechnology
d. B.Sc. Microbiology
e. B.Sc. Biochemistry

The third order of preference for eligibility is

a. B.Sc. Nursing

Duration of the programme - Two years

CBCS- STRUCTURE OF THE PROGRAMME

The programme structure comprises of two parts.

Course Component	No. of Courses	Hours of Learning	Marks	Credits
Part A (Credit Courses)				
Core Courses	18	1152	1800	56
Elective Courses (Optional)	04	288	400	16
Supportive Courses	02	108	200	04

Innovative Learning Courses (Research)	04	216	400	08
On-the-Job Training Courses	02	324	400	08
Online Courses	02	72 (3 days per semester)	-	08
Total	30+02	2088 (87 days per semester)	3200	100
Part B (Self-Learning Credit Courses)				
Elective Foundation Courses	01	18	100	02
Experiential Learning Courses	06	594	S/US	08
Total	30	684	100	10

Semester I

S.No.	Course Code	Course Title	Hours/ week	L	T	P	C
Core Courses (C)							
1.	18FSTNC01	Food Science and Chemistry	4	3	1	0	4
2.	18FSTNC02	Food Processing Technology	4	3	1	0	4
3.	18FSTNC03	Research Methodology	4	3	1	0	4
4.	18FSTNC04	Food Science and Chemistry Practical	3	-	1	2	2
5.	18FSTNC05	Data Management and Statistics Practical	3	-	1	2	2
Elective Courses (One Course per semester) (E) (Optional)							
5.	18FSTNE01	Food Packaging Technology	4	3	1	0	4
5.	18FSTNE02	Instrumentation in Food Processing	4	3	1	0	4
Online Courses (O)							
1.	18FSTNO01	Courses in online portal of SWAYAM	1	-	1	-	-
Experiential Learning (EL) Courses							
1.	18FSTNEL01	Industrial Visit – minimum three industries (self visit)	2 (Extra)	-	-	2	1 (Extra)
Innovative Learning (IL) Courses							
1.	18FSTNIL01	Part 1 Research: Food Product Development and Quality Evaluation	5	-	1	4	2
On-the-Job Training (Skill Component) (SC) Courses							
1.	18FSTNSC01	Processed Food Entrepreneur (NSDC curriculum)	3	-	1	2	-
		Total	30	13	09	08	22+1 (Extra)

Note:- L- Lecture, T-Tutorial/Demonstration, P- Practical, C- Credit

Semester II

S.No.	Course Code	Course Title	Hours/ week	L	T	P	C
Core Courses (C)							
1.	18FSTNC06	Food Microbiology and Preservation	4	3	1	-	4
2.	18FSTNC07	Food Safety and Quality Control	4	3	1	-	4
3.	18FSTNC08	Food Safety and Quality Control Practical	3	-	1	2	2
4.	18FSTNC09	Food Composition Analysis Practical	3	-	1	2	2
Elective Courses (One Course per semester) (E) (Optional)							
5.	18FSTNE03	Food Industries Waste Management	4	3	1	0	4
5.	18FSTNE04	Food Biotechnology	4	3	1	0	4
Supportive Courses (S) for other Department Students							
1.	18FSTNS01	Food Safety Management Practical	3	-	1	2	2
Elective Foundation (EF) Courses							
1.	18FSTNEF01	Human Rights (Self Study)	-	-	-	-	2 (Extra)
Online Courses (O)							
1.	18FSTNO02	Courses in online portal of SWAYAM	1	-	1	-	4 (Extra)
Experiential Learning (EL) Courses							
1.	18FSTNEL02	Visit to three Units with ISO systems; HACCP certification; implemented GMP and GHP (self visit)	2 (Extra)	-	-	2	1 (Extra)
2.	18FSTNEL03	Six Weeks Internship in Reputed Food Processing Industries (Summer Vocation)	Extra hours	-	-	45 days	2 (Extra)
Innovative Learning (IL) Courses							
1.	18FSTNIL02	Part 2 Research – Business Plan and Quality Assurance System for the New Product	5	-	1	4	2
On-the-Job Training (Skill Component) (SC) Courses							
1.	18FSTNSC01	Processed Food Entrepreneur (NSDC curriculum)	3	-	1	2	4
		Total	30	10	10	10	24+9 (extra)

Note:- L- Lecture, T-Tutorial/Demonstration, P- Practical, C- Credit

Semester III

S.No	Course Code	Course Title	Hours/	L	T	P	C

.			week				
Core Courses (C)							
1.	18FSTNC10	Nutritional Biochemistry	4	3	1	0	4
2.	18FSTNC11	Nutrition in Life Cycle	4	3	1	0	4
3.	18FSTNC12	Public Health Nutrition	4	3	1	0	4
4.	18FSTNC13	Computer Aided Diet Planning Practical	3	-	1	2	2
Elective Courses (One Course per semester) (E) (Optional)							
5.	18FSTNE05	Specialized Nutrition	4	3	1	0	4
5.	18FSTNE06	Nutritional Policies and Programmes	4	3	1	0	4
Supportive Courses (S) for other Department Students							
1.	18FSTNS01	Nutrition for the Community Practical	3	-	1	2	2
Online Courses (O)							
1.	18FSTNO03	Courses in online portal of SWAYAM	1	-	1	-	4 (Extra)
Experiential Learning (EL) Courses							
1.	18FSTNEL04	Visits to three MSSRF Community Nutrition Camp/UNICEF Nutrition Camp/Mid-Day Meal Unit/ICDS Unit etc. (self visit)	2 (Extra)	-	-	2	1 (Extra)
Innovative Learning (IL) Courses							
1.	18FSTNIL03	Part 3 Research – Nutrition and Health Care Process of the Community	3	-	1	2	2
On-the-Job Training (Skill Component) SC							
1.	18FSTNSC02	Sports Nutritionist (NSDC curriculum)	4	1	1	2	-
		Total	30	13	09	08	22+5 (Extra)

Note:- L- Lecture, T-Tutorial/Demonstration, P- Practical, C- Credit

Semester IV

S.No.	Course Code	Course Title	Hours/ week	L	T	P	C
Core Courses (C)							
1.	18FSTNC14	Clinical Nutrition I	4	3	1	-	4
2.	18FSTNC15	Clinical Nutrition II	4	3	1	-	4
3.	18FSTNC16	Biochemical Analysis Practical	3	-	1	2	2
4.	18FSTNC17	Computer Aided Clinical Nutrition Practical	3	-	1	2	2
5.	18FSTNC18	Innovation and Startup Practical	3	-	1	2	2
Elective Courses (One Course per semester) (E) (Optional)							

5.	18FSTNE07	Physiological Aspects of Nutrition	4	3	1	0	4
5.	18FSTNE08	Nutritional Epidemiology	4	3	1	0	4
Online Courses (O)							
1.	18FSTNO04	Courses in online portal of SWAYAM	1	-	1	-	-
Experiential Learning (EL) Courses							
1.	18FSTNEL05	Visit to three Health and Fitness Centres/ Naturopathy Unit/Nutraceutical Manufacturing Unit	2 (Extra)	-	-	2	1 (Extra)
2.	18FSTNEL06	Four Weeks Internship in Reputed Multi-specialty Hospitals (Summer Vocation)	Extra hours	-	-	30 days	2 (Extra)
Innovative Learning (IL) Courses							
2.	18FSTNIL04	Part 4 Research – Nutrition Care Process of an Individual	3	-	1	2	2
On-the-Job Training (Skill Component) (SC) Courses							
2.	18FSTNSC02	Sports Nutritionist (NSDC curriculum)	5	1	2	2	4
		Total	30	10	10	10	24 + 3 (Extra)

Note:- L- Lecture, T-Tutorial/Demonstration, P- Practical, C- Credit

Credit Calculation

Method of teaching	Hours	Credits
Lecture	1	1
Tutorial/Demonstration	1	1
Practical/Internship/On the job training/ self learning	2	1

Online Courses

The students are required to complete four mandatory courses – one course in each semester by registering in the online education portal (SWAYAM).

Elective Foundation Courses

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

Experiential Learning Courses

The students are required to undertake four industrial visit oriented courses each in one semester and two internship courses (second and fourth semester break) in a reputed food industry/organization/hospital/health centres mandatorily. On completion of the course, the students are required to submit a report. The departmental committee on the basis of certificate from host industry/organization, training report and viva voce will assess the student's performance and will be awarded Satisfactory/Unsatisfactory grade.

Innovative Learning Courses

The students have to do the research in the field of food product development and quality control in the first year and public health nutrition in the second year. The project will be done in the Department/National Laboratories/Relevant Industries.

On-the-Job Training Courses

The job specific qualification taught in every year as outcome based skill component is assessed by concerned Sector Skill Councils of NSDC or industrial partners by following the rules and regulations of NSDC and University. The separate certificate will be issued to the students in association with SSC and industry.

Co-Curricular Activities

1.Short –term Courses (Extra Credit Courses)

The students are required to undertake any two short term courses with minimum duration of 7 days (7x6 = 42hours) in the theme not covered in the syllabus.

S.No.	Short term course Code	Title of the course	Duration (Hours)	L	T	P	C
I year							
1.	18FSTNST01	Nutrition Labelling and Pamphlet Design	42	3	11	28	-
2.	18FSTNST02	Statistical Quality Control in Food Industries	42	3	11	28	-
II Year							
3.	18FSTNST03	Community Nutrition Intervention	42	8	19	15	-
4.	18FSTNST04	*In Vitro and In Vivo* Techniques in Nutrition Research	42	8	19	15	-

The modules for the short term courses are given in Appendix II. The modules will be updated according to the suggestion proposed by the experts handling the courses.

2. UGC – NET Coaching

The students have to undergo minimum five days coaching class in each semester on strategy to prepare for UGC – NET Examination.

3.Bridge Course

The first year students are instructed on curriculum framework, SWOT analysis of the Department and the comprehensive contribution of the students for the growth and famine of the Department as bridge course.

Extra-curricular Activities

The students have 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.

1. NSS/NCC/YRC camps and its competitions
2. Inter-institutional/Inter-departmental competitions
3. Personality Development programmes
4. Student Seminar
5. Placement training

6. IAS coaching class
7. Typewriting class
8. Language coaching class

Remedial Coaching

In order to improve the knowledge, skills and linguistic proficiency of 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 in rotation by all faculty in the Department as extra workload for teaching. The hour will be mentioned in the time table to motivate the students to attend the remedial classes.

Mentor-Mentee System

The students of Department of Food Science and Nutrition are supported by all faculties in the Department personally and professionally through mentor and mentee system under the umbrella of Youth Club. Faculties will guide the students on all aspects of Youth Club policies.

Both Mentor and Mentee will follow the guidelines of Youth Club. All students will become the member of the Youth Club, can forecast their activities to build their general graduate attributes.

CBCS – SCHEME OF EXAMINATIONS

Semester I

S.No.	Course Code	Course Title	Hours	I	E	T	C
Core Courses (C)							
1.	18FSTNC01	Food Science and Chemistry	3	25	75	100	4
2.	18FSTNC02	Food Processing Technology	3	25	75	100	4
3.	18FSTNC03	Research Methodology	3	25	75	100	4
4.	18FSTNC04	Food Science and Chemistry Practical	3	40	60	100	2
5.	18FSTNC05	Data Management and Statistics Practical	3	40	60	100	2
Elective Courses (One Course per semester) (E) (Optional)							
5.	18FSTNE01	Food Packaging Technology	3	25	75	100	4
5.	18FSTNE02	Instrumentation in Food Processing	3	25	75	100	4
Online Courses (O)							
1.	18FSTNO01	Courses in online portal of SWAYAM	3	-	100	100	-
Experiential Learning (EL) Courses							
1.	18FSTNEL01	Industrial Visit – minimum three industries (self visit)	3	S/US	-	S	1 (Extra)
Innovative Learning (IL) Courses							
1.	18FSTNIL01	Part 1 Research: Food Product Development and Quality Evaluation	3	40	60	100	2
On-the-Job Training (Skill Component) (SC) Courses							

1.	18FSTNSC01	Processed Food Entrepreneur (NSDC curriculum)	-	-	-	-	-
		Total	27	220	480	700	22+1 (Extra)

Note:- I- Internal, E-External, T- Total, C- Credit, S-Satisfactory, US - Unsatisfactory

Semester II

S.No.	Course Code	Course Title	Hours	I	E	T	C
Core Courses (C)							
1.	18FSTNC06	Food Microbiology and Preservation	3	25	75	100	4
2.	18FSTNC07	Food Safety and Quality Control	3	25	75	100	4
3.	18FSTNC08	Food Safety and Quality Control Practical	3	40	60	100	2
4.	18FSTNC09	Food Composition Analysis Practical	3	40	60	100	2
Elective Courses (One Course per semester) (E) (Optional)							
5.	18FSTNE03	Food Industries Waste Management	3	25	75	100	4
5.	18FSTNE04	Food Biotechnology	3	25	75	100	4
Supportive Courses (S) for other Department Students							
1.	18FSTNS01	Food Safety Management Practical	3	40	60	100	2
Elective Foundation (EF) Courses							
1.	18FSTNEF01	Human Rights (Self Study)	3	25	75	100	2 (Extra)
Online Courses (O)							
1.	18FSTNO02	Courses in online portal of SWAYAM	3	-	100	100	4 (Extra)
Experiential Learning (EL) Courses							
1.	18FSTNEL02	Visit to three Units with ISO systems; HACCP certification; implemented GMP and GHP (self visit)	3	S/US	-	S	1 (Extra)
2.	18FSTNEL03	Six Weeks Internship in Reputed Food Processing Industries (Summer Vocation)	3	S/US	-	S	2 (Extra)
Innovative Learning (IL) Courses							
1.	18FSTNIL02	Part 2 Research – Business Plan and Quality Assurance System for the New Product	3	40	60	100	2
On-the-Job Training (Skill Component) (SC) Courses							
1.	18FSTNSC01	Processed Food Entrepreneur (NSDC curriculum)	6	50	150	200	4

		Total	39	285	615	900	24+9 (extra)

Note:- I- Internal, E-External, T- Total, C- Credit, S-Satisfactory, US - Unsatisfactory

Semester III

S.No.	Course Code	Course Title	Hours	I	E	T	C
Core Courses (C)							
1.	18FSTNC10	Nutritional Biochemistry	3	25	75	100	4
2.	18FSTNC11	Nutrition in Life Cycle	3	25	75	100	4
3.	18FSTNC12	Public Health Nutrition	3	25	75	100	4
4.	18FSTNC13	Computer Aided Diet Planning Practical	3	40	60	100	2
Elective Courses (One Course per semester) (E) (Optional)							
5.	18FSTNE05	Specialized Nutrition	3	25	75	100	4
5.	18FSTNE06	Nutritional Policies and Programmes	3	25	75	100	4
Supportive Courses (S) for other Department Students							
1.	18FSTNS01	Nutrition for the Community Practical	3	40	60	100	2
Online Courses (O)							
1.	18FSTNO03	Courses in online portal of SWAYAM	3	-	100	100	4 (Extra)
Experiential Learning (EL) Courses							
1.	18FSTNEL04	Visits to three MSSRF Community Nutrition Camp/UNICEF Nutrition Camp/Mid Day Meal Unit/ICDS Unit etc. (self visit)	3	S/US	-	S	1 (Extra)
Innovative Learning (IL) Courses							
1.	18FSTNIL03	Part 3 Research – Nutrition and Health Care Process of the Community	3	40	60	100	2
On-the-Job Training (Skill Component) SC							
1.	18FSTNSC02	Sports Nutritionist (NSDC curriculum)	-	-	-	-	-
		Total	27	220	480	700	22+5 (Extra)

Note:- I- Internal, E-External, T- Total, C- Credit, S-Satisfactory, US - Unsatisfactory

Semester IV

S.No	Course	Course Title	Hours	I	E	T	C

.	Code						
Core Courses (C)							
1.	18FSTNC14	Clinical Nutrition I	3	25	75	100	4
2.	18FSTNC15	Clinical Nutrition II	3	25	75	100	4
3.	18FSTNC16	Biochemical Analysis Practical	3	40	60	100	2
4.	18FSTNC17	Computer Aided Clinical Nutrition Practical	3	40	60	100	2
5.	18FSTNC18	Innovation and Startup Practical	3	40	60	100	2
Elective Courses (One Course per semester) (E) (Optional)							
5.	18FSTNE07	Physiological Aspects of Nutrition	3	25	75	100	4
5.	18FSTNE08	Nutritional Epidemiology	3	25	75	100	4
Online Courses (O)							
1.	18FSTNO04	Courses in online portal of SWAYAM	3	-	100	100	-
Experiential Learning (EL) Courses							
1.	18FSTNEL05	Visit to three Health and Fitness Centres/ Naturopathy Unit/Nutraceutical Manufacturing Unit	3	S/US	-	S	1 (Extra)
2.	18FSTNEL06	Four Weeks Internship in Reputed Multi-specialty Hospitals (Summer Vocation)	3	S/US	-	S	2 (Extra)
Innovative Learning (IL) Courses							
2.	18FSTNIL04	Part 4 Research – Personalised Nutrition Care Process of an Individual	3	40	60	100	2
On-the-Job Training (Skill Component) (SC) Courses							
2.	18FSTNSC02	Sports Nutritionist (NSDC curriculum)	6	50	150	200	4
		Total	36	285	615	900	24 + 2 (Extra)

Note:- I- Internal, E-External, T- Total, C- Credit, S-Satisfactory, US - Unsatisfactory

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.

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.

Scheme for Evaluation and Attainment Rubrics

Evaluation will be done on a continuous basis and will be evaluated four times during the course work. The first evaluation will be in the 7th week, the second in the 11th week, third in the 16th week and the end – semester examination in the 19th week. Evaluation may be by objective

type questions, short answers, essays or a combination of these, but the end semester examination is a University theory examination with prescribed question paper pattern.

Attainment Rubrics for Theory Courses (K1, K2, K3, K4 and K5)
Internal *(Max. Marks - 25)*

- Activity documents in CO1, CO2, CO3, CO4 and CO5- 05 Marks
- Communication skill + ppt. upload – 05 Marks
- Internal Tests (K1 and K2) and Problem Solving Exercises (K3, K4, K5) - 10 (Each 5 Marks)
- Attendance - 05 marks

External *(Max. Marks - 75)*
Question Paper Pattern (Theory)

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 Rubrics for Lab Courses (K3, K4 and K5)
Internal *(Max. Marks-40)*

- Good Laboratory Practices - 05 Marks
- Standard Operating Procedure for one Equipment - 10 Marks
- Performance Evaluation - 10 Marks
- Internal Tests – 10 (Best two out of three tests: Each 05 Marks)
  Internal test components are
  - Initial procedure (5 marks)
  - Conduct of experiment (5 marks)
  - Result Analysis (5 marks)
  - Viva- Voce (5 marks)
- Attendance - 05 marks

External *(Max. Marks - 60)*
External test components are

- Initial procedure (5 marks)
- Conduct of experiment (10 marks)
- Result Analysis (10 marks)
- Viva- Voce (5 marks)

Student can perform two experiments (Each 30 marks)

Attainment Rubrics for Experiential Learning Courses/Industrial Visit (04) and Internship (02) (K4 and K5)
Internal *(Max. Marks – 50 for Industrial Visit and 50 for Internship)*
For Industrial visit/Internship, the continuous assessment (Internal) can be through

- First review- Identification of industries – 25% (10 marks)

- Second review- Visit certificate and documentation with industrial approval – 25% (10 marks)
- Third review – Report on visit - 50% (20 marks)

Evaluation criteria for Viva-Voce (Internal) can be on the basis of

- Subject knowledge (technical skills) - 50 % (30 marks)
- Analytical skills - 30 % (18 marks)
- Communication/Presentation skills - 20 % (12 marks)

Results are reported as satisfactory (secured 50% or more marks) or unsatisfactory (secured less than 50% marks)

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

Internal *(Max. Marks - 40)*

For Project/ Dissertation the continuous assessment can be through review seminars by project review committee of the Depart/ Centre

- First review- literature survey and problem identification – 25% (10 marks)
- Second review- Design methodology – 25% (10 marks)
- Third review: validation of model and documentation – 50% (20 marks)

External *(Max. Marks - 60)*

Evaluation criteria for Viva-Voce can be on the basis of

- Subject knowledge (technical skills) - 50 % (30 marks)
- Analytical skills - 30 % (18 marks)
- Communication/Presentation skills - 20 % (12 marks)

Attainment Rubrics for On-the-Job Training Courses/Skill Component (02) (K1, K2, K3 and K4)

Internal *(Max. Marks - 40)*

For NSDC QP, the continuous assessment can be through

- First review- Creation of Templates for Performance Criteria – 50% (20 marks)
- Second review- Activity based Self Learning – 25% (10 marks)
- Third review: – Internal Tests - 25% (10 marks)

External *(Max. Marks - 60)*

Evaluation criteria for external assessment by respective Sector Skill Council can be on the basis of

- Subject knowledge (Technical skills) - 30% (18 marks)
- Analytical skills - 30% (18 marks)
- Generic skills - 20% (12 marks)
- Communication/Presentation skills – 20% (12 marks)

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

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: 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: 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: 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: 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: 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: 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

Modules for the short term courses

Nutritional Labeling and Pamphlet Design (18FSNST01)

Objectives

1. To enable the students to design the nutrition label, pamphlets and advertisement pages using Corel Draw and Adobe Photoshop

Modules

Module	Sub Modules	L	T	P	Total hours
Corel Draw and Adobe Photoshop	Menus	1	2	3	6
	Tool boxes	1	2	3	6
	Keyboard shortcuts	1	1	1	3
	Designing visiting card	-	1	3	4
	Designing a certificate	-	1	3	4
	Designing an advertisement page	-	1	3	4
	Designing a food label	-	1	4	5
	Designing a nutrition label	-	1	4	5
	Designing a nutrition pamphlet	-	1	4	5
	Total	3	11	28	42

Outcome

1. Students can able to design a visiting card, invitation, certificate, advertisement pages – online and offline, food label, nutrition label and nutrition pamphlet.

Statistical Quality Control in Food Industries

Objectives

1. To update the practical knowledge of the students on *statistical applications in food quality control*

Modules

Module	Sub Modules	L	T	P	Total hours
Application of	Data entry in SPSS	1	3	3	7

SPSS, Design Expert and UnscramblerX softwares	Statistical tests using SPSS – Descriptive Statistics	1	3	3	7
	Statistical tests using SPSS – Testing of Hypothesis	1	3	3	7
	Design Expert Software applications	1	3	-	4
	Response Surface Methodology in Design Expert	1	-	7	8
	UnscramblerX software applications	1	-	3	4
	Drying kinetics using UnscramblerX	2	-	3	5
	Total	8	12	22	42

Outcome

1. Students can able to perform statistical calculation and experiments using SPSS, Design Expert and UnscramblerX softwares.

-Community Nutrition Intervention

Objectives

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

Modules

Module	Sub Modules	L	T	P	Total hours
Nutrition Intervention in a village	Selection of a village	1	1	3	5
	Baseline survey	1	1	3	5
	Household Nutrition Education	1	1	3	5
	Education to School teachers	-	1	3	4
	Education to PHC and ICDS workers	-	1	3	4
	Education to Children	-	1	3	4
	Education to Canteens, Petty shop owners, Street food vendors	-	1	4	5
	Education on entrepreneurship	-	1	4	5
	Report writing and measuring the outcome	-	1	4	5
	Total	3	9	30	42

Outcome

1. Students can able to do nutrition intervention in their own village

***In Vitro* and *In Vivo* Techniques in Nutrition (18FSNST04)**

Objectives

1. To update the practical knowledge of the students on *in vitro* and *in vivo* nutrient availability from any food item.

Modules

Module	Sub Modules	L	T	P	Total hours
In vitro techniques	*In vitro* starch digestibility	1	3	3	7

	In vitro protein digestibility	1	3	3	7
	In vitro iron bioavailability	1	3	3	7
In vivo techniques (Animal and Human Models)	Protein Efficiency Ratio	1	5	-	6
	Acute Toxicity Studies	1	5	-	6
	Glycemic Index and Load	1	-	3	4
	Role of animal and human ethical committee	2	-	3	5
	Total	8	19	15	42

Outcome

1. Students can able to perform *in vitro* analysis on starch, protein and iron and conduct *in vivo* experiments using animal and human system with ethical clearances.

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.

Course Name	Food Science and Chemistry	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC01	**Academic Year Introduced**	2018 - 19
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 balancing nutrients
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 andoils,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 L+Tu+Te=To
Colloidal System	To provide learning on types and application of colloidal system	10+3+1=14
Cereals, Millets and Pulses	To impart knowledge on science and cooking principles of different cereals, millets and pulses and its complementary role	10+3+1=14
Sugars, Fruits and Vegetables	To illustrate the types, science in cooking of sugar, fruits and vegetables	10+3+1=14
Egg and Fleshy Foods	To elaborate the science of egg, meat, poultry and fish on cooking in different medium	10+3+1=14
Milk, Fats and Oils, Spices and Beverages	To sketch the nature of milk protein, fats and oils, types of spices and non-alcoholic aromatic beverages	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-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	CO1	K1, F	Tabulate the nutrient rich food for each nutrient	K4, S1
2.	Colloidal System in foods- Types & Properties	CO1	K1, F	Exemplify the colloidal foods in our daily diet	K5, S1
3.	Sols- types and properties	CO1	K2, F	Exemplify the sols in our daily diet	K5, S1
4.	Gels-theory of gel formation and factors influencing gel formation	CO1	K2, F	Exemplify the gels in our daily diet	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 out examples of food foam in our daily life	K5, S1
7.	Hydrocolloids	CO1	K2, C	Sketch out 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
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&dextrinisation	CO2	K2, P	Differentiate the features of different principles of starch cookery	K4,S2

11.	Starch uses in food systems	CO2	K1,C	Exemplify the starch used in different food preparation	K5, S4
12.	Toxic constituents in pulses	CO2	K2,F	Compare the features of natural toxins present in pulses	K5,S4
13.	Factors influencing cooking quality of pulses	CO2	K2,C	Prepare the checklist on factors affecting cooking quality of various pulses	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 &flavours	CO3	K2,C	Tabulate the presence of pigments, enzymes, tannins, pectin, acids and flavours in fruits or vegetables	K3, S1
20.	Changes during the cooking, effect of cooking on pigments	CO3	K2, C	Demonstrate the effect of cooking on pigments in fruits or vegetables	K3, S1
21.	Browning reaction in fruits and vegetables	CO3	K1, F	Catalogue the type of browning in fruits and vegetables	K4, S1
22.	Ripening of fruits	CO3	K1, F	Criticize on different ripening agents	K4, S4
UNIT IV: Egg,Poultry,Meat and Fish					
23.	Egg - structure, composition	CO4	K1,F	Sketch the types of egg in the market	K3,S1
24.	Coagulation of egg protein, Factors effecting coagulation of egg protein, egg quality	CO4	K2, P	Schematize the steps in coagulation of egg protein; Experiment the egg quality using any one method	K4, S1
25.	Meat- structure, composition	CO4	K1, F	Tabulate the type of protein present in meat	K3,S1
26.	Postmortem changes, tenderness of meat, changes during cooking	CO4	K2, P	Sketch out the tenderizers in meat preparation	K4, S1
27.	Poultry & fish- classification, composition, structure	CO4	K1, F	Picturize the types of poultry and fish	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	CO5	K2, C	Practice the experiments on effect of various agents on milk	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	Sketch the brands of oil and its composition	K3,S2
32.	Effects of heating on fat	CO5	K2, C	Theorize the effect of repeated use of an oil	K4, S4
33.	Rancidity & its prevention	CO5	K2,C	Conclude the preventive measure for rancidity	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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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

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

Course Name	Food Processing Technology	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC02	**Academic Year Introduced**	2018 - 19
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:	Apply the acquired knowledge for manufacturing of sugar, starch isolate and modified starch and define the appropriate techniques for processing of 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 L+Tu+Te=To
Cereals, Millets and Pulses/legumes	To interpret the various steps and techniques involved in milling and processing of cereals, millets and pulses/legumes	10+3+1=14
Milk and Egg	To familiarize with different equipments and technologies applied in an egg and dairy plant and conversion into value added products	10+3+1=14
Fleshy Foods and Oilseeds	To illustrate the concepts involved in the processing of fleshy foods and oil seeds	10+3+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	10+3+1=14
Sugar, Starch and Spices	To impart the knowledge of raw sugar manufacturing, isolation and modification of starch and processing of spices	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-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	Differentiate the breakfast cereals from puffed and flaked cereals with examples	K3, S3
4.	Processing of millets	CO1	K2, P	Explore the different types of millets of Indian origin	K4, S5
5.	Pulse/legume processing– milling and germination	CO1	K2, P	Schematise the ways to enrich the nutrients in pulses/legumes and ways to reduce the antinutritional factors @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 protocol in milk collection centre, milk processing industry	K4, 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

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 – manufacturing of egg powder	CO2	K2, P	Extrapolate the GMP for the manufacture of egg powder	K3, S1
UNIT - III: Fleshy Foods and Oilseeds					
9.	Fleshy food processing – preprocessing, canning, dehydro freezing, dehydration of meat, poultry and fish, smoking and curing of meat, fish oil extraction	CO3	K2, P	Systematic literature review presentation on processing and preserving techniques of fleshy foods and criticize the pros and cons	K6, S2
10.	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
11.	Specialty fats from non-traditional oilseeds, modification of fat, fat substitutes and replacers and fat mimetics	CO3	K1, C	Specify the application of fat mimetics, replacers and other non-conventional fat sources	K3, S2
UNIT – IV: Fruits, Vegetables and Plantation Products					
12.	Fruits and Vegetables Processing– preprocessing, drying and dehydration, juices extraction, concentrates preparation, Minimal processing and Hurdle technology	CO4	K2, P	Demonstrate the processed products of fruits and vegetables and explain its processing protocol	K3, S2
13.	Production of mushroom and its processed products.	CO4	K2, P	Differentiate edible and non-edible mushrooms	K4, S4
14.	Plantation products processing-Processing of coffee, tea leaves and cocoa beans	CO4	K2, P	Document on coffee, tea and cocoa based beverages in the world with preparation	K6, S4
UNIT V: Sugar, Starch and Spices					
15.	Sugar – Manufacturing of sugar from sugarcane and palm, sugar cubes and powdered sugar	CO5	K2, P	Prepare a scrapbook on natural sweeteners	K5, S4
16.	Starch – Starch isolation, modification of starch	CO5	K2, C	Schematise the type of starch in foods	K6, S2
17.	Manufacturing of food Hydrocolloids – CMC and gaur gum	CO5	K1, C	Exemplify the industrial application of hydrocolloids	K5, S1
18.	Spices Technology - Extraction of essential oils - oleoresin and colors	CO5	K2, P	Design a pamphlet describing its health benefits	K5, S3

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Course Name	Research Methodology	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC03	Academic Year Introduced	2019-20, IV Semester
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
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 L+Tu+Te=To
Research Process	To illustrate the types of research and steps in research process	10+3+1=14
Conceptualizing the Research Problem	To define research problem from research ideas	10+3+1=14
Research Design	To categorize and discriminate research designs in food science and nutrition research	10+3+1=14
Research Methods and Data Collection	To learn and compare various methods of sampling, collection and valid measurement of data	10+3+1=14
Processing of Data and writing a research report	To infer and experiment the processing and representation of data in a research report	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-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	Explore the research opportunities in food science, technology and nutrition	K3, S1
2.	Purpose of research	CO1	K2, C	Exemplify the purpose of research	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	Map the difference between quantitative and qualitative research in the eight steps of research process	K4, S3
Unit II: Conceptualizing the Research Problem					
5.	Conceptualization of research – from ideas to action	CO2	K2, C	Develop the theoretical framework for a recent issue in the field of Food Science, Technology and Nutrition	K6, S3
6.	Reviewing the literature	CO2	K2, F	Schematize the systematic literature review for a research title with the list of key words used for search	K6, S3
7.	Formulating the research problem	CO2	K2, MC	List the problems in the field of food science, technology and nutrition to be solved	K4, S4
8.	Identifying variables and constructing the hypothesis	CO2	K2, C	• Differentiate research question, objectives and hypothesis • Identify the variables from a research question • Formulate hypothesis from research objectives	K6, S5
UNIT III: Research Design					

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.	Qualitative Research Designs – key features, uses and limitations	CO3	K1, C	Criticize a research article adopted qualitative research design	K5, S4
10.	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 given research article	K4, S4
11.	Quantitative Research Designs – key features, uses and limitations	CO3	K1, C	Criticize a research article adopted quantitative research design	K5, S4
12.	Experimental and non-experimental research design	CO3	K1, C	Differentiate the experimental and non-experimental research	K4, S1
13.	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
14.	Cross sectional and longitudinal studies	CO3	K1, F	Compare the features of cross sectional and longitudinal study	K4, S1
15.	Epidemiological methods	CO3	K1, F	Audit the advancement in studying nutrition epidemiology	K4, S3
UNIT IV: Research Methods and Data Collection					
16.	Research methods in food science and technology research– Good Laboratory Practices	CO4	K1, P	Demonstrate GLP among peer learners	K4, S4
17.	Standard Operating Procedures (SOP) for laboratory experiments	CO4	K2, P	Frame the SOP for operation of equipments and food quality evaluation procedure	K6, S5
18.	NABL accredited laboratory	CO4	K2, F	Visit an NABL Accredited Laboratory and Report it	K5, S5
19.	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 and validate it • Exemplify the GCP in nutrition counselling centre	K6, S3
20.	Primary and secondary data, construction of the research tools	CO4	K2, C	Conduct a pilot survey for pre-testing of questionnaire in the class room	K5, S5
21.	Reliability and validation of research tools, pilot testing	CO4	K2, C	Validate the pretested questionnaire using a discussion forum	K5, S3
22.	Sampling design – principles of sampling, sampling terminology	CO4	K2, C	Identify the sampling method for a research problem	K3, S2
23.	Types of sampling and calculating the sample size	CO4	K2, C	• Calculate the sample size for a nutrition survey • Frame the informed consent form and validate	K4, S3
24.	Ethical issues in data collection	CO4	K2, F	List the ethical issues in each step of research process	K5, S1
UNIT V Processing of Data and writing a research report					
25.	Editing and coding the data	CO5	K1, C	Code a Nutrition data of your choice	K4, S3
26.	Organization of data- Classification, meaning and objectives, types of classification	CO5	K1, C	Classify the given data	K4, S1
27.	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
28.	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
29.	Format of research report, different referencing system and writing the bibliography	CO5	K2, C	Analyze the reference and bibliography in a research article	K4, S3

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Journals and Documents

1. Annals. Food Science and Technology, Valahia University Press

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.	Food Science and Human Wellness, Beijing Academy of Food Sciences
3.	Journal of Food, Agriculture and Environment, WFL Publisher Ltd.
4.	Sustainability, Agri, Food and Environmental Research, Universidad Catolica de Temuco
5.	Journal of Innovation and Entrepreneurship, Springer
6.	The Journal of Global Entrepreneurship Research, Springer
7.	Journal of Food Science and Technology, Springer Natural

Course Name	Food Science and Chemistry Practical	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC04	**Academic Year Introduced**	2018 - 19
Type of Course	Practical	**Semester**	I

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	Determine the colloidal nature, chemical nature and content of gluten, pectin and casein in respectable 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 Tu+P+Te=To
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+8+3 = 12
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+3 = 6
Total Hours of Instruction		54 (18x3)

Tu-Tutorial, P-Practical, Te-Tests, To-Total Hours

COURSE PLAN

Module /Experiment 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	CO2	K4, P	Demonstrate the gelatinization and retrogradation properties of the given sample using DSC	K3, S1
6	Pasting properties of cereal / pulse flour	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					

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

10.	Smoking point of oil	CO1	K4, P	Justify the reason for changes in smoking point of different oil and used oils	K4, S4
11.	Iodine number of oil	CO1	K4, P	Compare the iodine number of different oil and used oils	K5, S4
12.	Saponification number of oil	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	Identify the fruits rich in pectin content	K6, S3
Module VII: Food Pigments					
14.	Effect of cooking and pre processing on pigments in fruits and vegetables	CO2, CO3	K4, P	Define the best method of cooking and pre processing to preserve pigments in fruits and vegetables	K6, S4
Module VIII: Phytochemicals and Enzymes					
15.	Polyphenolic compounds and 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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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.
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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	18FSTNC05	**Academic Year Introduced**	2018 - 19
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 Tu+P+Te=To
Processing of data	To understand and apply the guidelines to edit, code, tabulate and organize the collected data	1+8+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	4+8+0 = 12
Correlation and Regression	To apprehend the role of correlation and regression in predicting the nature of collected data	1+8+3 = 12
Forecasting and Time Series Analysis	To perceive the application of forecasting and time series analysis in food industries	1+8+0 = 9
Statistical Quality Control	To realize the need for statistical quality control in food processing industries	1+5+0 = 6
Total Hours of Instruction		54 (18x3)

Tu-Tutorial, P-Practical, Te-Tests, To-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

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

Module IV: Correlation and Regression					
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: Forecasting and Time Series Analysis					
13.	Forecasting models	CO3	K4, P	Forecast the critical control point in a food operation over a period of time in Excel	K6, S3
14.	Components of time series analysis	CO3	K4, P	Analyze and report the changes in the critical control point in a day using time series analysis in Excel	K4, S4
Module VI: Statistical Quality Control					
15.	Sampling plan	CO3	K4, P	Visit an industry with automation of 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	K3, S3

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2	Shukla, S.M. and Sahai, S.P. (2017), Statistical Methods, Sahitya Bhawan Publications.
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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
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4	Pagadala Suganda Devi (2017), Research Methodology: A Handbook for Beginners, Notion Press, Chennai
5	Vijayalakshmi Ponnuraj and Sivaprakasam, C. (2008), Research Methods: Tips and Techniques, MJP Publishers
6	Anantarayanan Raman and Jayashree Nimmagadda, (2006), A Handbook of Research Process, Macmillan Publishers.
JOURNALS AND DOCUMENTS	
1	Annals. Food Science and Technology, Valahia University Press
2	Food Science and Human Wellness, Beijing Academy of Food Sciences
3	Journal of Food, Agriculture and Environment, WFL Publisher Ltd.
4	Sustainability, Agri, Food and Environmental Research, Universidad Catolica de Temuco
5	Journal of Innovation and Entrepreneurship, Springer
6	The Journal of Global Entrepreneurship Research, Springer
7	Journal of Food Science and Technology, Springer Natural

Course Name	Food Packaging Technology	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNE01	Academic Year Introduced	2018 - 2019
Type of Course	Theory	Semester	I

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	recall the history, functions and requirements of packaging
CO2:	classify types of packaging materials, define its properties and apply the concept in food industry
CO3:	select and design specific packaging material for specific food products
CO4:	test the different packaging material using standard methods and compare the results with packaging standards
CO5:	apply the recent trends in food packaging systems and equipments for packaging of food products

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 L+Tu+Te=To
History, Functions and Requirements of Packaging	To understand the historical development, basic functions and need for a food package	10+3+1=14
Types of Packaging Materials	To familiarize with different types of packaging materials and its applications	10+3+1=14
Package Design for Different Food Products	To learn the concepts in designing packaging materials suitable for various food products	10+3+1=14
Testing Procedures for Food Packaging Materials/Packaged Foods and Laws and Regulations	To gain knowledge and skills about the testing procedures and comparison standards of packaging materials	7+6+1=14
Packaging Equipments and Systems	To acquire professional knowledge about packaging equipments and recent trends in food packaging systems	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN

Unit/Chapters	Intended Learning Chapters	CO(s) Mapped	Cognitive Level/KD	Psychomotor domain activities	Psychomotor domain level
UNIT I: History, Functions and Requirements of Packaging					
1.	Historical background	CO1	K1, F	List the packaging materials used in ancient times	K3, S3
2.	Importance and scope of food packaging	CO1	K2, F	Enlist the scope of food packaging	K4, S3
3.	Functions of food packaging	CO1	K3, C	Infograph the functions of food packaging	K5, S4
4.	Requirements for effective food packaging	CO1	K2, C	Identify the requirements for an effective food package	K6, S1
	Graphics, Package Design	CO1	K3, F	Apply a graphic design for any one food package	K3, S1
	Printing and Labelling	CO1	K2, F	Point out the FSSAI mandatory requirements of labelling	K3, S1
	Main printing processes	CO1	K3, F	Report on the various printing methods applied on a food package	K4, S4
	Printing inks, varnishes	CO1	K3, C	Picturize the inks and varnishes used in food packaging	K5, S3
	Adhesives and labels	CO1	K2, F	Explicit the types of adhesives in sticking a label on the food package	K5, S1
UNIT II: Types of Packaging Materials					
5.	Paper and paper-based materials - Corrugated fiber board (CFB), Injection molding and blow molding	CO2	K1, F	Collect and discuss the different paper-based packaging materials in use	K4, S1
6.	Plastics: types of plastics and their properties, co-extrusion, lamination,	CO2	K2, P	Differentiate degradable, non degradable and edible plastics with examples	K5, S1

	biodegradable plastics and edible packaging and its bio-composites				
7.	Environmental concerns - recycling and disposal of packaging waste	CO2	K2, C	Discuss the salient features of FSSAI regulations on environmental concern on food package by each industry	K5, S1
8.	Metals: Tinplate, tinning process, components of tinplate, tin free can (TFC), types of can metallic films, lacquers	CO2	K2, C	Exemplify the different metals used in food market	K5, S1
9.	Glass: composition, properties, methods of bottle making, types of closures	CO2	K2, C	Exhibit the type of food packed in glass containers with different type of closures	K3,S1
UNIT III: Package Design for Different Food Products					
10.	Package design for fresh horticultural produce	CO3	K2, C	Summarize the type of package applied for packaging the fresh horticultural produce	K4, S3
11.	Package design for dry foods	CO3	K2, C	Demonstrate the dry food packages	K5,S4
12.	Package design for animal foods	CO3	K1, F	Justify the package design applied for packing animal foods	K6,S1
13.	Package design for moisture sensitive foods	CO3	K1, F	Discuss the qualities of package used to pack moisture sensitive foods	K3, S1
14.	Package design for frozen foods	CO3	K1, F	Illustrate the packages used to pack frozen foods	K3, S1
15.	Package design for fats and oils	CO3	K2, P	Sketch the mandatory specifications for selecting a package for fats and oils	K4, S1
16.	Package design for thermally processed foods	CO3	K1, F	Describe the salient features of any one package used to pack RTC foods	K4, S4
17.	Package design for carbonated beverages and non-carbonated beverages	CO3	K2, P	Pictographically represent the packages for beverages exist in the market	K5, S4
UNIT IV: Testing Procedures for Food Packaging Materials, Packaged Foods and Laws and Regulations					
18.	Testing Procedures for Packaging Materials - thickness, tensile strength, puncture resistance, bursting strength, seal strength, water vapor permeability, CO2 permeability, oxygen permeability, and grease resistance	CO4	K1, F	Define and demonstrate the testing procedure for any one food packaging material	K4, S2
19.	Testing procedures for packaged foods	CO4	K1, F	Mention any two agencies involved in testing of packed foods	K5, S3
20.	Compatibility and shelf life studies	CO4	K1, F	Design the protocol to test the compatibility and shelf stability of a packed food product	K6, S2
21.	Evaluation of transport worthiness of filled packages	CO4	K2, F	Identify the methods used to evaluate the worthiness of any one food package during transportation	K5, S4
22.	Food Packaging Laws and Regulations	CO4	K2, C	Discuss the salient features of FSSAI packaging regulations	K2, S1
UNIT V: Packaging Equipments and Systems					
23.	Packaging equipments - bottling machines, cartooning systems, seal and shrink-packaging machine, form, fill and sealing machine (FFS)	CO5	K1, F	Capture and present the video on operation of any four equipments used in packaging of food in a food industry	K4, S1
24.	Packaging Systems - vacuum packaging systems, controlled and modified atmosphere packaging systems, aseptic packaging systems, retort packaging, active and intelligent packaging systems	CO5	K1, F	Distinguish the various types of food packaging systems with suitable infographics	K6, S1

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4	Ahvenainen, R. (Ed.). (2003), Novel Food Packaging Techniques. Elsevier.
5	Cerqueira, M. A. P. R., Pereira, R. N. C., da Silva Ramos, O. L., Teixeira, J. A. C., & Vicente, A. A. (2017), Edible food packaging: Materials and processing technologies. CRC Press.
JOURNALS AND DOCUMENTS	
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

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

4	Journal of Food, Agriculture and Environment, WFL Publisher Ltd.
5	Natural Products and Bioprospecting, Springer.

Course Name	Instrumentation in Food Processing	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNE02	Academic Year	2018 - 2019
Type of Course	Theory	Semester	I

COURSE OUTCOMES:

On completion of the course, the students will be able to	
CO1	understand the concept of unit operations of food processing, transport and storage equipments
CO2	spelt the principle and applications of processing and separation equipments in food industry
CO3	distinguish the principle and applications of the various heat transfer equipments used in food operation
CO4	comprehend the technical operation of the food processing equipments used in mass transfer process
CO5	twig the application of high end novel food processing and packaging equipments with quality assurance

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	2	-	1	1	2	1	1	2
CO2	3	1	1	2	2	-	1	2	3	2	2	2
CO3	3	1	1	2	2	-	1	2	3	2	2	2
CO4	3	1	1	2	2	-	1	2	3	2	2	2
CO5	3	1	2	3	3	2	1	2	3	2	2	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module Title	Objectives	Hours of Instruction L+Tu+Te=To
Unit Operations, Transport and Storage Equipments	To learn the food processing operations, transport and storage of perishable, non-perishable and semi perishable foods	10+3+1=14
Processing and Separation Equipments	To understand the role of processing and separation equipments in a food business operation	10+3+1=14
Heat Transfer Equipments	To study the different type of heat transfer equipments and its functions	10+3+1=14
Mass Transfer Equipments	To learn the importance and operating procedure of the mass transfer equipments	10+3+1=14
Equipments for Novel Food Processes and Packaging	To familiarize the role of novel equipments in advanced food processing and packaging technology	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN:

Unit/Chapters	Intended Learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activities	Psychomotor domain level
UNIT I: Unit Operations, Transport and Storage Equipments					
36.	Classifications; design and selection of food processing equipments	CO1	K2, C	Enlist the equipments used in various units of processing of any one food product	K2, S1
37.	Mechanical transport equipments - pumps, process piping and valves, conveyors	CO1	K2, C	Solicit the equipments used to transport products in continuous operation of a food processing unit	K3, S1
38.	Food storage equipments – solid and liquid food storage equipments	CO1	K2, C	Prepare a video presentation on food storage equipments in any one food operation	K6, S1
UNIT II: Processing and Separation Equipments					
39.	Processing equipments - peelers, dehullers / dehuskers, size reduction- slicers/ dicers, mincers, cutters, crushers and grinders; size enlargement- agglomerators, homogenizers and mixers	CO1	K2, C	Develop a e-content on principle, application and ISI technical specifications of any one food processing equipment	K3, S1
40.	Separation equipments – sorters, separators – solid /solid separators, solid / liquid separators.	CO1	K2, C	Conduct a systematic literature review on various models of separation equipments used in any one food processing operation	K5, S4
UNIT III: Heat Transfer Equipments					
41.	Heat transfer equipments – heat exchangers	CO2	K2, C	Prepare and display the SOP for the operation of any one heat transfer equipments	K3, S2
42.	Heat generation equipments- microwave oven, omhic heating system, infrared emitters	CO2	K2, C		

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

43.	Food evaporation equipments- evaporators	CO2	K2, C		
44.	Thermal processing equipments – blanchers, sterilizers and pasteurizers	CO2	K2, C		
Unit-IV Mass Transfer Equipments					
45.	Distillers, extraction and leaching equipments, gas and liquid absorption equipments, adsorption and ion exchange equipments, crystallizers	CO3	K2, C	Define the role of any one mass transfer equipments in various food operations through interactive video presentation	K5, S1
46.	Food dehydration equipment- dryers	CO3	K2, C		
47.	Refrigeration and freezing equipments – refrigerators, freezers, thawers, freeze driers or lyophilizers	CO3	K2, C		
Unit-V Equipments for Novel Food Processes and Packaging					
48.	Membrane separation equipment, irradiation system, extruders, fermenters	CO4	K2, C	Select an equipment and describe the manufacturing protocol to prepare any one value added product	K5, S4
49.	Pulse electric field processing equipment, high pressure processing equipment, pulsed light processing equipment	CO4	K2, C	Find the feasible application of any one novel processing equipment in a medium scale industry	K5, S1
50.	Instrumentation and control for food quality assurance	CO4	K2, C	Design a process flow for a quality assurance in a food production unit	K6, S3
51.	Fillers, closures, sealers, wrappers, aseptic packaging equipment and palletizers	CO5	K2, C	Exhibit the upgradation to be made in a food packaging equipment according to the packaging material	K6, S5

REFERENCES

TEXT BOOKS	
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2.	Kress-Rogers, E. and Brimelow, C.J.B. (2001), Instrumentation and Sensors for the Food Industry, 2nd Edition, Woodhead Publishing
3.	Tarleton, S., & Wakeman, R. (2006), Solid/liquid Separation: Equipment Selection and Process Design, Elsevier.
4.	Tothill (Editor), (2003), Rapid and On-line Instrumentation for food Quality Assurance (Woodhead Publishing Series in Food Science, Technology and Nutrition), First Edition, Woodhaed Publishing.
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1.	Cheremisinoff, N. P. (2000). Handbook of Chemical Processing Equipment. Elsevier.
2.	Peter Zeuthen and LeifBogh – Sorensen, (2003), Food Preservation Techniques, Woodhead publishing ltd.
3.	George D. Saravacos and Athanasios E. Kostaropoulos (2002), Handbook of Food Processing Equipment, Kluwer Academic /Plenum publishers.
4.	Erika Kress-Rogers and Christopher J.B. Brimelow (2001), Instrumentation and Sensors for the Food Industry, A volume in Woodhead Publishing Series in Food Science, Technology and Nutrition.
5.	Zeuthen, P., & Bøgh-Sørensen, L. (Eds.). (2003). Food Preservation Techniques. Elsevier.
JOURNALS AND DOCUMENTS	
1.	Food Control, Elsevier
2.	Critical Reviews in Food Science and Nutrition, Taylor & Francis

Course Name	Food Product Development and Quality Evaluation	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNIL01	**Academic Year Introduced**	2018 - 19
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 Instruction Tu+P+Te=To
Concept Development	To learn the design thinking process to develop 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)

Tu-Tutorial, P-Practical, Te-Tests, To-Total Hours

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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WEB REFERENCES	
1	https://bit.ly/30GcCBI, https://bit.ly/30DtEjZ, design thinking process – Stanford D school format, https://stanford.io/3ePItVD,; https://static.wixstatic.com/media/87ae64_969a463e789349a7bd95bbf888590032.jpg, https://empathizeit.com/wp-content/uploads/2019/06/dschool_ProcessHexDiagram_Tool_Behaviors_final_2019.png, https://www.smartsheet.com/sites/default/files/IC-defining-your-product-questionnaire.pdf, accessed on 23.07.2020
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
3	https://online.visual-paradigm.com/de/diagrams/templates/process-flow-diagram/food-manufacturing/, process flow preparation templates preparation software, accessed on 23.07.2020
4	Nutrify India Now App (NIN ICMR) installation through google playstore, https://bit.ly/32H5OGK, 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

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

Course Name	Food Microbiology and Preservation	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC06	**Academic Year Introduced**	2018 – 19
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 L+Tu+Te=To
Food microbiology and hazard	To learn morphology of microorganisms in food, growth of microorganisms in food	10+3+1=14
Microbial food contamination and 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+3+1=14
Microbial food contamination and control (non-perishable foods)	To understand the role of processing and preservation in controlling the microbial contamination	10+3+1=14
Industrial microbiology	To eliminate the root cause of food poisoning and food intoxication	10+3+1=14
Isolation and detection of microorganisms in food	To familiarize the techniques in isolation, detection and exposure assessment of microorganisms in food	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-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	K1F	Collect information about the recent developments in food microbiology and compare it with historical one	K6,S2
2.	Classification of micro organisms based on its cellular characteristics: prokaryotes and eukaryotes	CO1	K2C	Create a chart work depicting the difference between prokaryotes and eukaryotes	K6,S2
3.	Classification of micro organisms	CO1	K2C	Create a pictorial representation of microbes show casing its morphology	K6,S2
4.	Sources of microorganisms in foods	CO1	K2F	Point out the sources of microbes from food and non food sources	K4,S1
5.	Microbial growth and its growth curve	CO1	K1C	Illustrate the growth curve of a micro organism differentiating all the four phases	K4,S2
6.	Factors affecting growth-intrinsic and extrinsic factors	CO1	K2C		
7.	Controlling growth of microorganisms.	CO1	K2C		
UNIT II: Microbial food contamination and control (Perishable and semi-perishable foods)					
8.	Spoilage of milk and microbes responsible for it	CO2	K2C	Visit nearby dairy, slaughter house or store and enlist the spoilage indications you have observed in foods. Discuss it with your peer group	K5,S3
9.	Spoilage of meat and microbes responsible for it	CO2	K2C		

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

10.	Spoilage of fish and microbes responsible for it	CO2	K2C		
11.	Spoilage of various plant products and microbes responsible for it	CO2	K2C		
12.	Spoilage of canned foods	CO2	K2C		
13.	Microbiological criteria of foods and their significance	CO2	K2F	Predict the permissible limits of microbes in water and soil	K3,S1
14.	HACCP system used in controlling microbiological hazards	CO2	K3P	Illustrate a HACCP plan for any one food item	K3,S3
15.	Food safety used in controlling microbiological hazards	CO2	K3P	List the food safety practices to be followed in an industry	K1,S1
16.	Applications of hurdle technology for controlling microbial growth	CO2	K3C	Identify incidences in food industries where lack of knowledge on hurdle technology affects the quality of food	K4,S1
Unit III: Microbial food contamination and control (non-perishable foods)					
17.	Effects of food preservatives in microbial load	CO3	K2C	Distinguish the preservation techniques with appropriate pictures.	K6,S4
18.	Effects of heat process techniques in arresting microbial growth	CO3	K2C		
19.	Effects of irradiation in arresting microbial growth	CO3	K2C		
20.	Effects of low temperature storage in controlling microbial growth	CO3	K2C		
21.	Non destructive method of preservation – High pressure processing	CO3	K2C	Collect videos on working of non destructive preservation methods and discuss it	K6,S1
22.	Non destructive method of preservation – pulse electric field	CO3			
23.	Non destructive method of preservation – pulse light field	CO3			
24.	Non destructive method of preservation – ultrasound	CO3			
25.	Modified atmosphere packaging, Controlled atmosphere packaging and Vacuum packaging	CO3	K2C	Identify the products in market which are packed in MAP, CAP	K4,S1
26.	Control of water activity and microbial growth	CO3			
Unit IV: Industrial microbiology					
27.	Food microbiology and public health	CO4	K2C	Compare and contrast food poisoning and food intoxication	K5, S2
28.	Definition of food poisoning and its types	CO4	K2C		
29.	Bacterial agents of food borne illness – food borne pathogens and producers of food borne toxins	CO4	K2C		
30.	Food poisoning by Clostridium, Salmonella, E.coli	CO4	K2F	Identify the reported incidences of food poisoning caused by bacteria	K4,S1
31.	Food poisoning by Bacillus, Staphylococcus and Streptococcus	CO4	K2F		
32.	Non-bacterial agents of food borne illness - poisonous algae	CO4	K2F	Summarize the incidences on food borne illness by algae and fungi	K5, S1
33.	Non-bacterial agents of food borne illness - poisonous fungi	CO4	K2F		
Unit V: Isolation and detection of microorganisms in food					
34.	Indicator microorganisms	CO5	K2C	Predict the indicator organisms to estimate water quality	K3,S1
35.	Methods of isolation and detection of microorganisms or their products in food - conventional methods	CO5	K2C	Perform these isolation techniques with the help of experts in a laboratory	K3S1
36.	Methods of isolation and detection of microorganisms or their products in food: rapid methods (newer techniques) - immunological methods	CO5	K2C		
37.	Methods of isolation and detection of microorganisms or their products in food – fluorescent antibody	CO5	K2C		
38.	Methods of isolation and detection of microorganisms or their products in food - radio immunoassay	CO5	K2C		

39.	Methods of isolation and detection of microorganisms or their products in food - ELISA, PCR	CO5	K2C		

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2	Banwart, G.J. (1997), Basic Food Microbiology, CBS Publishers
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REFERENCE BOOKS	
1	Adam, M.R & Moss, M.O. (1995), Food Microbiology, New AGE international [P] Limited Publishers
2	Corry, J. E., Curtis, G. D., & Baird, R. M. (Eds.). (2011). Handbook of culture media for food and water microbiology. Royal Society of Chemistry.
3	Stanier, R.Y. (1996) General Microbiology, MacMillan Publications, Fifth Edition
4	Da Silva, N., Taniwaki, M. H., Junqueira, V. C., Silveira, N., Okazaki, M. M., & Gomes, R. A. R. (2018). Microbiological examination methods of food and water: a laboratory manual. CRC Press.
5	McLandsborough, L. (2017). Food microbiology laboratory. CRC Press.
JOURNALS AND DOCUMENTS	
1	International Journal of Food Microbiology, Elsevier
2	Advanced in Applied Microbiology, Elsevier

Course Name	Food Safety and Quality Control	Programme Name	M.Sc. Food Science Technology and Nutrition
Course Code	18FSTNC07	Academic Year Introduced	2018 - 19
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 particular food industry
CO3:	select particular food safety and quality management system for food industries
CO4:	familiarize the various sampling and statistical quality control methods and its applications in food industries
CO5:	apply the acquired knowledge in sensory evaluation of foods

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 L+Tu+Te=To
Food safety and quality	To understand and explain the importance of food safety and quality	10+3+1=14
Quality Assurance in Food industry	To familiarize with different quality assurance systems followed in food industry	10+3+1=14
Food Quality Management System	To infer the various food quality management systems and quality norms of FSSAI	10+3+1=14
Sampling and Statistical Quality Control	To adapt and interpret sampling and statistical quality control techniques	10+3+1=14
Sensory evaluation	To take part in sensory analysis of foods	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN

Unit/Chapters	Intended learning Outcomes	CO(s) Mapped	Cognitive Level /KD	Psychomotor domain activity	Psychomotor domain level
UNIT I: Food safety and quality					
1.	Principles of quality control and safety	CO1	K1, F	Recall the principles of food safety	K4, S1
2.	need of quality control and safety	CO1	K2, F	Distinguish between quality and safety	K5, S1
3.	strategy and criteria for food safety	CO1	K3, C	Identify the criteria used to analyze the food safety	K5, S1
4.	Quality Standards – mandatory standards	CO1	K2, C	List the mandatory food safety standards	K5, S1
5.	Quality Standards - optional standards	CO1	K3, F	Identify the need of optional quality standards	K4, S1
6.	Consumer lifestyle	CO1	K2, F	State the purpose of food safety in consumer point of view	K5, S1
7.	Consumer demand	CO1	K2, C	Recite the demand of consumer in terms of quality of food products	K5, S1
8.	issues in food safety	CO1	K3, F	Identify any two recent issues in food safety	K5,S4
9.	food traceability	CO1	K3, C	State the different methods used to trace the food products	K3,S1
10.	food recall	CO1	K2, F	Point out the different methods of recalling of food products	K6, S4
UNIT II: Quality Assurance in Food industry					
11.	Objectives, importance and functions of quality control	CO2	K1, F	Point out any four functions of quality control	K3, S3
12.	Concept of Quality Assurance and Quality Control	CO2	K2, C	State the demerits of quality assurance	K4, S3
13.	Quality Control procedures, Quality Assurance procedures	CO2	K2, P	Distinguish between quality control and assurance	K5,S4
14.	Organizational structure and functions of United States Food and Drug	CO2	K1,C	List the agencies in regulating food safety	K6,S1

	Administration (USFDA), Global Food Safety Initiative (GFSI)				
15.	International Consultative Group on Food Irradiation (ICGFI)	CO2	K2,F	Identify the functions of ICGFI	K3, S1
16.	European Food Safety Authority (EFSA)	CO2	K2,C	Tabulate any two importance of EFSA	K3, S1
17.	British Retail Consortium (BRC) global standards	CO2	K2,C	Recall any four global food safety standards	K4, S1
18.	Codex Alimentarius	CO2	K1,F	State the functions of Codex Alimentarius	K4, S4
19.	Sanitary and Phyto-Sanitary measures (SPS)	CO2	K2, C	Mention any four sanitary measures to be followed in food industries	K5,S4
20.	Plant Quarantine Act	CO2	K1, C	Recall the uses of Plant Quarantine Act	K3,S1
UNITIII: Food Quality Management System					
21.	FSSAI functions, duties	CO3	K1, F	Sate the purpose of FSSAI	K3, S3
22.	FSSAI - responsibilities of food safety regulators	CO3	K2, C	Recall the responsibility of FSSAI	K4, S3
23.	food safety and standards for food products	CO3	K2, P	Identify the GRAS limit of preservative (Calcium Propionate)	K5,S4
24.	implementation, validation	CO3	K1,C	Point out the steps involved in validation of FSMS	K6,S1
25.	verification and improvement of food safety management systems	CO3	K2,F	Mention any two FSMS adapted in food industry	K3, S1
26.	Good Manufacturing Practices (GMP)	CO3	K2,C	List the merits of GMP	K3, S1
27.	Good Hygienic Practices (GHP)	CO3	K2,C	Compare GHP and GMP	K4, S1
28.	Good Laboratory Practices (GLP)	CO3	K1,F	Recite the steps in GLP	K4, S4
29.	ISO 22000, FSSC 22000	CO3	K2, C	Recall the importance of ISO 22000	K5,S4
30.	Food Safety Audit	CO3	K1, C	Identify the need for food safety audit	K3,S1
UNIT IV: Sampling and Statistical Quality Control					
31.	Sampling- concept	CO4	K1, F	Enlist the different methods of sampling	K4, S1
32.	Sampling- methods and importance	CO4	K2, F	Relate simple and randomized sampling	K5, S1
33.	Statistical Process and Quality Control - concept	CO4	K3, C	List any four objectives of Statistical quality control techniques	K5, S1
34.	Statistical Process and Quality Control - importance	CO4	K2, C	State purpose of quality control	K5, S1
35.	Statistical Process and Quality Control - tools	CO4	K3, F	List any four tools used in Statistical quality control techniques	K4, S1
36.	Control charts: importance	CO4	K2, F	Mention the importance of control charts	K5, S1
37.	Control charts: types	CO4	K2, C	Mention any two types of control charts	K5, S1
38.	Control charts: design process	CO4	K3, F	Recall the steps in designing the control charts	K5,S4
39.	Control limits and errors	CO4	K3, C	Point out the use of control limit	K3,S1
40.	Process Capability	CO4	K2, F	State any two pros and cons of process capability	K6, S4
UNIT V: Sensory evaluation					
41.	Sensory evaluation - Introduction	CO5	K1, F	Sate the steps involved in sensory evaluation of foods	K4, S1
42.	sensory panel - screening and selection methods	CO5	K2, C	How did you choose sensory panel members?	K5, S1
43.	training of sensory panel	CO5	K2, C	Mention the different methods used to train the sensory panel	K5, S1
44.	Physiological factors affecting sensory panel	CO5	K1, F	Identify the factors affecting the sensory panel concentration	K5, S1
45.	Hedonic rating of food	CO5	K2, C	Recite any two hedonic scale methods use to analyze the organoleptic properties of foods	K4, S1
46.	Sensory Evaluation tests - Difference - Paired Comparison	CO5	K2,C	Tabulate the different sensory evaluation methods	K5, S1
47.	Triangle, Duo-trio Test	CO5	K1, F	Compare triangle and duo-trio test	K5, S1
48.	Quantitative – Grading	CO5	K1, F	Recite the importance of grading in sensory evaluation	K6, S3
49.	Quantitative – Scaling	CO5	K3, C	Point out the methods used to scale the foods	K3, S1
50.	Quantitative - Ranking	CO5	K2, C	Recall the various ranking methods used to examine the sensory properties of foods	K4,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	Da-Wen Sun., "Handbook of Food Safety Engineering", John Wiley & Sons, New Jersey, 2012.
2	Ronald H. Schmidt, and Gary E. Rodrick., "Food Safety Handbook", John Wiley & Sons, New Jersey, 2005.
3	YasmineMotarjemi and HuubLelieveld., "Food Safety Management - A Practical Guide for the Food Industry", Elsevier, New York, 2014
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5	David Kilcast, "Sensory Analysis for Food and Beverage Quality Control: A Practical Guide", Woodhead Publishing Ltd, Cambridge, 2010
JOURNALS AND DOCUMENTS	
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 Safety and Quality Control Practical	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC08	**Academic Year Introduced**	2018-2019
Type of Course	Practical	**Semester**	II

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Analyze the physical, functional properties and quality analysis of food
CO2:	Categorize the food adulteration by using various detective techniques
CO3:	Identify different packaging material and point out the parts of a food label
CO4:	Determine the microbial count and identification of microorganisms of the food products

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

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction Tu+P+Te=To
I: Physical Mapping of Food Groups and Quality Assurance	To understand the importance of physical verification and functional properties of foods	3+12+3 = 18
II: Food Sensitivity and Microbiology	To detect the microbial food safety of food items	3+12+3 = 18
III: Quality Estimation	To recognize the packaging materials and identify its uses	3+12+3 = 18
Total Hours of Instruction		54 (18x3)

Tu-Tutorial, P-Practical, Te-Tests, To-Total Hours

COURSE PLAN

Module/Experiment No.	Intended learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
Module I: Physical Mapping of Food Groups and Quality Assurance					
1.	Determination of physical dimensions of food.	CO1	K4, P	Summarize the result on physical dimension of the basic five food groups	K6,S1
2.	Determination of bulk density, WAC and FAC of grain/flour	CO1	K4, P	Examine the Functional properties of the given test	K4,S2
3.	Determination of pH, Titrable acidity and total soluble solids of fruit pulp	CO1	K4, P	Interpret the result based on the various quality test	K5, S2
Module II: Food Sensitivity and Microbiology					
4.	Determination of total microbial count.	CO4	K4, P	Differentiate the food samples given based on the total microbial count	K4,S1
5.	Determination of Antimicrobial and antifungal activity	CO4	K4, P	Evaluate the shelf life of the given sample	K5,S1
6.	Taste sensitivity tests.	CO1	K4, MC	Differentiate the sensitivity of various food samples in different individuals and relate the result	K4,S4
Module III: Quality Estimation					
7.	Tests for adulterants	CO2	K4, P	Criticize the food items by performing adulteration tests in the sample using various methods	K4,S3
8.	Identification of packaging material	CO3	K1, F	Categorize the packaging material	K6,S3
9.	Identification of parts of a food label	CO3	K1, F	Demonstrate the identification of parts of food label	K3,S3

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2	Ain A.Sonin, (2001), The Physical Basis of Dimensional Analysis, Second Edition.

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

3	Srilakshmi B, (2018), Food Science, New Age International Publishers, Seventh Edition.
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1	International Standard ISO 7971-3 (2009) Published by ISO, First Edition.
2	George D.Sadler and Patricia A.Murphy (2010), pH and Titrable Acidity, Food Analysis (pp. 219-238)
3	Laird DT, Gambrel-Lenarz SA, Scher F.M, Graham T.E and Reddt L.J.Maturin, (2015) "Chapter 6 Microbiological Count Methods", Standard methods for the Examination of Dairy Products.
4	A Food Labeling Guide – Guidance for Industry (2013), Cerntre for Food Safety and Applied Nutrition, Food and Drug Administration
JOURNALS AND DOCUMENTS	
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	Rudiati Evi Masithoh, Ron Haff, Sumio Kawano, (2016), Determination of Soluble solids content and Titrable Acidity of Intact Fruit and Juice of Satsuma Mandarin Using a Hand-Held near Infrared Instrument in Transmittance Mode.
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	18FSTNC09	**Academic Year Introduced**	2018 - 19
Type of Course	Practical	**Semester**	II

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Determination of the macro and micronutrient content in the food sample
CO2:	Qualitative estimation of the nutrient content in the food sample
CO3:	Understand the knowledge about instrumentation and working principle

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	2	1	3	2
CO2	1	3	3	3	3	1	3	2	2	1	3	2
CO3	3	1	3	3	3	2	3	2	2	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction Tu+P+Te=To
Quantitative- Macronutrients, Micronutrients – Vitamins and Minerals	To familiarize with the procedures for estimation of macro and micronutrients	3+12+3 = 18
Qualitative Tests	To learn the quantitative analytical techniques for food composition	3+12+3 = 18
Demonstration	To demonstrate the procedures for analysis equipments	3+12+3 = 18
Total Hours of Instruction		54 (18x3)

Tu-Tutorial, P-Practical, Te-Tests, To-Total Hours

COURSE PLAN

Module/Experiment No.	Intended learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
MODULE I:Quantitative- Macronutrients					
1.	Total sugar by phenol sulphuric acid method	CO1	K4P	Exhibit the result on the presence of sugar, Protein, Fat, Moisture, Ash and Crude fiber content by using different method of analysis	S3
2.	Protein by Kjeldhal and Lowry's method	CO1	K4P		
3.	Fat by Soxhlet method	CO1	K4P		
4.	Moisture by hot air oven method and moisture analyser	CO1	K4P		
5.	Ash content by AOAC method	CO1	K4P		
6.	Crude fiber by acid and alkali digestion method	CO1	K4P		
Micronutrients - Vitamins					
7.	Total carotenoids	CO1	K4P	Interpret the total carotenoids and ascorbic acid content in the given sample	S3
8.	Ascorbic acid	CO1	K4P		
Micronutrients - Minerals					
9.	Calcium	CO1	K4P	Exhibit the result on the presence of calcium, iron, phosphorus and sodium level of the given sample	S3
10.	Iron	CO1	K4P		
11.	Phosphorus	CO1	K4P		
12.	Sodium	CO1	K4P		
MODULE II. Qualitative Tests					
13.	Sugars	CO2	K5P	Demonstrate and interpret the result	S3
14.	Amino acids	CO2	K5P		
15.	Phytochemicals	CO2	K5P		
MODULE III. Demonstration					

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

16.	Energy value by bomb calorimeter	CO3	K4P	Experiment the following tests using equipments	S1
17.	Analysis of sugar fractions by HPLC.	CO3	K4P		
18.	Analysis of mineral content by AAS.	CO3	K4P		

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2	Jayaram. J.(1996), Laboratory manual in Biochemistry, New Age International Ltd, publishers, New Delhi, fifth reprint.
3	Haghi, A. K., &Carvajal-Millan, E. (2014). *Food composition and analysis: methods and strategies*. Apple Academic Press.
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2	Publishing company ltd, Mumbai.
3	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

Subject Name	Food Industries and Waste Management	**Programme & Department of the Students**	M.Sc Food Science Technology and Nutrition
Course Code	18FSTNE03	**Academic Year**	2018-2019
Type of Course	Theory	**Semester**	II

OUTCOME BASED EDUCATIONAL DETAILS - COURSE WISE

COURSE OUTCOMES:

On completion of the course, the students will be able	
CO1:	To distinguish the types and nature of waste generated by the food industry
CO2:	To employ methods for proper storage and disposal of waste
CO3:	To design a plan for proper utilization of food waste
CO4:	To obtain knowledge on different types of water treatments
CO5:	To understand the various standards and management systems for waste disposal

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	2	2	1	2	2	2	1	3
CO2	3	1	1	2	2	2	1	2	3	3	2	3
CO3	3	2	2	2	2	1	1	2	3	2	3	3
CO4	3	2	2	2	2	1	1	2	3	2	3	3
CO5	3	1	1	2	2	2	1	2	3	2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module Title	**Objectives**	**Hours of Instruction L+Tu+Te=To**
Food industrial wastes	To learn the types of waste generated, Non-degradable and biodegradable wastes and Food industrial wastes	10+3+1=14
Storage & disposal of waste	To understand the Biological treatment of food industry wastes, Storage and disposal of liquid and gaseous waste	10+3+1=14
Utilization of food waste	To understand the utilizing wastes to make value added products and single cell proteins.	10+3+1=14
Waste water treatment	To learn the Standards, Physical, chemical and biological characteristics of waste water treatment	10+3+1=14
Environmental Management System	To impart knowledge on Environment management systems, Legislation and Standards for emission or discharge of environmental pollutants	10+3+3=16
Total Hours of Instruction		72 (18x4)

COURSE PLAN :

	Intended learning Outcomes	**CO(s) Mapped**	**Cognitive Level / KD**	**Psychomotor domain activity**	**Psychomotor domain level**
Unit-1 Food industrial wastes					
1.	Introduction: types of waste generated	CO1	K2,C	Choose any one food industry and collect information about list of waste and their effects on environment	K2,S3
2.	Classification :Non-degradable and biodegradable wastes	CO1	K2,F		
3.	Food industrial wastes from fruits and vegetable processing industry- beverage industry, fish, meat & poultry industry, sugar industry and dairy industry.	CO1	K2,C		
Unit-2 Storage & disposal of waste					
4.	Storage and disposal of solid waste: land-filling, burial, incineration, recycling	CO2	K2,P	Pictorial representation (PPT) of storage and disposal of waste management of a industry	K2,S4

5.	Biological treatment of food industry wastes	CO2	K2,P		
6.	Storage and disposal of liquid and gaseous waste;	CO2	K2,P		
7.	Legal aspects related to storage and disposal.	CO2	K2,C		
Unit-3 Utilization of food waste					
8.	Methods of utilizing wastes to make value added products; pectin, food colorants, antioxidants from fruit peels (citrus, mango, pomegranate), lycopene from tomato peels, vegetable seed oils,	CO3	K2,C	Prepare any one value added product from agricultural waste	K6,S5
9.	Biomolecules and enzymes from meat processing, single cell proteins.	CO3	K2,C		
Unit-4 Waste water treatment					
10.	Introduction. Standards for disposal of water	CO4	K2C	Visit to waste water treatment plant and prepare a report on it	K2,S3
11.	Physical, chemical and biological characteristics of waste water	CO4	K1,F		
12.	Measurement of organic content in waste water	CO4	K2,P		
13.	Physical unit operations in waste water treatment - screening; racks, mixing, flocculation, sedimentation, floatation, elutriation, vacuum filtration, incineration;	CO4	K2,P		
14.	Chemical unit operations in waste water treatment-chemical precipitation, aeration and gas transfer process, rate of gas transfer, adsorption, disinfection;	CO4	K2,P		
15.	Biological unit operations - aerobic and anaerobic.	CO4	K2,P		
Unit-5 Environmental Management System					
16.	Environment management systems (ISP 14000) and its application in food industry;	CO5	K1,C	Collect information on regulations to control environmental waste management	K2S2
17.	Legislation related to waste management	CO5	K1,C		
18.	Standards for emission or discharge of environmental pollutants from food processing industries covered under PFA Act.	CO5	K1,C		

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2	Loannis S. and Arvanitoyannis (2008). Waste Management in Food Industry, Academic Press
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2	Ioannis Arvanitoyannis (2008) Waste Management for the Food Industries,1st Edition, ISBN: 9780123736543 eBook ISBN: 9780080554938.
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1	Journal of Waste Management,Elsevier
2	Journal of Environmental Science and Health-Part B pesticides,Food Contaminants and Agricultural Wastes,Taylor and Francis
3	Journal of Reservaton,Conservation and Recycling ,Elsevier
4	Journal ofEnvironmental and Waste Management ,EPP Publications

Course Name	Food Biotechnology	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNE04	Academic Year Introduced	2018 - 19
Type of Course	Theory	Semester	II

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Describe genetic engineering and biotechnology
CO2:	Illustrate the production of food preservatives, food colours and food flavours from microbes
CO3:	Discover protein engineering techniques in manufacturing of antibiotics
CO4:	Identify the production techniques of transgenic plants and principle of nanotechnology
CO5:	Recognize fermentation methods and products identified through fermentation

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	1	3	2	2	3
CO2	3	2	1	3	1	1	1	2	3	2	2	3
CO3	3	2	2	2	1	1	1	1	3	2	2	3
CO4	3	2	2	2	1	1	1	1	3	2	2	3
CO5	3	1	2	2	3	1	1	2	3	2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction L+Tu+Te=To
Introduction to Genetic Engineering	To impart knowledge on biotechnology and genetically modified foods	10+3+1=14
Food Preservation	To recognize the natural antimicrobials used in food preservation techniques	10+3+1=14
Protein Engineering	To apply protein engineering technology in manufacturing of enzymes	10+3+1=14
Transgenic Foods	To learn about the principles of nanotechnology and describe the manufacturing of transgenic plants	10+3+1=14
Fermentation Technology	To illustrate fermentation technology in the field of food technology	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN

S. No.	Intended learning Outcomes	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
	Unit I Introduction to Genetic Engineering				
1.	Introduction to food biotechnology	CO1	K1,F	Interpret the recent developments in the field of biotechnology	K5, S1
2.	Basic principles of genetic engineering	CO1	K1,C	Compare genetically modified food crops with the naturally available foods. Identify its pros and cons	K5, S2
3.	Improvement of the food crops by genetic engineering	CO1	K2,C		
4.	Genetically modified plants and animals for enhanced foodproduction	CO1	K2,C	Design a scrap book/ video with voice over stating the ethical concerns in developing and marketing a GM foods	K6, S4
5.	Safety of GM food crops, ethical issues concerning GM foods	CO1	K2,C		
6.	Trade related aspects of biotech foods; intellectual property rights (IPR) issues and bio piracy problems	CO1	K2,P		
	UNIT II Food Preservation				
7.	Natural antimicrobials for food preservation: phytoalexins, essential oils and their components	CO2	K2,P	Assess the usage of natural antimicrobials in food preservation technique	K5, S3
8.	Natural antimicrobials for food preservation: Bacteriocins and its application in food system as biopreservative	CO2	K2,P	Identify the food products in market preserved with natural preservatives	K4, S3
9.	Natural antimicrobials for food preservation:nisin,	CO2	K2,P	Illustrate the production of natural food	K4, 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

	pediocinsetc			preservatives	
10.	Biotechnological routes to food colour and flavour production – microbes and enzymes	CO2	K2,P	Interpret the uses of microbes in food flavor and food color production	K5, S1
	Unit III Protein Engineering				
11.	Protein engineering in food technology: methods	CO3	K1, F	Evaluate the methods based on several aspects and contrast the best methods	K5, S2
12.	Applications of protein engineering to produce glucose isomerise	CO3	K2, C	Sketch the production of glucose isomerase	K3, S1
13.	Applications of protein engineering to produceLactobacillus beta-galactosidase	CO3	K2,C	Develop a video show casing protein engineering techniques	K4, S4
14.	Applications of protein engineering to producepeptide antibiotic nisin	CO3	K2,C	Examine the foods in market and identify the ones preserved with nisin	K3, S2
15.	Biotechnology for protein security: prospects and problems.	CO3	K2, P	Point out the limitations of biotechnology	K4, S2
	Unit IV Transgenic Foods				
16.	Biotechnology and Food ingredients: biogums, fat substitutes	CO4	K2,P	Outline the production of food ingredients	K4, S1
17.	Biotechnology and Food ingredients:biocolors, organic acids andsweeteners	CO4	K2,P		
18.	Transgenic plant foods: golden rice, Btbrinjal	CO4	K2,P	Collect videos on transgenic plants and defend it with your own words	K6, S3
19.	Transgenic plant foods:maize, tomato	CO4	K2,P		
20.	Transgenic plant foods:potato, soyabean	CO4	K2,P		
21.	Production of Food additives and supplements	CO4	K2,P	List out examples of additives and supplements	K5, S1
22.	Nanotechnology: Principles and applications in foods	CO4	K1,F	Identify the applications of nanotechnology in the field of food technology	K4, S1
23.	Effect of biotech foods on the food business of developing and developed countries.	CO4	K1,C	Conduct a survey in your department/ college premises to assess the knowledge on GM foods	K4, S3
	Unit VFermentation Technology				
24.	Food Fermentation - Process in production of alcoholic beverages	CO5	K2,P	Prepare a checklist on the factors affecting fermentation	K3, S1
25.	Cheese making, bread making, fermented soya based foods	CO5	K2,P	Tabulate the preparation methods of fermented products	K4, S1
26.	Meat fermentations and vinegar	CO5	K2,P	Summarize the role of vinegar in food preservation techniques	K5, S1
27.	Microbial products – Primary and secondary metabolites	CO5	K2,P	Compare and contrast primary metabolites and secondary metabolites	K5, S2
28.	Vit B12, Citric Acid production	CO5	K2,P	Schematic representation of metabolites production	K3, S1
29.	Penicillin & alcohol production	CO5	K2,P		
30.	Microbial biomass production- baker's yeast, single cell protein and mushroom	CO5	K2,P	Differentiate yeast, SCP and mushroom	K4, S2
31.	Probiotics and Prebiotics	CO5	K2,P	Infer the food sources of probiotics	K4, S1

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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

2	Journal Biotechnology advances ,Elsevier
3	Trends in Biotechnology ,Elsevier
4	Trends in Food Science and Technology ,Elsevier

Course Name	Food Safety Management Practical	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNS01	Academic Year Introduced	2018-2019
Type of Course	Practical	Semester	II

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 in the kitchen, personal hygiene, institutional food safety measures,
CO3:	Identify different parts of the label and differentiate different types of packaging materials
CO4:	Demonstrate different methods of adulteration test and identify the types of food additives
CO5:	Educate the public on food safety rules and regulations and create awareness about food fortification

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

2- Slight, 2- Moderate, 3-Substantial

COURSE OBJECTIVES

Unit/Module	Objectives	Hours of Instruction L+Tu+Te=To
Hygienic handling of food and 7 C's control	To illustrate the types of hazards and measures to control the hazards	1+8+2=10
Good hygiene and sanitary practices	To gain practical experience on safe handling of food	1+10+1=12
Food label and Food Packaging	To categorize the components of a food label and to illustrate the types of packaging material	1+8+2=10
Food Additives and Food Adulteration	To test common adulterants in food	1+10+1=12
Food Fortification	To identify fortified foods in market, and create awareness on the government food safety regulations	1+8+2=10
Total Hours of Instruction		54 (18x3)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN :

S. No.	Intended learning practices	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activity	Psychomotor domain level
Unit 1 : Hygienic handling of food and 7 C's control					
30.	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	K5,S3
				Explore the effect of temperature and time on microbial growth	K5,S3
				Determine the fitness of food for consumption	K5,S3
				Recommend the 7 C's in control of contamination and control measures	K4,S1
				Specify the 5 F's for food infection and infestation	K4,S2
Unit 2: Good hygiene and sanitary practices					
31.	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 Success-O-Meter in habit forming tools and self-evaluation trackers on good hygiene and healthy practices	K6,S2
Unit 3: Food label and Food Packaging					
32.	Components of food label and FSSAI regulations	CO3	K2,C	Tell 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 4: Food Additives and Food Adulteration					
33.	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 5: Food Fortification					
34.	Fortification in food and government programmes on food fortification	CO5	K2,F	Examine the types of fortificants in food label	K4,S5

References	
Text Books	
1	FSSAI Training Manual on "Hygienic Handling of Food, Hygiene of our Surroundings, Personal Hygiene, Need for Food Safety-Invisible World of Microorganisms, Detect Adulteration with Rapid Test, Safe Food Handling and Hygiene Booklet for Food Handlers, Safe and Nutritious Food at School, Safe and Nutritious Food at Workplace and Safe and Nutritious Food at Home, www.snfportal.in, 2017.
2	FSSAI and Food Fortification Resource Centre Team (2017), Large Scale Food Fortification in India.
Reference Books	
1	FSSAI Manuals for Quality testing (www.fssai.gov.in), Accessed, 2020
2	Food and Agricultural Organization (1980): Manuals of Food Quality Control. 2 Additives Contaminants Techniques, Rome.
3	Furia, T.E. Ed. 1980. Regulatory Status of Direct Food Additives. CRC Press, Florida.
4	Krammer, A. and Twigg, B.A. (1970). Quality Control for the Food Industry. 3rd Edn. AVI, Westport.
5	Rekha S. Singhal ,Pushpa R. Kulkarni, Dananesh V. Rege, (1997). Hand Book of Indices of food Quality and Authenticity, wood head Publishing Ltd.
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	Business Plan and Quality Assurance System for New Food Product	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNIL02	**Academic Year Introduced**	2018 - 19
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 Tu+P+Te=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)

Tu-Tutorial, P-Practical, Te-Tests, To-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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1	https://commons.wikimedia.org/wiki/File:Business_Model_Canvas.png - Business Model Alchemist, 25 April 2010, Source tag: http://www.businessmodelalchemist.com/tools; Attribution - Business Model Alchemist / CC BY-SA (https://creativecommons.org/licenses/by-sa/1.0)
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

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

3	http://ecoursesonline.iasri.res.in/mod/page/view.php?id=124501, Food Processing Plant Design & Layout, Module 4 – Lesson 7 Plant Layout, accessed on 09.05.2020
4	Cheese Production, Encyclopedia Britannica, http://ecoursesonline.iasri.res.in/mod/page/view.php?id=124501, accessed on 09.05.2020, https://cdn.britannica.com/s:700x500/91/78591-050-858019AF/cheese-making-process.jpg, accessed on 05.07.2020; https://www.yslfood.com/en/category/Tofu-Production-Line/A0102.html, accessed on 06.07.2020; https://online.visual-paradigm.com/de/diagrams/templates/process-flow-diagram/food-manufacturing/, process flow preparation templates preparation software, accessed on 23.07.2020
5	https://foodregulatory.fssai.gov.in/food-safety, accessed on 09.05.2020
6	https://foodregulatory.fssai.gov.in/fsms-manuals, accessed on 09.05.2020; https://www.fda.gov/regulatory-information/search-fda-guidance-documents/guidance-industry-guide-minimize-microbial-food-safety-hazards-fresh-cut-fruits-and-vegetables, accessed on 05.07.2020
7	https://www.scimagojr.com/journalrank.php?category=1106&area=1100&page=1&total_size=301, accessed on 09.05.2020

Course Name	Nutritional Biochemistry	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC10	Academic Year Introduced	2018 - 19
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 L+Tu+Te=To
Water and Energy	To inculcate knowledge on the functions of water and importance of energy balance	10+3+1=14
Carbohydrates	To elucidate the types, functions and metabolism of carbohydrates and types of dietary fiber	10+3+1=14
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	10+3+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)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN

Unit/Chapter	Intended Learning Chapters	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activity	Psychomotor domain level
Unit I: Water and Energy					
1.	Body water and 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	CO1	K2, C	Infograph the factors affecting water intake and output	K4, S2
4.	Energy value of food	CO1	K1, F	Prepare and exhibit a pyramid structure for foods with high calorie to low calorie	K5, S1
5.	Determination of energy value of food	CO1	K3, P		
6.	Components of energy expenditure	CO1	K2, C	Pictorial representation of components of energy expenditure	K3, S2
7.	Energy balance and energy requirements	CO1	K2, C	Prepare energy balance chart for an individual	K6, S3
8.	Energy system in the body	CO1	K2, C	Prepare a scrap book about energy systems in human body	K6, S2
Unit II: Carbohydrates					
9.	Types of carbohydrates	CO2	K1, F	Tabulate various types of sugars	K4, S1
10.	Functions of carbohydrates	CO2	K2, F	Illustration of different functions of carbohydrates	K4, S2
11.	Amino sugars, proteoglycans and glycoprotein	CO2	K2, C	Compare the types of sugars	K5S1
12.	Digestion and absorption of carbohydrates	CO2	K1, C	Download a video on CHO digestion and present it	K2S4
13.	Metabolism of carbohydrates	CO2	K1, C	Poster presentation or chart work depicting various cycle of CHO metabolism	K3S2
14.	Energetics of carbohydrate metabolism	CO2	K1, C	Compare and present number of ATP molecules produced in different metabolic	K5S1

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

				pathway	
15.	Regulation of blood glucose level	CO2	K2,C	Draw a chart depicting the types of CHO	K6S1
16.	Classification of complex carbohydrates	CO2	K1,F		
17.	Role of dietary fiber	CO2	K2,C	Point out the functions of dietary fiber	K4S1
18.	Resistance starch	CO2	K2,C	Compare different types of RS	K4S2
19.	Requirements of dietary fiber	CO2	K1,F	Summarize the requirements of dietary fiber for each age group	K6S1
20.	Effect of over consumption of fiber	CO2	K2,C	Word wheel	K6S2
Unit III: Protein					
21.	Nutritional classification	CO3	K1F	Tabulation of types of proteins	K4S1
22.	Functions	CO3	K1F	Word wheel on functions	K3S2
23.	Digestion and absorption	CO3	K2C	Download a video on protein digestion and present it	K2S4
24.	Protein metabolism	CO3	K2C	Create a poster and present it	K3S2
25.	Nutritional classification of amino acids	CO3	K1F	Differentiate amino acids based on its classification	K4S1
26.	Biologically active peptides	CO3	K2C	MCQ about the concept	K2S2
27.	Sequencing of proteins	CO3	K2P	Summarize the protein sequence	K5S1
28.	Protein requirements	CO3	K1F	List out protein requirements as per RDA	K4S1
29.	Amino acid balance in the diet	CO3	K2C	Criticize the importance of amino acid	K4S1
Unit IV: Fats					
30.	Classification of lipids and fatty acids	CO4	K1F	Tabulation of types of lipids	K4S1
31.	Digestion and absorption of fats	CO4	K2C	Prepare a video on fats digestion and present it	K6S4
32.	Functions of lipids	CO4	K1F	Word wheel about functions	K3S4
33.	Lipid metabolism	CO4	K2C	Poster presentation on metabolism of lipids	K3S2
34.	Functions of lipoproteins	CO4	K1F	Word wheel	K3S4
35.	Fat requirements	CO4	K1F	Tabulation of requirements as per RDA	K4S1
36.	Energetics of fatty acid cycle	CO4	K3C	Summarize the ATP molecules produced/used in each cycle	K5S2
Unit V: Vitamins and minerals					
37.	Classification of vitamins and minerals	CO5	K1F	Pictorial representation on sources of vitamins and minerals	K5S2
38.	Biochemical functions	CO5	K1F		
39.	Digestion, absorption and metabolism	CO5	K2C	Poster presentation on metabolism of vitamins and minerals	K4S1
40.	Interrelationship between vitamins and minerals	CO5	K2C	Collect recent articles about various vitamin and mineral supplements	K6S1

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2	Berg J.M, Tymocezko J.L, (2007), Biochemistry, W H Freeman and Company, Sixth edition
3	Jain J.L, (2001), Fundamentals of Biochemistry, Books & Allied Pvt. Ltd, Third edition
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4	Whitford, D. (2013). Proteins: structure and function. John Wiley & Sons.
5	Kroner, Z. (2011). Vitamins and minerals. ABC-CLIO.
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1	The Journal of Nutritional Biochemistry, Elsevier science Inc, 9552863
2	Annals of Clinical Biochemistry, Sage Publications Inc, 45632
3	Journal of Biochemistry, Oxford University Press, 0021924X
4	Journal of Human Nutrition and Dietetics, Wiley-Blackwell, 9523871
5	American Journal of Biochemistry and Biotechnology, Science Publications, 15533468
6	Indian Journal of Clinical Biochemistry, Association of Clinical Biochemists of India, 9701915
7	Indian Journal of Biochemistry and Biophysics, Scientific Publishers, 3011208

Course Name	Nutrition In Lifecycle	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC11	Academic Year Introduced	2018 - 19
Type of Course	Theory	Semester	III

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	To understand the basic concepts of nutrition dietary guidelines, RDA
CO2:	To understand the stages of gestation,distinguish nutritional requirements and health concerns of pregnancy and lactation and recommendations to overcome them
CO3:	To justify the value of breastmilk and weaning at right age and to understand the role of nutrition in growth and development
CO4:	To assess the food habits and eating problems during school going age and adolescence and to recommend nutritional management
CO5:	To 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 L+Tu+Te=To
Concept of Nutrition	To familiarize with the concepts of nutrition, dietary guidelines, RDA	10+3+1=14
Nutrition during pregnancy and Lactation	To provide learning on nutritional needs and requirements during Pregnancy and Lactation	10+3+1=14
Nutrition in infants and Preschool children	To impart knowledge on importance of breastmilk and weaning foods during infancy and food habits in preschool children	10+3+1=14
Nutrition in School age and during Adolescence	To categorize the nutritional requirements in different stages of childhood and adolescence	10+3+1=14
Nutrition in Adulthood and Old Adulthood	To recognize the importance of nutrition during adulthood and old age	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN

Unit/Chapters	Intended learning Outcomes	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
UNIT I: Concept of Nutrition					
1.	Concepts of Food groups	CO1	K1F	Construct a model of food pyramid/my plate and present it (Group activity)	K2S2
2.	Portion size of Food groups and balanced diet(ICMR)	CO1	K2C		
3.	Dietary Guidelines for Indians	CO1	K2C	Mention the recent changes in dietary guidelines for Indians	K5S1
4.	RDA-Basic components required to derive RDA,Basis for energy,protein,fat,fiber,vitamins and minerals	CO1	K2C		
5.	RDA by ICMR requirement	CO1	K2C		
6.	Computation of allowances	CO1	K2C		
Unit II Nutrition During Pregnancy And Lactation					
	NUTRITION DURING PREGNANCY				
7.	Stages of gestation,	CO2	K1F	Assess a dietary habit of a pregnant woman	K4S4
8.	Maternal physiological adjustments	CO2	K2F		

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.	Weight gain during pregnancy	CO2	K2F	(family member/neighbor) during 3 trimester	
10.	Nutritional requirements –preconception and pregnancy	CO2	K2C		
11.	Storage of nutrients	CO2	K2C		
12.	Physiological cost of pregnancy	CO2	K2C		
13.	Health concerns of pregnancy	CO2	K2C		
	NUTRITION DURING LACTATION				
14.	Hormonal control and reflex action	CO2	K1F	Collect information on lactosecretogogues ,galactogogues	K6S3
15.	Physiology of milk production	CO2	K1F		
16.	Special food during lactation	CO2	K2C		
17.	Nutritional requirements during lactation	CO2	K2C		
UNIT III: Nutrition in Infants and Preschool children					
	NUTRITION IN INFANTS				
18.	Growth and development	CO3	K2F	Take a disease condition/disorder in infants write guidelines and prepare a diet (PEM,Chronicdiarhoea,Jaundice,Inbornerrors,Lactose intolerance, FTT,Developmental problems	K3S4
19.	Weight as the indicator	CO3	K2C		
20.	Breast Vs Bottle feeding	CO3	K2C		
21.	Nutritional allowances	CO3	K2C		
22.	Feeding premature and LBW infants	CO3	K2C		
23.	Supplementary feeding	CO3	K2C		
24.	Nutritional Components of colostrum Mature milk and Weaning Foods	CO3	K2C		
	NUTRITION IN PRESCHOOL CHILDREN				
25.	Growth and development	CO3	K2F	Visit a balwadi center and assess a report on programmes implemented for the benefits of preschool children	K5S2
26.	Food Habits	CO3	K2C		
27.	Nutritional Requirements	CO3	K2C		
28.	Supplementary Foods	CO3	K2C		
UNIT IV: Nutrition in School age and during adolescence					
	NUTRITION IN SCHOOL AGE			Prepare a attractive lunch for school children with balanced diet	K3S4
29.	Early and middle childhood	CO4	K2F		
30.	Growth and Development	CO4	K2F		
31.	Food habits	CO4	K2C		
32.	Nutritional needs and feeding	CO4	K2C		
33.	Packed lunch	CO4	K2C		
	NUTRITION IN ADOLESCENTS				
34.	Physical growth	CO4	K2F	Conduct a survey and evaluate on food habits in adolescents about eating disorders	K6S2
35.	Pubertal changes	CO4	K2F		
36.	Nutritional needs	CO4	K2C		
37.	Eating disorders-Anorexia nervosa and Bulimia nervosa	CO4	K2C		
38.	Adolescent pregnancy and its complications	CO4	K2C		
Unit V: Nutrition In Adulthood And Old Adulthood					
	NUTRITION IN ADULTHOOD				
39.	Type of Work	CO5	K2C	Categorize and List Out the RDA of all the micro and macronutrients	K4S1
40.	Nutritional Requirements	CO5	K2C		
	NUTRITION IN OLD ADULTHOOD		K2C		
41.	Process of ageing	CO5	K2F	Do a case study report on age related problem (Parkinson,Alzheimer,eyedegeneration, osteoporosis etc) and Analyze it	K4S3
42.	Physiological and Psychological changes during old age	CO5	K2F		
43.	Nutritional requirements	CO5	K2C		
44.	Factors affecting food intake	CO5	K2C		

45.	Common nutritional problems in old age	CO5	K2C		

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1	American Journal of Clinical Nutrition, American Society for Nutrition, 29165
2	Advances in Nutrition , American Society of Nutrition
3	British Journal of Nutrition, Cambridge University Press, 71145
4	European Journal of Clinical nutrition, Nature Publishing Group, 9543007
5	Journal of Infant ,Child and Adolescent Nutrition,Sage Periodicals Press
6	Journal of Maternal and Child Nutrition ,Blackwell Publishing Inc
7	Journal of Nutrition,Health and Ageing ,Springer Paris

Course Name	Public Health Nutrition	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSNTC12	**Academic Year**	2018-2019
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 able to assess nutritional status
CO2	Identify the surveillances of nutrition status in emergency population
CO3	Discuss the nutrition transition and food security system, polices of developing countries
CO4	Describe the public health nutrition strategies for nutritional problems in India
CO5	Recognize the role of nutrition education in 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 L+Tu+Te=To
Community Nutrition	To impart knowledge on Growth monitoring methods and assessment of nutritional status of the community	10+3+1=14
Nutrition assessment and surveillance	To understand the nutritional status, epidemiology and to assess the indicators of the surveillance	10+3+1=14
The nutrition transition and food security system, polices to developing countries	To illustrate the nutrition transition and food security system, diversity, environmental impact and polices to developing countries	10+3+1=14
The public health nutrition strategies for nutritional problems in India	To elaborate strategies of the public health nutrition, nutritional problems and program for prevention of the nutritional problems	10+3+1=14
The role of nutrition education in community	To Appraise the types, methods, Planning In nutrition education, problems and career of public health nutrition	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN :

Unit/Chapters	Intended learning Outcomes	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activity	Psychomotor domain level
UNIT 1: Community Nutrition					
35.	Definition of community	CO1	K1,F	Dramatize the community nutrition	K3,S3
36.	Public health nutrition and cycle	CO1	K2,C	Collect the recent information on public health nutrition	K2,S1
37.	Nutritional status assessment(Direct)	CO1	K3,P	Identify a mode of direct assessment method and create a video	K3,S3
38.	Growth monitoring methods and body composition studies	CO1	K4,P	Discriminate the different growth monitoring methods	K6,S1
UNIT 2: Nutrition assessment and surveillance					
39.	Assessment of Nutritional Status(indirect)	CO2	K2P	Collect the video on indirect nutritional assessment	K2,S1
40.	KAP survey , nutrition indicators	CO2	K5P	Create a report on KAP survey	K4,S4
41.	Assessment and surveillance of nutrition status in emergency affected population.	CO2	K4P	Collect recent information on emergency situation occurred in India	K5,S5
42.	Nutritional epidemiology	CO2	K2C	Prepare a document on the relation between food and disease	K1,S1
UNIT 3: The nutrition transition and food security system, polices to developing countries					
43.	Nutrition transition in developing countries	CO3	K2,C	Collect the information on nutrition transition for ppt presentation (idea generate)	K2,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

44.	Definition of food security	CO3	K1,C	Describe the food security	K6, S1
45.	Factors affecting food security system and food security status assessment	CO3	K2,C	Formulate a questionnaire regarding KAP survey (report)	K5,S5
46.	National and international approaches to improve food security	CO3	K2,C	Collect the current scenario concept that improves food security	K4,S2
47.	Dietary diversity and its assessment	CO3	K2,C	Describe the household dietary diversity survey report	K6,S3
48.	Environmental impacts	CO3	K4,F	Conclude the environmental impacts that affects food security	K2,S1
49.	Insecure employment and energy reliance	CO3	K2,C	Case study on insecure employment	K5,S1
50.	Political, economical and social processes influencing food	CO3	K2,C	Awareness program to the public on food insecurity	K6,S2
51.	Nutritional policies and legislation	CO3	K2,C	Illustrate the nutritional policies and legislation followed in India	K4,S2
UNIT 4: The public health nutrition strategies for nutritional problems in India					
52.	Policies and program address food insecurity	CO4	K2,C	Describe the policies and programmes related to food security	K6,S3
53.	Hunger and intervention in diverse population	CO4	K4,C	Prepare a module to reduce the hunger in diverse population	K3,S5
54.	Nutrition related program	CO4	K2,C	Appraise the nutritional related progammes	K4,S3
55.	Prevention of public health and nutrition problems	CO4	K2,C	List out the program in history of one program	K1,S1
56.	Preventive programmes of nutritional problems in India	CO4	K2,C		
UNIT 5: The role of nutrition education in community					
57.	Types and method of nutrition education	CO5	K1,F	Design a flowchart about the different types of methods in nutrition education	K5,S5
58.	Principles of planning in nutrition education	CO5	K2,F	Explain the principles of planning in nutrition education	K6,S2
59.	Executing and evaluating nutrition education programmes	CO5	K2,C	Evaluate the nutrition education programmes and justify	K6,S5
60.	Problems of nutrition education	CO5	K2,C	Relate the problems in nutrition education	K3, S1
61.	Roles and responsibilities of public health nutritionist and careers in public health nutrition	CO5	K2,C	Point out the roles and responsibilities of public health nutritionist	K4, S5

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TEXTBOOKS	
1.	Michael J. Gibney, Barrie M. Margetts et al, (2013) Public health nutrition, Blackwell publishing, 1st edition.
2.	Suryataba Das (2018) Textbook of community nutrition, Academic Publishers, 3rd Edition.
3.	Natalie stein (2014) Public Health Nutrition, Jones &Bartlett learning publishers, 1st Edition.
REFERENCE BOOKS	
1.	Sheila Chander Vir, (2011) Public Health Nutrition in Developing Country, WPI Publishing, Part -1.
2.	Margaret, Ronny et al, (2020) Public Health Nutrition (Rural, Urban, and Global Community-Based Practice), Springer Publishing.
3.	Bratati Banerjee, DK Taneja's (2017) Health policies programmes in India, Jaypee Brothers Medical publishers, 15th Edition.
4.	Mark Lawrence & Toney Worsley (2007) Public Health Nutrition from Principles to practice, Open University Press, 1st Edition.
5.	Natellie Stein, MS (2014) Introduction to public health nutrition. Pp 4-12
6.	Bamji, MS Rao et al (2003) Textbook of Human Nutrition, Oxford and IBH Publishing Co.Pvt.Ltd., New Delhi.
7.	Michael J. Gibney, Barrie M. Margetts, John M. Kearney, Lenore Arab (2013) Public Health Nutrition, Wiley Blackwell.
8.	Michigan Natalie Stein. Public Health Nutrition, 2014
9.	Sheila ChanderVir (2015) Public Health and Nutrition in Developing Countries (Part I and II). Wood head publishing India PVT Ltd, New Delhi
10.	Judith L. Buttriss, Ailsa A. Welch, John M. Kearney, Susan A. Lanham-New (2017) Public Health Nutrition, Wiley Blackwell.
11.	Jacqueline Edington (1999) Problems of nutritional assessment in the community. Proceedings of the Nutrition Society (1999), 58,47-51
12.	K. Vijayaraghavan (2011) Food and nutrition situation in India. Pp -878-889
13.	Rayner G, Lang T. (2012) Public health and nutrition. Our vision: Where do we go? [Commentary]. World Nutrition, **3,** 4, 92-118
14.	World Nutrition (2012) Journal of the World Public Health Nutrition Association. www.wphna.org Volume **3**, Number 4
JOURNALS AND DOCUMENTS	
1.	http://www.jblearning.com/samples/0763747602/47602_ch01_5165.pdf
2.	http://sydney.edu.au/science/molecular_bioscience/cphn/pdfs/human_nutrition_study_guide.pdf

Course Name	Computer Aided Diet Planning Practical	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC13	Academic Year Introduced	2018-2019
Type of Course	Practical	Semester	III

COURSE OUTCOMES:

On completion of the course, the students will be able to	
CO1:	To understand concepts of weights and measures and food exchanges and apply it in menu planning
CO2:	Plan a menu according for different age groups and physiological conditions using software
CO2:	Identify the nutritional requirements for different nutrient deficiency and plan a diet using software

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

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction Tu+P+Te=To
Weights and Measures; Food Exchange List	To weigh and measures the food items to understand the quantification of foods; to illustrate the food exchange list	5+10+1= 2
Plan a menu for Pregnant and Lactate women	To impart the nutrition importance on pregnancy and lactation stage.	1+14+1 = 16
Plan a menu for infants and school children	To understand the food types at different form to increase the food consumption among infants and school going children	1+2+4 = 7
Plan a menu for adolescence and adults	To enumerate the dietary management and their daily activities	1+2+4 = 7
Total Hours of Instruction		54 (18x3)

Tu-Tutorial, P-Practical, Te-Tests, 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; Food Exchange List					
1.	Weights and Measures	CO1	K4, P	To compare the weights and measures of raw and cooked foods	K6, S1
2.	Food Exchange list	CO1	K1, P	To collect reliable data on food exchange list	K5, S1
Module 2: Plan a menu for Pregnant and Lactate women					
3.	Menu plan for pregnancy	CO2	K3, C	To develop a menu to fulfill the nutritionalrequirements for each trimesters of pregnancy	K5, S3
4.	Menu plan for lactation	CO2	K3, C	To evaluate the caloric needs during lactation and plan a diet	K6, S3
Module 3: Plan a menu for Infants and School Children					
5.	Menu plan for infants	CO2	K3, P	To calculate the caloric needs during growth and development and plan a variety of weaning diet	K4, S3
6.	Menu plan for preschool children	CO2	K3, P	To plan a diet for preschool children for their individual requirements	K5, S3
7.	Menu plan for school children	CO2	K3, P	To plan a diet for different ages of school children according to their likes and dislikes	K5, S3
Module 3: Plan a menu for adolescence and adults					
8.	Menu plan for adolescent boys and girls	CO2	K3, P	To analyze the nutritional needs and eating disorders during adolescence and plan a menu	K4, S3
9.	Menu plan for an adult	CO2	K3, P	To categorize the needs for different individuals and recommend a diet according to it	K4, S3
10.	Menu plan for Nutritional Deficiencies	CO3	K4, P	To assess the nutritional deficiency and plan a nutrient rich diet to overcome the deficiency	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

	a. Protein Calorie Malnutrition b. Anaemia c. Iodine Deficiency d. Fluorosis e. Vitamin A Deficiency f. Scurvy g. Angular stomatitis h. Calcium Deficiency				

Note: Content beyond syllabus if any may be included.

REFERENCES

Software	
1	Ntuitive software offered by Fitterfly technologies, Mumbai
2	Digest Software
3	Nutuitive application available at Play store
4	NIN application available at Play store

Course Name	Specialized Nutrition	**Programme Name**	M.Sc. Food Science Technology and Nutrition
Course Code	18FSTNE05	**Academic Year Introduced**	2018-2019
Type of Course	Theory	**Semester**	III

COURSE OUTCOMES:

On completion of the course, the students will be able to	
CO1:	Analyze physiological adaptation and nutritional requirements in space system
CO2:	Compare the nutritional requirement in military operations and navy
CO3:	Compare the nutritional requirements and adaptation in cold & high altitude environment and high terrestrial environment.
CO4	Recognise the feeding program and nutrition requirement in emergency situations.
CO5	Able to analyse and evaluate nutritional requirements on different sports.

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	3	3	3	2	2	3	3	3	3
CO2	3	1	2	3	3	3	2	2	3	3	3	3
CO3	3	1	2	3	3	3	2	2	3	3	3	3
CO4	3	1	2	3	3	3	2	2	3	3	3	3
CO5	3	1	2	3	3	3	2	2	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction L+Tu+Te=To
Nutrition in space	To impart nutrition related space programmes	10+3+1=14
Nutrition in military operation	To illustrate the nutrition strategies in military operation	10+3+1=14
Nutrition in cold and high altitude environment	To elaborate the nutritional requirement and energy loss in cold and high altitude environment	10+3+1=14
Nutrition in emergency	To understand the nutritional requirement during natural calamities	10+3+1=14
Sports nutrition	To provide more information regarding sports nutrition	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN:

Unit/Chapter	Intended learning practices	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activity	Psychomotor domain level
UNIT I: Nutrition in space					
1.	Understanding space flight (Mercury,Gemini, Apollo, Sky-lab, Apollo-Soyuz, Space shuttle- Mir program)	CO1	K2,F	Compare the merits and demerits of the different space flights	K4,S1
2.	International space station	CO1	K1,C	Criticize the recent international space station	K5,S1
3.	Adapting to space flight	CO1	K2,F	Conclude the effect of spaceflight on human body	K5,S1
4.	Space food system	CO1	K4,P	Predict the food system for space travel	K6,S5
5.	Physiological adaptation to weightlessness	CO1	K2,C	Estimate the weightlessness and fluid redistribution as stress factors in space	K6,S2
6.	Nutrition requirements and dietary intake during space flight	CO1	K4,P	Compare nutrition requirements from different space stations	K4,S3
7.	Bone demineralization	CO1	K2,F	Evaluate the bone loss in international space station	K5,S1
8.	Research and limitations on space craft	CO1	K4,F	Criticize the limitationsof space craft	K5,S3
UNITII: Nutrition in military operation					
1.	Types of military operation	CO2	K2,C	Tabulate the different types of military operations	K3,S3
2.	Nutrient Requirement and recommendation for military personnel	CO2	K4,P	Tabulate the nutrient requirement for military operations	K3,S5
3.	Nutrition and optimum physical performance of military personnel	CO2	K2,P	Compile the nutrition requirement and physical performance in military operations	K6,S1
4.	Body composition measurement and its relation to health and physical performance of military personnel	CO2	K2,P	Justify the relationship between body composition and physical performance	K5,S3
5.	Alimentation of military causalities	CO2	K2,P	Sketch out the alimentation of military causalities	K3,S3
6.	Nutrition for combat	CO2	K2,P	List the nutritional requirement during combat	K4,S5

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

7.	Dietary approach for high mileage warrior and long term warrior	CO2	K2,P	Design a diet for warrior	K6,S5
8.	Nutrition education and implementation of dietary goal of military personnel	CO2	K2,C	Prioritize for implementing nutritional science into practice to optimize military performance	K5,S1
Navy nutrition					
9.	History of navy nutrition	CO2	K2,F	Discuss the history of navy nutrition	K6,S1
10.	Nutrition requirements of navy personnel	CO2	K2,P	Evaluate the energy expenditure and nutritional status of navy personnel	K5,S1
11.	Nutritional guidelines of navy personnel	CO2	K2,P	Identify the nutritional guidelines for navy personnel	K3,S3
12.	Performance fundamentals-fueling series, rules to leave by, the big three, eat the rainbow, fuel up, hydrate, recovery nutrition and virtual meal builder	CO2	K2,C	Classify the performance fundamentals with explanation	K4,S3
13.	NOFFS-Operational series, navy operational fitness and fueling system	CO2	K2,C	Importance of NOFFS goals, Discuss the navy operational fitness and fuel system	K4,S5
14.	Food Services in Navy and Submarines, Galley Go Green nutrition program for navy personnel	CO2	K2,C	Justify the food services in each category	K5,S1
UNIT III: Nutrition in cold and high altitude environment					
1.	Physiology of cold exposure-(military schedules vs. biological clock, influence of cold stress on human fluid balance, muscle metabolism and shivering during cold stress)	CO3	K2,P	Discuss the cold environment in military schedules	K6,S1
2.	Macronutrients requirements for work in cold environments	CO3	K2,P	Explain the macronutrient requirement in cold environment and justify	K5,S2
3.	Cold exposure	CO3	K2,C	Sketch out the cold exposure during military operations	K3,S3
4.	Appetite and energy balance	CO3	K2,F	Determine the appetite and energy balance for military personnel	K5,S1
5.	Micro nutrient deficiency states and thermoregulation	CO3	K2,C	Elaborate the micronutrient deficiency states and thermoregualtion	K6,S1
6.	Drug induced delay of hypothermia	CO3	K2,F	Sketch out the drug induced delay of hypothermia	K3,S3
Nutrition in high terrestrial environment					
7.	Physiology of high altitude exposure	CO3	K2,C	Value the factors that affects human physiology of high altitude exposure	K6,S1
8.	Physical performance at high altitudes	CO3	K2,C	Appraise the effect of sport performance in high altitudes	K4,S5
9.	Fluid metabolism at high altitude	CO3	K2,F	Debate about the body fluid and energy metabolism at high altitude	K4,S1
10.	Maintain of body weight at high altitude	CO3	K2,F	Estimate the calorie intake and muscle mass at high altitude	K6,S4
11.	Energy and macro nutrient requirement for work in cold environment	CO3	K4,P	Conclude the energy balance and requirement in the cold environment	K6, K5
12.	Oxidative stress at high altitude and effect of vitamin E	CO3	K2,C	Evaluate the effect of vitamin E on oxidative stress at high altitude	K6,S1
13.	Performance and food components	CO3	K4,C	Justify the food components to enhance performance	K6,S5
14.	Treatments that may enhance mental performance at high altitude and in the cold	CO3	K2,F	Assess the performance in cold and high altitude	K6,S3
UNIT IV: Nutrition in emergency					
1.	Disaster (earth quake, flood , famine)	CO4	K2,F	Sketch out the strategies in the management of nutrition in major emergencies (earthquake, flood, famine)	K3,S1
2.	Major nutrition deficiencies	CO4	K2,F	Explain the nutrition deficiency and importance of nutrition in emergencies situation	K4,S3
3.	Nutritional surrivilence – general feeding program, selective feeding program	CO4	K4,P	Differentiate the general feeding programme and selecting feeding programme	K4,S3
4.	Prevention, treatment and control of communicable diseases	CO4	K2,P	Identify the measures to be taken to control/ prevent/ treatment in communicable disease.	K4,S5
5.	Health extension activities - immunization	CO4	K4,C	Design the health extension activities/ immunization	K5,S4
6.	Environment health management	CO4	K2,P	Plan for a healthy environment	K5,S5
7.	House hold food security and livelihoods	CO4	K4,F	Separate the strategies for food security and livelihoods in household level	K6,S1

UNIT V: **Sports nutrition**					
1.	Energy balance	CO5	K2,F	Sketch out the energy balance	K3,S2
2.	Body mass and composition	CO5	K4,F	Examine the body and composition and list the measurements available in India	K5,S3
3.	Fuel needs for training and recovery	CO5	K2,C	Sketch out the fuel needs for training and recovery and jusity	K3,S5
4.	Protein needs for training bulking up	CO5	K4,C	Construct the protein needs for training bulking up	K5,S3
5.	Vitamins, minerals and anti-oxidants for training and staying well	CO5	K2,C	Illustrate the vitamins, mineral and antioxidants for training and staying well	K4,S1
6.	Preparation for competition	CO5	K5,P	Conclude the preparation for competition	K6,S2
7.	Fluid, carbohydrate and salt needed during and after exercise	CO5	K2,P	Appraise the fluid, carbohydrate and salt requirement during and after workout	K4,S5
8.	Hydration process, supplements and sports food	CO5	K4,P	Sketch out the hydration process, supplements and sports food	K3,S5
9.	Nutritional concern of athletes in specific groups (young athletes , female athletes, power and sprint sports, endurance sports, team sports, weight conscious sports, travelling athletes, Olympic and elite athletes , vegetarian athletes physically disabled athletes , athletes with chronic medical conditions, athletes with eating disorder)	CO5	K2,P	Illustrate the Nutritional concern of athletes in specific groups	K4,S1
10.	Environment challenges for athletes	CO5	K2,C	Point out the environment challenges for athletes	K4,S3
11.	Cultural and regional issues nutritional and performance implications of use of addictive substances	CO5	K2,F	Relate the cultural and regional issues.	K6,S1
12.	Nutritional concern and knowledge of coaches and athletic trainers	CO5	K4,P	Analyze the nutritional concern and knowledge of coaches and athletic trainers	K5,S3

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TEXTBOOKS	
1.	Marriott, B. M. (Ed.). (1994). Food Components to Enhance Performance: An evaluation of potential performance-enhancing food components for operational rations. National Academies Press.
2.	Marriott, B. M. (Ed.). (1995). Not eating enough: Overcoming underconsumption of military operational rations. National Academies Press.
3.	Carlson, S. J., & Marriott, B. M. (Eds.). (1996). Nutritional Needs in Cold and High-Altitude Environments: Applications for Military Personnel in Field Operations. National Academies Press.
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1.	World Health Organization. (2000). The management of nutrition in major emergencies. World Health Organization.
2.	Heer, M., Titze, J., Smith, S. M., & Baecker, N. (2015). Nutrition Physiology and Metabolism in Spaceflight and Analog Studies. Springer International Publishing.
3.	Deuster, P. A., Pelletier, P. A., & Singh, A. (Eds.). (2007). The US Navy Seal Guide to Fitness and Nutrition. Simon and Schuster.
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5.	Carlson, S. J., & Marriott, B. M. (Eds.). (1996). Nutritional Needs in Cold and High-Altitude Environments: Applications for Military Personnel in Field Operations. National Academies Press.
JOURNALS AND DOCUMENTS	
1.	Frontiers in Physiology, Frontiers Media S.A.
2.	Journal of Military Medicine, Baqiyatallah University of Medical Sciences
3.	Nutrition Reviews, Oxford University Press
4.	Respiratory Physiology & Neurobiology, Elsevier

Course Name	Nutritional Policies and Programmes	Programme Name	M.Sc. Food Science Technology and Nutrition
Course Code	18FSTNE06	Academic Year Introduced	2018-2019
Type of Course	Theory	Semester	III

COURSE OUTCOMES:

On completion of the course, the students will be able to	
CO1:	Generalize the nutritional policies and Schemes available in india
CO2:	Associate the principles of nutrition programmes and educational level of nutrition programme.
CO3:	Classify various organization and Services provided.
CO4:	Find out the merits and demerits of the each organization sector
CO5:	To Provide the voluntaries Service among 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	3	1	1	1	1	2	1	1	3	3	2	3
CO2	3	1	1	1	1	2	2	2	3	2	2	3
CO3	3	1	1	1	1	2	2	2	3	2	2	3
CO4	3	1	1	1	1	2	1	2	1	2	3	3
CO5	3	2	1	2	1	3	2	3	2	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction L+Tu+Te=To
Nutrition Policies and Schemes	To impart nutrition policies and schemes	10+3+1=14
Nutrition Programmes	To understand the nutrition programmes	10+3+1=14
National Organization	To elucidate the national organizations and it structure	10+3+1=14
International Organization	To elaborate the international organizations and it structure	10+3+1=14
International Voluntary Services	To illustrate the international voluntary service and its current scenario	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN:

Unit/Chapter	Intended learning practices	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activity	Psychomotor domain level
UNIT 1: Nutrition Policies and Schemes					
1.	History of Nutritional Policies and Programmes	CO1	K1,F	Identify the of Nutritional Policies and Programmes in India	K1,S2
2.	Millennium Development Goals (MDG)	CO1	K2,C	Tabulate the eight different millennium development goals	K3,S2
3.	Nutritional Policies in India (National Nutrition Goals, National Nutrition policy, National Food Security Mission, National Food Security Bill, Public Distribution System, National plan of Action on Nutrition).	CO1	K2,C	Identify the different kinds of nutritional policies and compareeach other	K3,S1
4.	Nutrition Schemes in India (Ministry of Agriculture, GraminBhandranYojana, Ministry of Women and Child Development, SABALA or Rajiv Ghandhi Scheme for Empowerment of Adolescent girls, Ministry of Tribal Affairs, Village Grain Bank Scheme, Ministry of Rural Development, Annapurna Scheme, Ministry of Consumer Affairs (SC/ST/OBC Hostels)).	CO1	K1,F	Identify the nutrition schemes available in India and compare each other	K3,S1
5.	Nutrition in India(Targeting the first 1000 days of child's life, Scheme for Supply of food grains to welfare institutions, AkshayaPatra and private sector participation in mid-day meals,	CO1	K2,C	Sketch out the mid-day meal programme, Akshayapatra, SampoornaGrameenRozgarYojana, SaravaShikshaAbhiyan, RashtriyakrishiVikasYojana	K3,S2

	SampoornaGrameenRozgarYojana, SaravaShikshaAbhiyan, RashtriyakrishiVikasYojana)				
UNIT II: Nutrition Programmes					
6.	Ministry of Rural Development	CO2	K2,F	Identify and explain the schemes/ programmes in ministry of rural development	K3,S1
7.	Applied Nutrition Programme	CO2	K2,C	Sketch out the applied nutrition programme	K3,S2
8.	Ministry of social welfare (ICDS-Integrated child development scheme, Balwadi Nutrition Programme, Special Nutrition Programme).	CO2	K1,P	List out the social welfare programmes and explain in detail	K4,S1
9.	Ministry of Health and Family welfare (National Nutritional Anemia Prophylaxis programme, National prophylaxis programme for prevention of Blindness due to Vitamin A Deficiency, National Iodine Deficiency Disorder Control Programme)	CO2	K2,C	Sketch out the national nutritional programmes	K3,S2
10.	Ministry of Education(Mid-day meal programme, programmes for communicable and non-communicable diseases, Wheat based supplementary nutrition programmes).	CO2	K2,C	Elaborate the ministry of education programmes such as Mid-day meal programme, programmes for communicable and non-communicable diseases, Wheat based supplementary nutrition programmes	K6,S1
11.	World Food Programme Projects(CARE assisted Nutrition Programmes, Tamil Nadu Integrated Nutrition Projects, UNICEF Assistance For Women and Children, Emergency Feeding Programme).	CO2	K2,C	Criticize the current scenario of world food programme project	K1,S2
12.	National Programme for Nutrition Support to primary Education,	CO3	K2,C	Sketch out the overall responsibility of national nutritional programmes that support primary education	K4,S2
13.	National Food for work Programme.	CO3	K2,C	Appraise the national food for work programme	K5,S2
UNIT III: National Organization					
14.	ICMR	CO3	K2,C	Sketch out the national organization and explain the current scenario	K3,S4
15.	NIN	CO3	K2,C		
16.	NNMB	CO3	K2,C		
17.	CFTRI	CO3	K2,C		
18.	DFRL	CO3	K2,C		
19.	ICAR	CO3	K2,C		
20.	NIPCCD	CO3	K2,C		
21.	NSI	CO3	K2,C		
22.	NFI and IDA	CO3	K2,C		
UNIT IV: International Organization					
23.	FAO	CO4	K2,C	Sketch out the international organization and explain the current scenario	K3,S2
24.	WHO	C04	K2,C		
25.	UNICEF	CO4	K2,C		
26.	UNESCO	CO4	K2,C		
27.	UNDP	CO4	K4,C		
28.	World Bank Data	CO4	K4,C		
UNIT V: International Voluntary Services					
29.	CARE	CO5	K2,C	Criticize the forms and structure of International Voluntary Services	K5,S1
30.	CRS	CO5	K2,C		
31.	IDRC	CO5	K2,C		
32.	Micronutrient Intitative(MI)	CO5	K4C		

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

33.	IFPRI	CO5	K2C		
34.	WFS	CO5	K2C		
35.	WFP	CO5	K2C		
36.	AUSAID	CO5	K2C		
37.	CIDA	CO5	K2C		
38.	SIDA	CO5	K2C		
39.	DANIDA	CO5	K2C		
40.	USAID	CO5	K2C		

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2	The Indian journal of medical research, Indian Council of Medical Research

Course Name	Nutrition for the Community Practical	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNS02	**Academic Year Introduced**	2018 - 19
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:	convince the community about the significance of food equity, budgeting and storage
CO4:	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 Tu+P+Te=To
Nutritional Status Assessment	To empower the learners on assessing their nutritional status using anthropometric parameters	1+8+3 = 12
Balanced Diet and Food selection	To acquire skills on planning balanced meals through proper selection, preparation and inclusion of foods	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)

Tu-Tutorial, P-Practical, Te-Tests, To-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	K4, 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: Balanced Diet and Food Selection					
2.	Balanced diet review	CO2	K4, P	Individual daily meal analysis on concept of balanced diet (inclusion of basic five food groups)	K5, S2
3.	Selection criteria for nutritious food	CO2	K3, C	Selection criteria for good quality energy yielding foods, body building foods and protective foods	K5, S3
Module III: Food Equity, Budgeting and Storage					
4.	Factors influencing economy of food budgeting	CO3	K4, C	Analyze the factors influencing the (Nutritional Knowledge, Intelligent buying and Home Production and Processing) economy of food budgeting	K4, S2

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

5.	Food budgeting for a family using available resources	CO3	K3, P	Prepare a short term monthly budget based on balanced diet for an individual in the family	K4, S2
6.	Storage method of food items and importance of KAP survey tool	CO3	K3, P	Conduct a KAP survey on storage method of perishable, semi-perishable and non-perishable foods	K4, S2
MODULE IV: Nutritional Security and Nutritional Conservation					
7.	Measures to nutritional security in a family	CO4	K6, C	Sketch the measures to enhance nutritive value of food at household level	K4, S4
8.	Measures to enhance the nutritional conservation in a family	CO4	K6,C	State the measures to minimize and prevent nutrient loss in food preparation	K4, S4

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2	Boyle, M. A., &Holben, D. H. (2012), Community Nutrition in Action: an Entrepreneurial approach. Cengage Learning. Sixth Edition.
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1	Temple, N. J., &Steyn, N. (Eds.). (2016), Community Nutrition for Developing Countries. Athabasca University Press and UNISA Press.
2	Eilender, E. (2016), Public Health Nutrition and Community Nutrition. Momentum Press.
3	Nnakwe, N. (2012), Community Nutrition: Planning Health Promotion and Disease Prevention. Jones & Bartlett Publishers.
JOURNALS AND DOCUMENTS	
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.

Course Name	Nutrition and Health Care Process of the Community	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNIL03	Academic Year Introduced	2018 - 19
Type of Course	Part 3 Research	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:	convince the community about the significance of food equity, budgeting and storage
CO4:	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 PLAN

Exercise No.	Unit/Module Title	Tutorial (18 hours)	Practical (36 hours)
I	Village Assessment	Framing the Questionnaire and validation through pilot testing	Village Assessment in General
II	Nutritional Status Assessment	Assessment Procedure Validation, Ethical Considerations and Data Management	Assessment of Nutritional Status of Vulnerable groups in a Village a. Height (cm) b. Weight (kg) c. BMI (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)
III	Analyze and Create Awareness	KAP Survey tool development and validation and Development of Awareness Pamphlets and Booklets	a. Individual daily meal analysis on balanced diet (inclusion of basic five food groups) b. Factors influencing the (Nutritional Knowledge, Intelligent buying and Home Production and Processing) economy of food budgeting c. Preparation of short term monthly budget based on balanced diet for individual in the family d. Selection criteria of energy yielding foods, body building foods and protective foods e. Storage method of perishable, semi-perishable and non-perishable foods f. Measures to enhance nutritive value of food at household level g. Measures to minimize and prevent nutrient loss in food preparation

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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
3	https://online.visual-paradigm.com/de/diagrams/templates/process-flow-diagram/food-manufacturing/, process flow preparation templates preparation software, accessed on 23.07.2020
4	Nutrify India Now App (NIN ICMR) installation through google playstore, https://bit.ly/32H5OGK, 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

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

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Course Name	Clinical Nutrition I	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC14	Academic Year Introduced	2018-2019
Type of Course	Theory	Semester	IV

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Recognize the importance of diet and role of dietitian in disease management and in nutrition care process
CO2:	Predict the etio-pathophysiology, clinical and metabolic aberrations and nutritional management of GI, Liver and Gall Bladder Disorders
CO3:	Diagnose and assess the etio-pathophysiology, clinical and metabolic aberrations and nutritional management of fever, allergy and dental diseases
CO4:	Categorize and discriminate medical nutrition therapy for renal disorders and their medical nutrition therapy
CO5:	Infer on the medical nutrition therapy for the cardiovascular disorders

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	3	2	1	3	2	1	2	3	2
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

3- Slight, 2- Moderate, 3-Substantial

COURSE OBJECTIVES

Unit/Module	Objectives	Hours of Instruction L+Tu+Te=To
Concepts and Principles in Diet therapy Nutrition Care Process	To illustrate the types of dietitians, diets, nutrition assessment and nutrition counseling techniques	10+3+1=14
MNT for GI, Liver and Gall Bladder disorders(Etiopathophysiology ,clinical and metabolic aberrations and Nutritional Managements)	To diagnose and assess the medical nutrition therapy for Gastrointestinal disorders, liver and gall bladder disorders	10+3+1=14
MNT for fever,allergy and dental diseases(Etiopathophysiology ,clinical and metabolic aberrations and Nutritional Managements)	To categorize and discriminate medical nutrition therapy for fever, allergy and dental diseases	10+3+1=14
MNT for Renal Disorders (Etiopathophysiology ,clinical and metabolic aberrations and Nutritional Managements)	To learn about the various renal disorders and their medical nutrition therapy	10+3+1=14
MNT for Cardiovascular Disorders (Etiopathophysiology ,clinical and metabolic aberrations and Nutritional Managements)	To infer on the medical nutrition therapy for the cardiovascular disorders	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN :

S. No.	Intended learning practices	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activity	Psychomotor domain level
	UNIT 1				
I	**Concepts and Principles in Diet therapy**				
62.	Types of dietitian	CO1	K1,F	Identify the types of dietitian in hospitals	K1S1
63.	Role of dietitian	CO1	K2,C	Collect information about job role of dietitians as group activity	K1S2

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

64.	Delivery of nutritional care and diet counseling techniques	CO1	K2,C	Interpret the mode of delivery of nutritional care and diet counseling adopted in various hospitals	K3S1
65.	Guidelines for diet planning	CO1	K1,F	Categorize the steps in diet planning followed by a dietitian	K3S1
66.	Recent trends in dieting	CO1	K2,C	Point out the merits and demerits of various trending diets	K5S2
II. Nutrition Care Process					
67.	Assessment of Nutritional Status of hospitalized patients	CO2	K2P	Demonstrate the Nutritional Assessment ABNCH –group activity	K3S3
68.	Nutritional Diagnosis	CO2	K2C	Collect the Nutritional information of one family member using medical records	K4S2
69.	Implementation of Diet therapy, Monitoring and Evaluation of effectiveness	CO2	K2P	Prescribe dietary principles for Nutritionally diagnosed individual	K5S4
70.	Types of therapeutic diets(Regular ,Liquid diet-Clear fluid ,Full fluid ,bland diet, Soft diet)	CO2	K2C	Plan a recipe for each type of diet and estimate the calorie and macronutrient	K5S3
71.	Special diets –High calorie/Low calorie,High/Low protein, Low fat ,Low sodium ,Acitrom diet.	CO2	K2C	Debate on the contraindications for specific diets.	K1S1
72.	Routes of administration –TPN,EN.	CO2	K2C	List out commercially available products for TPN and EN with nutritional information	K1S1
73.	Preoperative and Post operative Nutrition	CO3	K2C	Conduct acasestudy on preoperative and postoperative diet	-
UNIT 2					
I.	**MNT for GI disorders(Etiopathophysiology ,clinical and metabolic aberrations and Nutritional Managements)**				
74.	Diarrhoea and Constipation	CO3	K2C	Plan a diet for different GI disorders and Justify diet prescription	K6S4
75.	Peptic Ulcer	CO3	K2C		
76.	GERD and Dumping syndrome	CO3	K2C		
77.	Coeliac disease and Lactose intolerance	CO3	K2C		
78.	IBD and IBS	CO3	K2C		
II	**MNT for Disorders of Liver and Gall Bladder (Etiopathophysiology ,clinical and metabolic aberrations and Nutritional Managements)**				
79.	Jaundice and Hepatitis	CO3	K2C	Video presentation on Liver and Gall bladder disorders and its management	K6S4
80.	Cirrhosis,hepatic coma	CO3	K2C		
81.	Cholecystitis ,Cholelithiasis	CO3	K2C		
82.	Role of fat in liver and gall bladder diseases	CO3	K4C		
83.	Nutrition and Alcoholism	CO3	K4C		
UNIT 3					
	MNT for fever,allergy and dental diseases(Etiopathophysiology ,clinical and metabolic aberrations and Nutritional Managements)				
84.	Fever –Malaria,typhoid,dengue,TB	CO3	K2C	Pictorial representation of different fever, allergies and food intolerance and dental problems.(Scrapbook or poster)	K3S2
85.	Allergy	CO3	K2C		
86.	Dental disease-Caries and Peritonitis	CO3	K2C		
UNIT 4					
	MNT for Renal Disorders (Etiopathophysiology ,clinical and metabolic aberrations and Nutritional Managements)				
87.	Glomerular nephritis	CO3	K2C	Collection of a case	K1S1

88.	Nephrosis	CO3	K2C	profile on different Renal disorders and Dialysis patients	
89.	Nephroscelerosis	CO3	K2C		
90.	Nephrolithiasis	CO3	K2C		
91.	Renal failure	CO3	K2C		
92.	Dialysis-HD and PD	CO3	K2C		
93.	Transplantation	CO3	K2C		
94.	Fluid and Electrolyte balance in renal patients	CO3	K2C		
UNIT 5					
	MNT for Cardiovascular Disorders (Etiopathophysiology ,clinical and metabolic aberrations and Nutritional Managements)				
95.	Hypertension	CO3	K2C	Systematic literature review presentation on Nutritional management of different cardiovascular disease	K5S1
96.	Atherosclerosis	CO3	K2C		
97.	Congestive Heart Failure	CO3	K2C		
98.	Dyslipidemia	CO3	K2C		
99.	Role of antioxidants in prevention and treatment of CVD	CO3	K4C		

Note: Content beyond syllabus if any may be included.

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JOURNALS AND DOCUMENTS	
1	Nutrition in Clinical Care,International Life Sciences Institute
2	British Journal of Nutrition, Cambridge University Press, 71145
3	European Journal of Clinical nutrition, Nature Publishing Group, 9543007
4	American Journal of Clinical Nutrition, American Society for Nutrition, 29165
5	Journal of Human Nutrition and Dietetics,Blackwell Publishing Inc.

Course Name	Clinical Nutrition II	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC15	Academic Year Introduced	2018 - 19
Type of Course	Theory	Semester	IV

COURSE OUTCOMES:

On completion of the course, the students will be able to	
CO1:	Identify the endocrine and pancreas disorders and its nutritional management
CO2:	Recite on the etiopathophysiology and nutrition management for metabolic disorders
CO3:	Recognize the nutrition care in cancer and various wounds
CO4:	Recommend the nutrition management process for critical care
CO5:	Suggest the nutrition intervention and nutrition management process for nervous disorders and musculoskeletal system disorder

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	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	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 L+Tu+Te=To
Management for Endocrine and Pancreatic disorders (Etiopathophysiology, clinical and metabolic aberrations and Nutritional Managements)	Toelucidate the physiological and dietary management on endocrine and pancreatic disorder	10+3+1=14
Management for Metabolic disorders (Etiopathophysiology, clinical and metabolic aberrations and Nutritional Managements)	To explain the clinical aspects and nutritional management of metabolic disorder	10+3+1=14
Nutrition in Cancer	To impart the importance of nutrition and management in different type of cancer condition	10+3+1=14
Nutrition in Critical Care	To figure out the injuries and impact of immune - suppressants	10+3+1=14
Management of Nervous and musculoskeletal system disorder (Etiopathophysiology, clinical and metabolic aberrations and nutritional management)	To elaborate the physiological and dietary management on nervous and musculoskeletal disorder	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN

Unit/ Chapters	Intended learning Outcomes	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activity	Psychomotor domain level
UNIT 1:Management ofEndocrine and Pancreatic disorders (Etiopathophysiology, clinical and metabolic aberrations and Nutritional Managements)					
1.	Hyper and Hypothyroidism	CO1	K2,F	Design a plan to change their lifestyle pattern through yoga, diet plan	K4,S3
2.	Obesity	CO1	K2,F	Classify the different grades of obesity	K4,S1
3.	PCOS	CO1	K2,F	Elaborate the causes and symptoms of polycystic ovary syndrome	K6,S5
4.	Grave's disease	CO1	K2,F	List the risk factors affecting grave's disease	K4,S1
5.	Aldosteroidism	CO1	K2,F	Measures to be taken for the management of aldosteroidism	K5,S2
6.	Pancreatitis	CO1	K2,F	Identify the factors influencing the Pancreatitis	K3,S1
7.	Diabetes Mellitus (Types, Complications, GI, Sugar	CO1	K2,F	Functions of insulin in diabetes mellitus (type 1 and 2)	K4,S4

	substitutes)			Identify the risk factors of diabetes mellitus	K3,S1
UNIT 2:Management of Metabolic disorders (Etiopathophysiology, clinical and metabolic aberrations and Nutritional Managements)					
8.	Maple syrup disease	CO3	K2,F	List the causes of maple syrup disease	K4,S2
9.	Galactosemia	CO3	K2,F	Criticize the symptoms of galactosemia	K5,S2
10.	Glycogen storage disease	CO3	K2,F	Distinguish between the types of glycogen storage disease	K4,S3
11.	Alcaptonuria	CO3	K2,F	Predict the complications, suppose the alcaptonuria is untreated	K6,S5
12.	Lesch-Nyhan syndrome	CO3	K2,F	Sketch out the clinical signs and symptoms of lesch-nyhan syndrome	K4,S1
13.	Nieman-pick disease	CO3	K2,F	Elaborate the risk factors and nutritional management in Nieman-pick disease	K6,S1
UNIT 3:Nutrition in Cancer					
14.	Reproduction of the normal cells and cancer cells	CO3	K2,C	Demonstrate the normal cells and cancer cells through picturization and justify	K3,S1
15.	Classification of neoplasms	CO3	K2,C	Sketch out the types of neoplasms	K4,S1
16.	Principles of cancer pathogenesis	CO3	K2,C	List out the principles of cancer pathogenesis	K4,S3
17.	Causes of cancer cell development	CO3	K2,C	Identify the risk factors of causing blood cancer	K3,S1
18.	Metabolic and nutritional alterations in malignancy	CO3	K2,C	Find the relationship between malnutrition and metabolic abnormalities in cancer patient	K4,S5
19.	Bodies defense system	CO3	K2,C	Criticize the development of autoimmune disorder in young adults	K4,S3
20.	Cancer therapy and nutrition	CO3	K2,C	Explain the nutritional requirement before and after cancer therapy	K4,S5
21.	Eating problems in cancer	CO3	K2,C	Identify the eating disorders in cancer patient	K3,S1
22.	Feeding and blend preparation for cancer	CO3	K2,C	Plan of liquid diet for esophageal cancer patient and justify the prescription	K6,S2
UNIT 4:Nutrition in Critical Care					
23.	Injury – Types, causes and dietary management	CO3	K2,C	Plan a diet for different types of wounds and Justify about the diet	K6,S4
24.	Burns – source and types of burns	CO3	K2,C	Tabulate the different degrees of burns and its sources	K3,S3
25.	Palliative treatment	CO3	K2,C	Explain the term palliative treatment	K5,S3
26.	Grading of burns and dietary regimen	CO3	K2,C	Solve the nutritional management in burned condition	K6,S5
27.	Wound management – types, dietary management for various wounds	CO3	K2,C	Functions of macronutrient in wound healing	K4,S3
28.	Nutrition in stress and trauma	CO3	K2,C	Identify the stress factors affects the individual health in nutrition aspect	K3,S5
29.	Role of immune enhancers	CO3	K2,C	Sketch out the role of immune enhancers	K4,S1
30.	Immuno suppressants and nutritional support system	CO3	K2,C	Explain the immunosuppressants and its sources	K4,S3
31.	Special diets in critical care	CO3	K2,C	Sketch out the special diets in critical care	K4,S1
UNIT 5: Management of Nervous and musculoskeletal system disorder (Etiopathophysiology, clinical and metabolic aberrations and nutritional management)					
32.	Epilepsy	CO1	K2,C	Categories the clinical signs and symptoms of epilepsy condition	K4,S5
33.	Alzheimer disease	CO1	K2,C	List any five symptoms that decline during alzhemier disease	K4,S3
34.	Parkinson disease	CO1	K2,C	Identify the risk factors that causing Parkinson disease	K3,S5
35.	Autism	CO1	K2,C	Sketch out the nutritional management in autism condition	K4,S1
36.	Neuropathies	CO1	K2,C	Classification of neuropathies	K4,S1
37.	Migraine	CO1	K2,C	Predict the symptoms and nutritional management of migraine	K6,S5

38.	Stroke	CO1	K2,C	Distinguish between signs and symptom occur in men and women	K4,S2
39.	Osteoporosis	CO1	K2,C	Identify the risk factors causing osteoporosis in female	K3,S5
40.	Osteomalasia	CO1	K2,C	Relationship between rickets and osteomalasia and justify the reason	K4,S3
41.	Osteoarthritis	CO1	K2,C	Explain the severity of osteoarthritis	K4,S3
42.	Rheumatoid arthritis	CO1	K2,C	Sketch out the nutritional management in rheumatoid arthritis	K4,S1
43.	Systemic lupus erythematosis	CO1	K2,C	Relationship between Systemic lupus erythematosis and autoimmune disorder	K4,S1

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2	Boushey, C. J., Coulston, A. M., Rock, C. L., & Monsen, E. (Eds.). (2001). Nutrition in the Prevention and Treatment of Disease. Elsevier.
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3	Sobotka, L., & Forbes, A. (2019). Basics in clinical nutrition (Vol. 1, No. 5th). Galen.
4	Lanham-New, S. A., Hill, T. R., Gallagher, A. M., & Vorster, H. H. (Eds.). (2019). Introduction to human nutrition. John Wiley & Sons.
5	Eastwood, M. A. (2013). Principles of human nutrition. Springer.
JOURNALS AND DOCUMENTS	
1	Transfusion Medicine and Hemotherapy, Karger Publisher
2	Iranian journal of nursing and midwifery research, Wolters Kluwer Health
3	Palliative care for children. Pediatrics, Springer Nature

Course Name	Biochemical Analysis Practical	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC16	**Academic Year Introduced**	2018 - 19
Type of Course	Practical	**Semester**	IV

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Analyze the qualitative test of urine and blood sample
CO2:	Estimate the health status by quantitative analysis of blood and urine Sample
CO3:	Gain knowledge on biochemical parameters and disease condition throughthe analysis

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	2	2	2	2	2	3	1	3	2
CO2	1	3	2	2	2	2	2	2	3	1	3	2
CO3	2	3	2	2	2	2	2	3	3	2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Objectives	Hours of Instruction Tu+P+Te=To
To perform various qualitative analysis in urine and blood sample	3+12+3 = 18
To estimate the blood parameters and can assess health status	3+12+3 = 18
To determine blood group and other parameters	3+12+3 = 18
Total Hours of Instruction	54 (18x3)

Tu-Tutorial, P-Practical, Te-Tests, To-Total Hours

COURSE PLAN

Module/ Experiment No.	Intended learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
Module I:Qualitative analysis of urine					
1.	Determine the presence of sugar level in urine	CO1	K4, P	Exhibit the result on the presence of sugar and its level in the given urine sample	S1
2.	Determine the presence of ketone bodies in the urine	CO1	K4, P	Exhibit the result on the presence of ketone bodies in the given urine sample	S1
3.	Determine the presence of albumin level in the urine	CO1	K4, P	Exhibit the result on the presence of albumin and its level in the given urine sample	S1
4.	To detect a blood content present in the urine	CO1	K1, P	Exhibit the result on the presence of blood content in the given urine sample	S1
5.	Examine the presence of bile salt and pigment in the urine	CO1	K4, P	Exhibit the result on the presence of bile salt and pigment in the given urine sample	S1
6.	Record the bilirubin value in the urine	CO1	K1,P	Exhibit the result on the presence of bilirubin value in the given urine sample	S1
Module II: Quantitative analysis of urine					
7.	Estimation of sugar content in the urine	CO2	K2, P	Expose the result on the presence of sugar content in the given urine sample	S3
8.	Estimate the urea level in the urine	CO2	K2, P	Interpret the result on the presence of urea level in the given urine sample	S3
9.	Estimation of creatinine content in the urine	CO2	K2, P	Exhibit the result on the presence of creatinine content in the given urine sample	S3
Module III: Qualitative analysis of blood					
10.	Group the type of blood for the given specimen	CO1	K6, P	Interpret the result on the presence of type of blood in the given Blood sample	S1
11.	Record the blood bleeding time for the given specimen	CO1	K1, P	Interpret the bleeding time in the given blood sample	S1
12.	Record the blood clotting time for the given specimen	CO1	K1, P	Interpret the clotting time in the given blood sample	S1
Module IV:Quantitative analysis of blood					
13.	Estimation of urea content in the blood by DAM method	CO1, CO3	K2, P	Exhibit the result on the presence of urea content in the blood by using DAM method	S3
14.	Assess the cholesterol level in serum by ZAK method	CO1, CO3	K5, P	Expose the result on the presence of cholesterol level by ZAK method in the given blood sample	S3
15.	Analyse the blood sugar level by Ortho Tolidine method	CO1, CO3	K4, P	Exhibit the result on the presence of blood sugar level by Ortho Tolidine method	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

16.	Determination of protein content present in the blood by biuret method	CO1, CO3	K5, P	Exhibit the result on the presence of protein content present in the blood by biuret method	S3

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2	RanjnaChawla, (2020), Practical Clinical Biochemistry Methods and Interpretations, Jaypee Medical Publisher, Fifth Edition
REFERENCE BOOKS	
1	Vishnu Moorthy A and Frederick J.BoehmIII ,(2009), Urinalysis and an Approach to Kidney Disease, Pathophysiology of Kidney Disease and Hypertension.
2	Guidance manual on "ABO and Rh Blood Grouping', National Institute of Biologicals
3	Vijay Kumar and Kiran Dip Gill, (2018), Basic Concepts in Clinical Biochemistry: A Practical Guide, pp. 67-70.
JOURNALS AND DOCUMENTS	
1	International Journal of Diabetes and Clinical Research , ClinMed International Library
2	Journal of Clinical and experimental Hepatology, Elsevier.
3	Journal of Young Pharmacists: JYP, Elsevier
4	Journal of comparative Pathology, Elsevier
5	Laboratory Procedural Manual on Complete Blood Count

Course Name	Computer Aided Clinical Nutrition Practical	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC17	Academic Year Introduced	2018 - 19
Type of Course	Practical	Semester	IV

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	To understand the different types of fluid diet and its importance
CO2:	To know the different types of disease condition and its nutrient requirement
CO3:	To understand the dysfunctionality and its nutritional management
CO4:	To understand the autism and differentiation of fever conditions
CO5:	To identify the communicable (HIV) and non communicable disease (Cancer)

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	3	2	1	2	2	3	2	3	3
CO2	2	3	3	3	2	1	2	2	3	2	3	3
CO3	2	3	3	3	2	1	2	2	3	2	3	3
CO4	2	3	3	3	2	1	2	2	3	2	3	3
CO5	2	3	3	3	2	1	2	2	3	2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction Tu+P+Te=To
Plan a menu for hospital diets	To impart the diets that followed in hospital sector	0+1+1= 2
Plan a menu for disease condition	To illustrate the severity of disease condition and nutrient requirement	1+20+1 = 22
Plan a menu for dysfunction condition	To explain the dysfunctionality and its complications	1+14+1 = 16
Plan a menu for autism and different types of fever	To point out the autism condition and types of fevers	1+2+4 = 7
Plan a menu for HIV and Cancer	To describe the HIV and Cancer condition	1+2+4 = 7
Total Hours of Instruction		54 (18x3)

Tu-Tutorial, P-Practical, Te-Tests, To-Total Hours

COURSE PLAN

Module/ Experiment No.	Intended learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
Module 1:Plan a menu for hospital diets					
1.	Liquid diet, Semi solid diet, Soft diet and Bland diet	CO1	K1,C	Differentiate the different fluid diets and plan a menu for each condition	K4,S1
2.	Post operative care	CO1	K4,P	Describe the post operative care condition and plan a menu for them	K6,S5
3.	Critical care – burns, injuries and trauma	CO1	K1,C	Differentiate the burns condition and plan a menu for different stages of burns and injuries; trauma	K4,S1
Module II: Plan a menu for disease condition					
4.	Gastro-intestinal disorder (diarrohea, constipation, peptic ulcer, malabsorption syndrome, ulcerative colitis)	CO2	K2, P	Design a menu for each condition and evaluate the nutrient requirement according to its condition	K5,S5
5.	Liver and gall bladder disease (jaundice, hepatitis, cirrhosis, hepatic coma, cholecystitis and cholelithiasis)	CO2	K3, P		
6.	Kidney disorder (nephritis, nephrosis, renal failure and patients in dialysis)	CO2	K3, P		
7.	Heart and circulatory disorder (hypertension, atherosclerosis, congestive heart failure, hyperlipoproteinemia and dyslipidemia)	CO2	K2, P		
Module III: Plan a menu for dysfunction condition					
8.	Different grades of obesity	CO3	K1,C	Create a menu for different type dynsfunction condition	K3, S3
9.	Different types of diabetes	CO3	K3,F		

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

10.	Different types of calcium deficiency (osteoporosis and rheumatoid trauma)	CO3	K3,F		
Module IV: Plan a menu for autism and different types of fever					
11.	Autism condition	CO4	K3,C	Explain the autism condition and design a menu for them with nutrient calculation	K3,S1
12.	Fever (typhoid, swine flu, dengue)	CO4	K3, C	Differentiate the fevers and plan a menu according to its condition	K3, S5
Module V: Plan a menu for HIV and Cancer					
13.	HIV	CO5	K3, C	Plan a menu for HIV condition and evaluate the nutrient content	K6, S5
14.	Cancer	CO5	K3, P	Create a menu for cancer and calculate the nutrient requirement	K1, S5

REFERENCES

Software	
1	Ntuitive software offered by Fitterfly technologies, Mumbai
2	Digest Software
3	Nutuitive application available at Play store
4	NIN application available at Play store

Course Name	Innovation and Startup Practical	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNC18	**Academic Year Introduced**	2018 - 19
Type of Course	Practical	**Semester**	IV

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	differentiate research and innovation
CO2	execute the steps in idea generation, idea to deployment and startup development stages
CO3	interpret the features of national innovation and start-up policy 2019 for students and faculty
CO4	implement design thinking process, systematic literature review, business model canvas, nutrition care process model, evidence based practice, practice based evidence, knowledge transfer model and theory of change model in innovation and commercialisation

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	-	-	2	1	1	1	-
CO2	-	-	-	2	-	-	1	2	1	3	1	-
CO3	-	-	-	1	-	2	3	2	1	3	1	3
CO4	-	-	-	3	-	1	2	2	1	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction Tu+P+Te=To
Research vs Innovation	To enable the students to integrate research in innovation	0.5+2+0.5 = 3
Innovation Strategy and Startup Process	To educate the learners on steps in innovation and start-up development stages	1+5+3 = 9
National Startup Policy	To outlay the features of national startup policy 2019 for students and faculty	1+4+1 = 6
Process and Models for Food Innovation and Startup	To exemplify the application of various process and models in food innovation and startup	10+20+6 = 36
Total Hours of Instruction		54 (18x3)

Tu-Tutorial, P-Practical, Te-Tests, To-Total Hours

COURSE PLAN

Module/ Experiment No.	Intended learning Chapters	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
Module 1: Research Vs Innovation					
1.	What is Research and Innovation?	CO1	K4, F	Conduct a quiz on research vs innovation	K6, S1
2.	Steps in research process vs innovation process	CO1	K3, MC	Identify the factors that make the company innovative	K5, S5
Module II: Innovation Strategy and Startup Process					
3.	Idea Generation for food and nutripreneurship	CO2	K6, MC	Create a challenge book	K6, S5
4.	Idea to Deployment – Product, Process and Service	CO2	K3, P	Modulate food and nutripreneurship ideas to deployment	K3, S1
5.	Startup Development Stages	CO2	K3, P	Generate a model for food and nutripreneurship startup	K6, S5
Module III: National Startup Policy					
6.	Features of National Startup Policy 2019 for Students and Faculty	CO3	K2, F	Appraise the features in National Startup Policy 2019	K3, S3
Module IV: Process and Models for Food Innovation and Startup					
7.	Systematic Literature Review Process	CO4	K3, C	Sketch the systematic literature review process for a food item	K3, S1
8.	Design Thinking Process	CO4	K3, C	Schematize the steps in design thinking process to solve a pain point in the food industry	K3, S5
9.	Business Model Canvas	CO4	K3, C	Pitch on a business model canvas for a product, process and service	K3, S5
10.	Nutrition Care Process Model	CO4	K3, P	Generate a process for nutrition and dietetic practice for an individual	K6, S5
11.	Evidence Based Practice	CO4	K3, P	Create an evidence based nutrition and dietetic practice	K6, S5
12.	Practice Based Evidence	CO4	K3, P	Infer an evidence based diet therapy on practice for a disease condition	K5, 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

13.	Knowledge Transfer Model	CO4	K4, P	Formulate a model to transfer knowledge to the community	K6, S4
14.	Theory of Change Model	CO4	K4, P	Exemplify the nutripreneurship through theory of change model	K4, S3

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2	Grunert, Klaus Gunter, Traill, Bruce (1997), Products and Process Innovation in the Food Industry, Springer
3	MHRD, (2019), National Innovation and Startup Policy 2019 for Students and Faculty: A Guiding Framework for Higher Education Institutions
4	Esther Myers and Yiva Orrevall, (2020), Using the Nutrition Care Process, TBA, USA.
REFERENCE BOOKS	
1	Francesca Zampollo (2018), Food Design Thinking: The Complete Methodology, onlineschooloffooddesign. org.
2	Paul Glasziou and Chris Del Mar (2007), Evidence based Practice Workbook, Second Edition, Blackwell Publishing.
3	Dietitians of Canada (2006-2011), Practice based Evidence : PEN Writers' Guide, pennutrition.com.
4	Kigali, Rwanda (2014), Theory of Change, Abdul Latif Jameel, Poverty Action Lab, Translating Research into Action.
JOURNALS AND DOCUMENTS	
1	Bernadette Mazurek Melnyk, Ellen Fineout-Overholt, Susan B. Stillwell, Kathleen M. Williamson, (2010), Evidence-based Practice: Step by Step, ajn@wolterskluwer.com.
2	John Mayne (2015), Useful Theory of Change Models, Canadian Journal of Program Evaluation, doi: 10.3138/cjpe.230
3	Esther F Myers, Naomi Trostler, V.Varsha and Hillary Voet (2017), Insights from the Diabetes in India Nutrition Guidelines Study: Adopting Innovations using Knowledge Transfer Model, Topics in Clinical Nutrition, Wolters Kluwer Health Inc., Vol.32, No.1: 69-86.
4	Dominic Glover and Nigel Poole (2019), Principles of Innovation to Build Nutrition Sensitive Food Systems in South Asia, Food Policy, Elsevier, 82: 62-73.

Course Name	Physiological Aspects of Nutrition	Programme Name	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNE07	Academic Year Introduced	2018 - 19
Type of Course	Theory	Semester	IV

COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1:	Infer on the physiological role of blood and its components and secretions of Gastrointestinal tract
CO2:	Recognize the importance of nutrients in immune system
CO3:	Classify the hormones and its Mechanism of action
CO4:	Relate the maintenance and regulations of water and electrolytes balance
CO5:	Specify the Metabolism of Drugs and its interaction with nutrients

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	1	1	2	2	3	2	2	3
CO2	3	1	2	2	1	1	2	2	3	2	2	3
CO3	3	1	2	2	1	1	2	2	3	2	2	3
CO4	3	1	2	2	1	1	2	2	3	2	2	3
CO5	3	1	2	2	1	2	2	2	3	2	2	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction L+Tu+Te=To
Blood and Secretions of GI tract	To impart knowledge on blood components and Gastrointestinal secretions	10+3+1=14
Relationship between Immunity and Malnutrition	To get insight into immune system and role of nutrients in inferring immunity	10+3+1=14
Hormones	To categorize the functions of hormones	10+3+1=14
Water Balance ,Acid base balance and Functional tests	To impart knowledge on body buffer system	10+3+1=14
Drugs and Drug Nutrient Interaction	To describe the drug metabolism in the human body and its interaction with nutrients	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN

Unit/Chapters	Intended learning Outcomes	CO(s) Mapped	Cognitive Level / KD	Psychomotor domain activity	Psychomotor domain level
UNIT I: Blood and Secretions of GI tract					
1.	**Blood** -Composition of blood, cellular elements of blood and hemopoiesis,	CO1	K2F	Demonstrate the blood grouping ,blood coagulation time and bleeding time	K3S1
2.	**Hemoglobin**- structure, synthesis and function, plasma proteins- functions and changes in various disorders,	CO1	K2F	Design a poster about components of blood with accurate information	K6S4
3.	**Secretion of gastrointestinal tract-** Physiology and clinical significance of enzymes and hormones of the gastrointestinal tract, Hunger, Appetite and Satiety, circadian rhythm of salivary, gastric, pancreatic and glucocorticoid secretions	CO1	K2F	Choose any one GI enzyme or hormone and prepare a flowchart about mechanism of action	K3S2
UNIT II Relationship between Immunity and Malnutrition					
4.	**Introduction** :Types of immunity, cells of the immune system, Immune response – humoral immunity, cell mediated immunity,	CO2	K2F	Systematic review presentation of journals and evaluate the significance of Immunonutrients –rich	K5S3
5.	**Immune changes in malnutrition**, vitamin deficiency, Iron deficiency and zinc modulation.	CO2	K2F		

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

6.	Neuro endocrine control of stress and immunity, Immune mechanisms in infections, Autoimmunity and Hypersensitivity	CO2	K2C	foods	
UNIT III: Hormones					
7.	**Hormones:** Principles of hormone action and endocrine control, synthesis, secretion and biological effect of pituitary, thyroid, parathyroid, adrenal, pancreas, male and female reproductive hormones.	CO3	K2F	Choose any one hormone and explain its physiological role and functions	K5S2
UNIT IV: Water Balance ,Acid base balance and Functional tests					
8.	**Water and electrolyte balance**- Total body water, intake versus output of water, body fluid compartments, composition of body fluid, measurement of body fluid volumes, forces controlling the water and electrolyte balance between cells and extra cellular fluid, metabolism of water and electrolytes,.	CO4	K2F	Prepare a list of disease/disorders caused due to water and electrolyte imbalance /acid base balance	K3S2
9.	*Regulation of acid base balance: Effect of diet on water, electrolyte and acid-base balance*	CO4	K2C		
10.	Function tests- Gastric function test, liver function test, renal function test and endocrine function test	CO4	K2P	Bring a lab report of your family member /neighbor on all the function tests and interpret the values	K3S2
UNIT V: Drugs and Drug Nutrient Interaction					
11.	*Drugs- Introduction, absorption, biotransformation and excretion of drugs, routes of drug administration, physiological action, clinical significance of drug,*	CO5	K2C	Choose any one category of drugs and determine its interaction with nutrients	K5S2
12.	Food and drug interaction,	CO5	K2C		
13.	**Drug induced malnutrition** – luminal factors, mucosal factors, antibacterial agents including antibiotics, hypolipidemic agents, anti-inflammatory agents, oral hypoglycemic drugs.	CO5	K2C		

REFERENCES

TEXTBOOKS	
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1	Journal of Nutrition, American Society of Nutrition-ASN, 223166
2	International Journal of Behavioral Nutrition and Physical Activity,BioMed Central
3	Journal of the Academy of Nutrition and Dietetics ,Elsevier USA
4	American Journal of Clinical Nutrition, American Society for Nutrition, 29165
5	Advances in Nutrition , American Society of Nutrition
6	British Journal of Nutrition, Cambridge University Press, 71145
7	European Journal of Clinical nutrition, Nature Publishing Group, 9543007
8	International Journal of Food Science and Nutrition Journal of Nutritional Science, Cambridge University Press, _
9	Nutrition and Metabolism ,Biomed Central
10	Journal of Human Nutrition and Dietetics ,Blackwell Publishing Inc

Course Name	Nutritional Epidemiology	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNE08	**Academic Year Introduced**	2018-2019
Type of Course	Theory	**Semester**	IV

COURSE OUTCOME

On completion of the course, the students will be able to	
CO1:	Define the concept of Health and disease
CO2:	Identify the principle of Epidemiology and its methods
CO3:	Know the facts and completion of Communicable diseases
CO4:	Identify and define the chronic non-communicable diseases
CO5:	Define the role of health and public care through epidemiology

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	1	1	2	2	3	2	2	3
CO2	3	1	2	2	1	1	2	2	3	2	2	3
CO3	3	1	2	2	1	1	2	2	3	2	2	3
CO4	3	1	2	2	1	1	2	2	3	2	2	3
CO5	3	1	2	2	1	2	2	2	3	2	2	3

1 – Slight, 2 – Moderate, 3 – Substantial

COURSE OBJECTIVES AND HOURS OF INSTRUCTION

Unit/Module	Objectives	Hours of Instruction L+Tu+Te=To
Concepts of Health and Disease	Understand the principles of epidemiology, nutritional epidemiology and its importance in community and public health	10+3+1=14
Principles of Epidemiology and Epidemiologic Methods	Be able to design and evaluate studies/nutritional programmes	10+3+1=14
Epidemiology of Communicable Diseases	To impart the knowledge on the science of communicable diseases and its complementary role in nutrition	10+3+1=14
Epidemiology of Chronic Non-Communicable Diseases and Conditions	To elaborate the science of non-communicable diseases in different medium	10+3+1=14
Health and Public Care	Be aware of characteristics and use of biological markers in understanding mechanistic basis for association revealed from epidemiological studies	10+3+3=16
Total Hours of Instruction		72 (18x4)

L-Lecture, Tu-Tutorial, Te-Tests, To-Total Hours

COURSE PLAN:

S. No.	Intended learning practices	CO(s) Mapped	Cognitive Level/ KD	Psychomotor domain activity	Psychomotor domain level
UNIT 1 Concepts of Health and Disease					
1.	Concept of health	CO1	K1, C	Visualizing the disease Spectrum	K1S5
2.	Concept of Disease- causation, disease control, prevention,	CO1	K2, P	Understanding the practical concepts of diseases by a hospital vist	K2S3
3.	Disease classification	CO1	K4, C	Classification charts preparation	K4S1
4.	Concept of wellbeing	CO1	K1, C	Observation and experimental the studies of case problems	K3S3
UNIT 2 Principles of Epidemiology and Epidemiologic Methods					
5.	History, Definition, Aims of epidemiology, Principles of Epidemiology,	CO2	K2P		K3S3

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

6.	Epidemiological triad,	CO2	K2C	Hospital vist	K5S5
7.	Eepidemiological approach, Basic measurements in epidemiology,	CO2	K2P	Case history collection from the hospital	K5S4
8.	Measurement of mortality, Measurement of morbidity, incidence, prevalence of disease,	CO2	K2C		K5S3
9.	Epidemiologic methods – Descriptive epidemiology, Analytical epidemiology, Case control study, Cohort study, Experimental epidemiology, Randomised control trials, non randomized trials,	CO2	K2C		K1S1
10.	Association and Causation, Infectious disease epidemiology and investigation of an epidemic.	CO2	K2C		K1S1
UNIT 3 Epidemiology of Communicable Diseases					
11.	Immunization- Hazards, Types	CO3	K2C	Plan a diet for different GI disorders and Justify diet prescription	K2S3
12.	Universal & National Immunization Schedules	CO3	K2C	Tabulation of the schedules	
13.	Screening and Survey of a Disease	CO3	K2C	Case study of a communicable Diseases	
14.	Investigation and Reporting	CO3	K2C		
15.	Monitoring and Surveillance	CO3	K2C		
16.	Respiratory infections	CO3	K2C	Video presentation on infections and its treatments	K3, P
17.	Intestinal infections	CO3	K2C		
18.	Arthropod borne infections	CO3	K2C		
19.	Zoonoses and Surface infections	CO3	K2C		
	UNIT 4 Epidemiology of Chronic Non-Communicable Diseases and Conditions				
20.	Cardiovascular diseases	CO3	K2C	Video presentation on CVD and Stroke due to BP and its management	K6S4
21.	coronary heart diseases	CO3	K2C		
22.	hypertension	CO3	K2C		
23.	stroke	CO3	K2C		
24.	rheumatic heart disease	CO3	K2C		
25.	cancer	CO3	K2C	Collection of a case profile on different non communicable diseases patients	K6S4
26.	diabetes	CO3	K2C		
27.	obesity	CO3	K2C		
28.	accidents and injuries	CO3	K2C		
29.	blindness	CO3	K2C		
UNIT 5 Health and Public Care					
30.	Emergence of new diseases, Prevention and control	CO3	K2C	Pictorial representation of nutritional epidemiology and its healthcare institution in India. (Scrapbook or poster)	K3S2
31.	Development of Public & Private Healthcare Institutions in India	CO3	K2C		
32.	Patterns of Nutritional Epidemiology	CO3	K2C		
33.	Anthropometrics	CO3	K2C	Nutritional intake and studies through video representation	
34.	Biochemical Markers	CO3	K2C		
35.	Socio demographic	CO3	K2C	Survey through Questionnaire in a field visit	
36.	psychosocial variables	CO3	K4C		
37.	Design and planning of Nutritional Epidemiological studies	CO3	K4C	Tabulation of the planning studies	K3S5
38.	Assessing, Applying and Evaluation	CO3	K4C	Through questionnaire	
39.	Nutrigenomics	CO3	K4C	Video representation on Gene Expression on Nutrients	

40.	personalized nutrition care process	CO3	K4C	Preparing Personalized Diet for an obese patient	
41.	Health care of the community	CO3	K4C	Pamphlets and Boucher preparation on Food Hygiene and safety surveillance	

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JOURNALS AND DOCUMENTS	
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2	Iranian journal of nursing and midwifery research, Wolters Kluwer Health
3	Palliative care for children. Pediatrics, Springer Nature

Course Name	Personalized nutrition care process of an individual	**Programme Name**	M.Sc. Food Science, Technology and Nutrition
Course Code	18FSTNIL04	**Academic Year Introduced**	2018 - 19
Type of Course	Part 4 Research	**Semester**	IV

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:	convince the community about the significance of food equity, budgeting and storage
CO4:	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 PLAN

Exercise No.	Unit/Module Title	Tutorial (18 hours)	Practical (36 hours)
I	General Information	Framing the Questionnaire and validation through pilot testing	General Information Assessment
II	Nutritional Status Assessment	Assessment Procedure Validation, Ethical Considerations and Data Management	Assessment of Nutritional Status of an Individual a. Height (cm) b. Weight (kg) c. BMI (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)
III	Analyze the Diet Pattern	Assessment Template Validation	a. Individual daily meal analysis on balanced diet (inclusion of basic five food groups) b. Food Preferences and Practices c. Food Availability and Purchase Power
IV	Meal Planning	Food Exchange List, Steps in Individual Meal Plan	a. Nutrient Requirement Calculation b. Portion Control and Number of Servings c. Meal Distribution d. Meal Planning e. Nutrient Intake Calculation f. Nutrient Adequacy Analysis g. Corrected Balanced Meal Plan
V	Implementation and Follow-up of Diet Plan	Diet Counselling Techniques and Follow-up session Procedures	Counsel the individual on balanced meal plan and follow-up record maintenance using nutrition care process software

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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

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