Dr. N.G.P. ARTS AND SCIENCE COLLEGE

REGULATIONS 2022-23 for Post Graduate Programme

(Outcome Based Education model with Choice Based Credit System)

M.Sc. FOOD AND NUTRITION

(For the students admitted during the academic year 2022-23 and onwards)

Eligibility:

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

Programme Educational Objectives:

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

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

PROGRAMME OUTCOMES:

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

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

Total Credit Distribution

Course	Credits	Total		Credits	Cumulative Total
Core	4	14x 100	1400	56	92
Core Practical	3	2 x 100	200	06	
	2	2 x 100	200	04	
EDC	4	1 x 100	100	04	
Core Project Work	8	1 x 200	200	08	
Internship	2	1 x 100	100	02	
Electives	3	3 x 100	300	09	
Elective Practical	3	1 x 100	100	03	
			2600	**92**	**92**

SCHEME OF EXAMINATION

M.Sc. FOOD AND NUTRITION

Course Code	Course Category	Course Name	L	T	P	Exam (hours)	Max Marks			Credits
							CIA	ESE	Total	
First Semester										
223FN2A1CA	CORE-I	Advanced Food Science	4	1	1	3	50	50	100	4
223FN2A1CB	CORE-II	Nutrition Through Life Cycle	4	1	1	3	50	50	100	4
223FN2A1CC	CORE-III	Nutritional Biochemistry	4	-	-	3	50	50	100	4
223FN2A1CD	CORE-IV	Food Chemistry	4	1	1	3	50	50	100	4
223FN2A1CP	CORE PRACTICAL -I	Food Science and Food Chemistry	-	-	4	3	50	50	100	2
223FN2A1DA	DSE- I	Functional Foods and Nutraceuticals	4	-	-	3	50	50	100	3
223FN2A1DB		Food Product Development								
223FN2A1DC		Harvest Technology of Agricultural produce								
Total			20	3	7				600	21

16/8/22
BoS Chairman/HoD
Department of Food Science & Nutrition
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

Dr.N.G.P. Arts and Science Co
APPROVED
BoS 13th 16-8-22 | AC - 13th 6-9-22 | GB - 18th 10-9-22

Academic Council
Dr.V. Rajendran
CHAIRMAN
Dr.N.G.P. Arts and Science College

Course Code	Course Category	Course Name	L	T	P	Exam (hours)	Max Marks			Credits
							CIA	ESE	Total	
Second Semester										
223FN2A2CA	CORE-V	Food Processing	4	1	-	3	50	50	100	4
223FN2A2CB	CORE-VI	Applied Physiology	4	-	-	3	50	50	100	4
223FN2A2CC	CORE-VII	Therapeutic Nutrition – I	4	-	-	3	50	50	100	4
223FN2A2CD	CORE-VIII	Macronutrients	4	-	-	3	50	50	100	4
223FN2A2CE	EDC	Computer Application in Nutrition	4	-	-	3	50	50	100	4
223FN2A2CP	CORE PRACTICAL -II	Food Analysis	-	-	6	3	50	50	100	3
223FN2A2DA	DSE-II	Food Biotechnology	3	-	-	3	50	50	100	3
223FN2A2DB		Food Waste and By - Product Utilization								
223FN2A2DC		Food Toxicology								
Total			**23**	**1**	**6**				**700**	**26**

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Coimbatore – 641 048

Dr.N.G.P. Arts and Science College
APPROVED
BoS- 14th 30.11.2022 | AC - 14th 19.01.2023 | GB - 19th 30.01.2023

Academic Council
Dr.V. Rajendran
CHAIRMAN
Dr.N.G.P. Arts and Science College

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Third Semester										
223FN2A3CA	Core – IX	Micronutrients	4	-	-	3	50	50	100	4
223FN2A3CB	Core – X	Therapeutic Nutrition - II	4	-	-	3	50	50	100	4
223FN2A3CC	Core – XI	Research Methodology and Statistics	4	1	-	3	50	50	100	4
223FN2A3CD	Core – XII	Food Additives and Contaminants	4	-	-	3	50	50	100	4
223FN2A3CP	Core Practical - III	Food Analytical Techniques	-	-	6	3	50	50	100	3
223FN2A3CQ	Core Practical - IV	Therapeutic Nutrition	-	-	4	3	50	50	100	2
223FN2A3CT	IT	Internship	-	-	-	3	50	50	100	2
223FN2A3DA	DSE - III	Instrumentation in Food Industry	3	-	-	3	50	50	100	3
223FN2A3DB		Food Packaging Techniques								
223FN2A3DC		Food Microbiology								
Total			**19**	**01**	**10**				**800**	**26**

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fourth Semester										
223FN2A4CA	Core – XIII	Public Health Nutrition	4	-	-	3	50	50	100	4
223FN2A4CB	Core - XIV	Food Safety and Quality Management	4	-	-	3	50	50	100	4
223FN2A4CV	Core	Project Work and Viva Voce	-	-	16	3	100	100	200	8
223FN2A4DP	DSE - IV	Food Quality Control	-	-	6	3	50	50	100	3
223FN2A4DQ		Nutrition in Health								
223FN2A4DR		Food Fermentation Techniques								
Total			**08**	**-**	**22**				**500**	**19**
***Grand Total**									**2600**	**92**

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Dr.N.G.P. Arts and Science College
APPROVED
BoS- 16th 16.10.23 | AC- 16th 13.12.23 | GB- 21st 05.01.24

Academic Council
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DISCIPLINE SPECIFIC ELECTIVE

Semester I (Elective I)

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

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	223FN2A1DA	Functional Foods and Nutraceuticals
2.	223FN2A1DB	Food Product Development
3.	223FN2A1DC	Harvest Technology of Agricultural produce

Semester II (Elective II)

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

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	223FN2A2DA	Food Biotechnology
2.	223FN2A2DB	Waste and By-Product Utilization
3.	223FN2A2DC	Food Toxicology

Semester III (Elective III)

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

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	223FN2A3DA	Instrumentation in Food Industry
2.	223FN2A3DB	Food Packaging Techniques
3.	223FN2A3DC	Food Microbiology

Semester IV (Elective IV)

(Student shall select any one of the following courses as Elective in fourthsemester)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	223FN2A4DP	Food Quality Control
2.	223FN2A4DQ	Nutrition in Health
3.	223FN2A4DR	Chemical Composition and Food Proportions

Self-study paper offered by the Department of Food Science and Nutrition

S. No.	Semester	Course Code	Course Name
1	III	223FN2ASSA	Composite Home science
2	III	223FN2ASSB	Diet Counseling

PG REGULATION (R4)

(Students Admitted in the AY 2022-23)

(OUTCOME BASED EDUCATION WITH CBCS)

Effective from the academic year 2022-23 and applicable to the students admitted to the Degree of Master of Arts/Commerce/Management/Science.

1.NOMENCLATURE

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

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

1.3 Batch: Refers to the starting and completion year of a programme of study. Eg. Batch of 2022–2024 refers to students belonging to a 2-year Degree programme admitted in 2022 and completing in 2024.

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

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

b) Extra Departmental Course (EDC): A course chosen generally from a related discipline/subject, with an intention to seek exposure in the discipline relating to the core domain of the student.

c) Discipline Specific Elective Course (DSE): Elective courses are offered under main discipline/ subject of study.

d) Project Work: It is considered as a special course involving application of knowledge in

problem solving/analyzing/exploring a real-life situation. The Project work will be given in lieu of a Core paper.

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

f) Advanced Learner Course (ALC): ALC is doing work of a higher standard than usual for students at that stage in their education. Research work / internships carried out in Universities/ Research Institutions/ Industries of repute in India or abroad for a period of 15 to 30 days.

2. STRUCTURE OF PROGRAMME

- Core Course
- Extra Departmental Course (EDC)
- Discipline Specific Elective (DSE)
- Industrial Training (IT)
- Project

3. DURATION OF THE PROGRAMME

A student is normally expected to complete the M.Sc. /M.Com. / M.A. Programme in 4 semesters. However, in any case not more than 5 consecutive semesters. Failing which the concerned BoS will identify suitable/ equivalent course.

4. REQUIREMENTS FOR COMPLETION OF A SEMESTER

Every student shall ordinarily be allowed to keep terms for the given semester in a program of his/ her enrolment, only if he/ she fulfills at least seventy five percent (75%) of the attendance taken as an average of the total number of lectures, practicals, tutorials, etc. wherein short and/or long excursions/field visits/study tours organised by the college and supervised by the faculty as envisaged in the syllabus shall be credited to his attendance. Every student shall have a minimum of 75% as an overall attendance.

5. EXAMINATIONS

The end semester examinations shall normally be conducted after completing 90 working days for each semester. The maximum marks for each theory and practical course as follows,

a) Mark distribution for Theory Courses

Continuous Internal Assessment (CIA) : 50 Marks

End Semester Exams (ESE) : 50 Marks

Total : 100 Marks

i) Distribution of Internal Marks

S.No.	Particulars	Distribution of Marks
1	CIA I (2.5 Units) (On completion of 45th working day)	15
2	Model (All 5 Units) (On completion of 85th working day)	15
3	Assignment	05
4	Attendance	05
5	Library Usage	05
6	Skill Enhancement *	05
	Total	**50**

Assignment Rubric
(Maximum -20 marks converted to 5 marks)

Criteria	4 marks	3 Marks	2 Marks	1 MArk
Language	Excellent spelling and Grammar	Good spelling and Grammar	Reasonable spelling and Grammar	Bad spelling and Grammar
Style	Outstanding style beyond usual college level	Attains College level style	Approaches College level style	Elementary form with little or no variety in sentence structure

Referencing	Good use of wide range of reference sources	Moderate use of suitable reference materials	Shows signs of plagiarism & using sources without referencing	No reference material used
Development	Main points well developed with high quality and quantity support	Main points developed with quality and quantity supporting details	Main points are present with limited details and development	Main points lack detailed development
Critical thinking/Problem solving	Advanced attempt to interpret the process, content/ analyse and solve the problem	Proficient attempt to interpret the process, content/ analyse and solve the problem	Adequate attempt to interpret the process, content/ analyse and solve the problem	Limited attempt to interpret the process, content/ analyse and solve the problem

Breakup for Attendance Marks:

S.No	Attendance Range	Marks Awarded
1	95% and Above	5
2	90% - 94%	4
3	85% - 89%	3
4	80% - 84%	2
5	75% - 79%	1

Note:

Special Cases such as NCC, NSS, Sports, Advanced Learner Course, Summer Fellowship and Medical Conditions etc. the attendance exemption may be given by principal and Mark may be awarded.

Break up for Library Marks:

S.No	Attendance Range	Marks Awarded
1	10h and above	5
2	9h- less than 10h	4
3	8h – less than 9h	3
4	7h - less than 8h	2
5	6h – less than 7h	1

Note:
In exception, the utilization of e-resources of library will be considered.

***Components for "Skill Enhancement" may include the following:**

Class Participation, Case Studies Presentation/Term paper, Field Study, Field Survey, Group Discussion, Term Paper, Presentation of Papers in Conferences, Industry Visit, Book Review, Journal Review, e-content Creation, Model Preparation & Seminar.

Components for Skill Enhancement
Any one of the following should be selected by the course coordinator

S.No.	Skill Enhancement	Description
1	Class Participation	• Engagement in class • Listening Skills • Behaviour
2	Case Study Presentation/ Term Paper	• Identification of the problem • Case Analysis • Effective Solution using creativity/imagination
3	Field Study	• Selection of Topic • Demonstration of Topic • Analysis & Conclusion
4	Field Survey	• Chosen Problem • Design and quality of survey • Analysis of survey

5	Group Discussion	• Communication skills • Subject knowledge • Attitude and way of presentation • Confidence • Listening Skill
6	Presentation of Papers in Conferences	• Sponsored • International/National • Presentation • Report Submission
7	Industry Visit	• Chosen Domain • Quality of the work • Analysis of the Report • Presentation
8	Book Review	• Content • Interpretation and Inferences of the text • Supporting Details • Presentation
9	Journal Review	• Analytical Thinking • Interpretation and Inferences • Exploring the perception if chosen genre • Presentation
10	e-content Creation	• Logo/ Tagline • Purpose • Content (Writing, designing and posting in Social Media) • Presentation
11	Model Preparation	• Theme/ Topic • Depth of background Knowledge • Creativity • Presentation
12	Seminar	• Knowledge and Content • Organization • Understanding • Presentation

ii) Distribution of External Marks

Total	**:**	**50**
Written Exam	**:**	**50**

Marks Distribution for Practical course

Total	**:**	**100**
Internal	**:**	**50**
External	**:**	**50**

i) Distribution of Internals Marks

S. No.	Particulars	Distribution of Marks
1	Experiments/Exercises	15
2	Test 1	15
3	Test 2	15
4	Observation Notebook	05
	Total	**50**

ii) Distribution of Externals Marks

S.No.	Particulars	External Marks
1	Materials and methods/ Procedures/Aim	10
2	Experiment/ Performance/ Observations/ Algorithm	10
3	Results/ Calculations/ Spotters/ Output	10
4	Inference/Discussion/ Presentation	10
5	Record	6
6	Viva- voce	4
	Total	**50**

A) Mark Distribution for Project

Total	**:**	**200**
Internal	**:**	**100**
External	**:**	**100**

i) Distribution of Internal Marks

S.No.	Particulars	Internal Marks
1	Review I	40
2	Review II	40
3	Attendance	20
	Total	**100**

ii) Distribution of External Marks

S.No	Particulars	External Marks
1	Project Work & Presentation	80
2	Viva -voce	20
	Total	**100**

Evaluation of Project Work shall be done jointly by Internal and External Examiners.

6 . Credit Transfer

a. Upon successful completion of 1 NPTEL Course (4 Credit Course) recommended by the department, during Semester I to II, a student shall be eligible to get exemption of one **4 credit course** during the 3rd or 4th semester. The proposed NPTEL course should cover content/syllabus of exempted core paper in 3rd or 4th semester.

S. No.	Course Code	Course Name	Proposed NPTEL Course	Credit
1			Option - 1 Paper title	4
			Option - 2 Paper title	
			Option - 3 Paper title	

b. Upon successful completion of **2 NPTEL Courses** (2 Credit each) recommended by the department, during Semester I to II, a student shall be eligible to get exemption of **one 4 credit course** during the 3rd or 4th semester. Out of 2 NPTEL proposed courses, **at least 1 course**

should cover content/syllabus of exempted core paper in 3rd or 4th semester.

Mandatory

The exempted core paper in the 3rd or 4th semester should be submitted by the students for approval before the end of 2nd semester

Credit transfer will be decided by equivalence committee

S. No.	Course Code	Course Name	Proposed NPTEL Course	Credit
1			Option – 1 Paper title	2
			Option – 2 Paper title	
			Option – 3 Paper title	
2			Option – 1 Paper title	2
			Option – 2 Paper title	
			Option – 3 Paper title	

NPTEL Courses to be carried out during semester I – II.

S. No.	Student Name	Class	Proposed NPTEL Course		Proposed Course for Exemption
			Course I	Option 1- Paper Title Option 2- Paper Title Option 3- Paper Title	Any one Core Paper in 3rd or 4th Semesters
			Course II	Option 1- Paper Title Option 2- Paper Title Option 3- Paper Title	

Class Advisor **HoD** **Dean**

7. Internship/Industrial Training

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

Mark Distribution for industrial / institutional training

Total	**:**	**100**
Internal	**:**	**50**
External	**:**	**50**

i) Distribution of Internal Marks

S.No.	Particulars	Internal Marks
1	Review I	20
2	Review II	20
3	Attendance	10
	Total	**50**

ii) Distribution of External Marks

S.No	Particulars	External Marks
1	Internship /Industrial training Presentation	40
2	Viva -voce	10
	Total	**50**

Evaluation of Internship /Industrial training Presentation shall be done jointly by Internal and External Examiners.

8. Extra Credits: 10

Earning extra credit is not essential for programme completion. Student is entitled to earn extra credit for achievement in Curricular/Co-Curricular/ Extracurricular activities carried out other than the regular class hours.

A student is permitted to earn a maximum of 10 extra Credits during the programme period.
A maximum of 1 credit under each category is permissible.

Category	Credit
Self study Course	1
CA/ICSI/CMA (Foundations)	1
CA/ICSI/CMA (Inter)	1
Sports and Games	1
Publications / Conference Presentations (Oral/Poster)/Awards	1
Innovation / Incubation / Patent / Sponsored Projects / Consultancy	1
Representation in State / National level celebrations	1
Awards/Recognitions/Fellowships	1
Advanced Learner Course (ALC)*	2

Credit shall be awarded for achievements of the student during the period of study only.

GUIDELINES

Self study Course

A pass in the self study courses offered by the department.

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

CA/ ICSI/ CMA (Foundations)

Qualifying foundation in CA/ICSI/CMA / etc.

CA/ICSI/ CMA (Inter)

Qualifying Inter in CA/ICSI/CMA / etc.

Sports and Games

The Student can earn extra credit based on their Achievement in sports in University/ State / National/ International.

Publications / Conference Presentations (Oral/Poster)

Research Publications in Journals

Oral/Poster presentation in Conference

Innovation / Incubation / Patent / Sponsored Projects / Consultancy

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

Representation in State/ National level celebrations

State / National level celebrations such as Independence day, Republic day Parade, National Integration camp etc.

Awards/Recognitions/Fellowships

Regional/ State / National level awards/ Recognitions/Fellowships

***Advanced Learner Course (ALC):**

ALC is doing work of a higher standard than usual for students at that stage in their education.

Research work/internships carried out in Universities/ Research Institutions/ Industries of repute in India or abroad for a period of 15 to 30 days will be considered as Advanced Learners Course.

QUESTION PAPER PATTERN

CIA Test I: [1½ Hours-2.5 Units] - 25 Marks

SECTION	MARKS	DESCRIPTION	TOTAL	Remarks
Section – A	8 x 0.5= 04 Marks	MCQ	25 Marks	Marks secured will be converted To 15 mark
Section - B	3 x 2 = 06 Marks	Answer ALL Questions Either or Type ALL Questions Carry Equal Marks		
Section - C	3 x 05 = 15 Marks	Answer ALL Questions Either or Type ALL Questions Carry Equal Marks		

CIA Test II/ Model [3 Hours-5 Units] - 50 Marks

SECTION	MARKS	DESCRIPTION	TOTAL	Remarks
Section – A	10 x 1 = 10 Marks	MCQ	50 Marks	Marks secured will be converted To 15 mark
Section - B	5 x 6 = 30 Marks	Answer ALL Questions (Either or Type Questions) Each Questions Carry Equal Marks		
Section - C	1 x 10 = 10 Marks	Compulsory Question		

End Semester Examination [3 Hours-5 Units] - 50 Marks

SECTION	MARKS	DESCRIPTION	TOTAL
Section – A	10 x 1 = 10 Marks	MCQ	50 Marks
Section - B	5 x 6 = 30 Marks	Answer ALL Questions (Either or Type Questions) Each Questions Carry Equal Marks	
Section - C	1 x 10 = 10 Marks	Compulsory Question	

Course Code	Course Name	Category	L	T	P	Credit
223FN2A1CA	ADVANCED FOOD SCIENCE	CORE	4	1	1	4

PREAMBLE

This course has been designed for students to learn and understand

- The structure, classification and nutrient composition of foods
- Identify what foods are good sources for what nutrients
- Appropriate sensory evaluation tests to answer specific questions.

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A1CA	ADVANCED FOOD SCIENCE	SEMESTER I

Total Credits: 4

Total Instruction Hours: 72 h

Syllabus

Unit I Cereals 15 h

Rice - Structure, Composition and nutritive value, Parched Rice Products- Parched and Aromatic rice. Aging of Rice. Gluten formation and Factors Affecting gluten formation, Gelatinization and factors affecting. Changes in cooked starch, dextrinisation, Cooking Quality of Rice.

Wheat - Structure, composition and nutritive value. Wheat flour – types, functionality of components, baking qualities.

Millets- Jowar, Bajra, Maize and Ragi, Composition and nutritive value and Products. Changes during cereal cookery. Fermented and unfermented cereal based products.

Unit II Pulses, Fats and Oil 15 h

Pulses - Composition and nutritive value, methods of processing - dry and wet processing, vegetable protein mixes, Anti nutritional factors and eliminations. Digestibility of pulses and factors that reduce the digestibility. Factors affecting cooking quality.

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

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

Unit III Vegetables and Fruits 14 h

Vegetables-Classification, Composition and nutritive value, selection. Changes and loss of nutrients during cooking of vegetables, Effect on cooking- pigments, sulphur containing vegetables,

Fruits - Composition and nutritive value, Enzymes in fruits and vegetable, Flavor constituents. Ripening of fruits. Storage of fruits and vegetables. Individual aroma compounds- vegetable, fruit.

Organic Farming- Types, Conventional farming, bio pesticides, organic manures.

Spices and condiments –Types, uses and abuses, Flavors (Natural and Synthetic)

medicinal uses, other aromatic- Vinegar and MSG.

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

Unit IV Milk and Egg 14 h

Milk - Composition, Physical and Chemical Properties - Effects of heat, acid and enzymes, Microbial Spoilage of milk. Milk Products and Types.

Egg - Structure, composition and nutritive value, Quality of egg, grading and selection, Changes during storage. Effects of heat on egg protein, Factors affecting coagulation egg protein, egg foam and factors affecting foam formation. Low cholesterol egg substitutes.

Unit V Fleshy Foods 14 h

Meat - Structure, composition and nutritive value, postmortem changes, ageing and tenderization of meat, curing, cuts and grades of meat, color of meat, changes of meat in cookery.

Poultry - Classification, composition, market forms, selection factors.

Fish - Classification, composition, kinds and characteristics of fresh fish, By-products and newer products of fish.

Pathogens and Food safety for fleshy foods.

Text Books

1 Srilakshmi,B 2015, "Food Science," 8th Edn., New Age International Private Ltd. New Delhi.

2 Manay & Shadaksharaswamy ,S.N. & M, 2008, "Food facts and Principles", New Age International Private Ltd NewDelhi..

References

1 Potter.N.N and Hotchkiss , 1996, " Food Science", CBS Publication

2 SunetraRoday ,I.N. 2015, —Food Science and Nutrition‖ Oxford Publisher. New Delhi

Course Code	Course Name	Category	L	T	P	Credit
223FN2A1CB	NUTRITION THROUGH LIFE CYCLE	CORE	4	1	1	4

PREAMBLE

This course has been designed for students to learn and understand

- The role of adequate nutrition in stages of life cycle
- The nutrition and food components and the deleterious effects of foods on the human body at various life-stages
- The importance of proper fueling for physical activity, pre and post workout

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Plan diet for the stages of the life span. Learning nutritional requirements for disease prevention.	K4
CO2	Analyze specific dietary practices during lactation supplementary and weaning foods for infants.	K5
CO3	Nutrition for toddlers-physiological and cognitive development feeding skill and nutrition problems.	K5
CO4	Evaluate physical growth, eating disorders, physiological psychological and socio-economic factors effect nutritional status.	K5
CO5	Choose the fitness assessments and plan nutritional needs during exercise and sports.	K5

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A1CB	NUTRITION THROUGH LIFE CYCLE	SEMESTER I

Total Credits: 4

Total Instruction Hours: 72 h

Syllabus

Unit I Nutrition in Preconception and pregnancy 13 h

Nutrition in Preconception-Introduction, factors contributing infertility in female, premenstrual syndrome, expansion in blood volume in pregnancy, nutrient intake for pre-conceptual women.

Nutrition in pregnancy - Stages of gestation, maternal physiological adjustments, weight gain during pregnancy and nutritional requirements for pregnancy, twin pregnancy miscarriage, preterm delivery, multi fetal pregnancies, pregnancy in obese women, gestational diabetes, pre-eclampsia, Intrauterine growth retardation.

Unit II Nutrition in Lactation and infants 16 h

Nutrition in Lactation - Physiological adjustments during lactation, Physiology of milk Production - hormonal controls and reflex action, problems of breast feeding, nutritional components of colostrums and mature milk, nutritional requirements during lactation. Human Milk bank-advantages and disadvantages Expressing and storing breast milk, Breast promotion network of India.

Nutrition in infants - Rate of growth, weight as the indicator, breast vs. bottle feeding, premature infant, Nutrition allowances, Nutrition and brain development feeding premature infants, low birth weight, implications for feeding and management in Pre-term and Low Birth Weight infants, supplementary foods and weaning foods.

Unit III Nutrition in Toddlers 12 h

Nutrition in Toddlers-Physiological and cognitive development, feeding skill and behavior, Nutrition in Preschool Children - Growth and development of preschool children, food habits, Micronutrient malnutrition among preschool children. Nutritional requirements for toddlers and mentally challenged Children. Implications of childhood obesity and other nutritional concerns

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

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

Nutrition During Adolescence - Physical growth, physiological and psychological problems associated with pubertal changes, nutritional needs, eating disorders –

anorexia nervosa, bulimia nervosa, nutrition and medical problems in adolescent pregnancy and its requirements and complications.

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

Nutrition for Old Age - theories of ageing, physiological changes, Socio economic and psychological factors – nutritional requirements, factors affecting food intake, Nutrient requirements that influence organ function with ageing, Advances in geriatric nutrition.

Unit V Nutrition for sports and Special Condition 15 h

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

Text Books

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

2 Srilakshmi, B, 2010 "Dietetics", 6thEdn., New Age International Pvt. Ltd, New Delhi.

References

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

2 Brown, J.E, 2002, "Nutrition Through The Lifecycle", Wadsworth Thomson Learning, USA.

Course Code	Course Name	Category	L	T	P	Credit
223FN2A1CC	NUTRITIONAL BIOCHEMISTRY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The application of biochemistry in the field of Food and Nutrition
- The on assay techniques and instrumentation
- The role of nutrients in the body

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A1CC	NUTRITIONAL BIOCHEMISTRY	SEMESTER I

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Carbohydrates 10 h

Carbohydrates – classification, functions. Glycolysis, TCA Cycle, HMP Shunt and Energy Production, Glycogenesis, Gluconeogenesis. Renal threshold for Glucose. Inborn Error of Carbohydrate Metabolism – Lactose Intolerance, fructosuria, Galactosemia.

Unit II Fatty Acids 10 h

Fatty Acids - Classification, Functions and Oxidation of Saturated and Unsaturated Fatty Acids, Biosynthesis of Cholesterol, Structure and Functions of Lecithin, Cephalin. Inborn errors of Fat Metabolism – Niemann-Pick Disease, Gouchers Disease

Unit III Protein 8 h

Protein- Classification, Function & Metabolism of Protein, Denaturation, Transamination, Deamination, Decarboxylation, Urea Formation and Protein Synthesis.

Amino acids – Classification, Function & Metabolism of Amino acids, phenylalanine, leucine, methionine and tryptophane.

Inborn errors of Amino acids – maple syrup urine disease, phenyl ketonuria.

Unit IV Nucleic acids 10 h

Nucleic acids – structure, function and properties of DNA and RNA. Biosynthesis and breakdown of purine and pyrimidine nucleotides. Assay Techniques: Bioassay techniques, molecular cloning, microbiological assay of vitamins. ELISA.

Unit V Techniques in nutritional biochemistry 10 h

Techniques in nutritional biochemistry- Separation of sugars and amino acids by chromatography. Electrophoresis separation of proteins. Colorimetry and spectrophotometer - principle and procedures. pH meter – working and application. Principle and procedure of operation of GC,HPLC and HPTLC. Elemental analysis by atomic absorption spectroscopy and flame photometry

Text Books

1 Lehininger A.L, 2000, "Biochemistry". 7Edition, Worth Publishers Inc., New York.

2 Deb A.C, 2004, "Fundamentals of Biochemistry", 8 Edition New Central Book Agency Pvt Ltd., Kolkata -India.

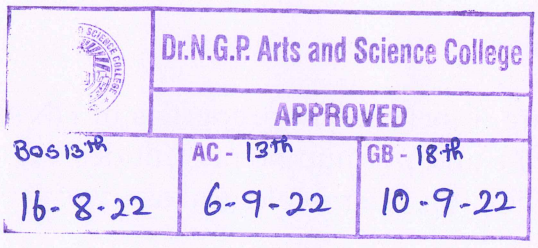
References

1 Shanmugam. A, 2004, "Fundamentals of Biochemistry for Medical Students", 7th Edition Karthik Printers, India.

2 Sathyanarayana. U and Chakrapani. U, 2004, "Biochemistry". 3rd Edition Books and Allied Publication ,Kolkata,India..

3 Tom brody, 2007, "Nutritional Biochemistry", 2nd Edition Academicpress,U.K.

4 Sharma.D and DevanshiSharma.C ,2015, "Nutritional Biochemistry",2nd Edition CBS publishing pvtltd,New Delhi.



Course Code	Course Name	Category	L	T	P	Credit
223FN2A1CD	FOOD CHEMISTRY	CORE	4	1	1	4

PREAMBLE

This course has been designed for students to learn and understand

- The gain insight into the chemistry of foods
- The chemistry underlying the properties of various food components
- Biochemical and enzymatic reactions that influence food quality with emphasis on food industry applications.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Elaborate the structure and properties of water, ice, Elucidate the structure, formation, strength, types and permanence and Emulsions	K3
CO2	Explicate the chemistry of Reactions of mono and oligosaccharides, Use of Polysaccharides in gelatinization, retrogradation.	K4
CO3	Illustrate the structure, physicochemical properties, functional properties of amino acids.	K4
CO4	Explicate the classification, sources, composition, and properties, role of lipids in food flavor.	K4
CO5	Illuminate the chemistry of Individual aroma compounds- vegetable, fruit and spice and condiment.	K5

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A1CD	FOOD CHEMISTRY	SEMESTER I

Total Credits: 4

Total Instruction Hours: 72 h

Syllabus

Unit I Physio-Chemical Properties of Water and Foods 14 h

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

Gels: Structure, formation, strength, types and permanence Emulsions: formation, stability, surfactants and emulsifiers, Common food emulsifiers, functions of emulsifying agents, Foams: Structure, formation and stabilization.

Unit II Chemistry of Starch and Sugars 14 h

Reactions of mono and oligosaccharides, use of polysaccharides in foods: non-starch polysaccharides:β-glucans,glucomannans, cellulose, hemicelluloses, pectins, gums,agar, alginates, carrageenan

Starch: structure, properties of amylose and amylopectin, effect of process in gelatinization, methods for following gelatinization. Characteristics of some food starches. Effects of ingredients and conditions on gelatinization- retro gradation, polysaccharide hydrolysis, sugars and sweeteners: sugars, syrups, sugar alcohols, sugar products, Sugar substitutes, caramelization.

Unit III Chemistry of Proteins 15 h

Amino acids, peptides and proteins - structure, physicochemical properties, functional properties, chemical and enzymatic modifications - denaturation, Changes in protein during denaturation,non-enzymatic browning, and other chemical changes, processing induced physical, chemical and nutritional changes, texturized proteins, protein isolates, concentrates, protein hydrolyzate, Complementary proteins ,Milk substitutes, Effect of heat, acids & enzymes on milk component.

Unit IV Chemistry of Fats and Oils 14 h

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

Unit V Chemistry of Fruits, Vegetables, Spices and Condiments 15 h

Pectic Substances, Plant Pigments, Spices and Condiments, Pectin's, phenolic components, enzymatic browning in fruits and vegetables, volatile compounds from vegetables during cooking, different types of plant pigments - water and fat soluble pigments, properties and active principles of spices and condiments.

Text Books

1 ShakuntalaManay,Shadaksharaswamy, M., 2000, "Foods,Facts and Principles", 2nd Edn., New Age International Pvt Ltd Publishers, Delhi

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

References

1 Swaminathan.M, 2005, "Food Science, Chemistry and Experimental Foods", Bappco Publishers, Bangalore.

2 Meyer,L.H.,2004,"FoodChemistry and Distributors", 4th Edn., CBS Publishers.

3 Paul, and Palmer, P.C., 2000, "Food Theory and Applications", JohnWileyand Sons, New York.

4 Chopra and Panesar , H.K, 2010, "Food Chemistry", New Narosa Publishing House, Delhi.

223FN2A1CP	FOOD SCIENCE AND FOOD CHEMISTRY	SEMESTER I

Total Credits: 2
Total Instructions Hours: 48 h

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

Note: Out of 14 – 12 Mandatory

Course Code	Course Name	Category	L	T	P	Credit
223FN2A1DA	FUNCTIONAL FOODS AND NUTRACEUTICALS	DSE	4	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- Medicinal benefits of natural Nutraceuticals belong to different phytochemical categories
- The functional foods and their role in the human health and well-being.
- The role of diet and dietary components in chronic diseases

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A1DA	FUNCTIONAL FOODS AND NUTRACEUTICALS	SEMESTER I

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Nutraceuticals as Science 9 h

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

Unit II Properties, structure and functions of various Nutraceuticals 10 h

Properties, structure and functions of various Nutraceuticals Glycosides, Isoprenoidderivaties, Glucosamine, Octacosanol, flavonoids, carotenoids, polyunsaturated fatty acids, lecithin, choline and spingolipids, Lycopene, Carnitine, Melatonin and Ornithine alpha ketoglutarate, Phytoestrogens, curcumin, organosulphur compounds as neutraceuticals.Formulation of functional foods containing nutraceuticals – stability, analytical and labelling issues.

Unit III Nutraceuticals of plantorigin 10 h

Plant secondary metabolites, classification and sub-classification - Alkaloids, phenols, Terpenoids, extraction and purification, applications, Concept of cosmoceuticals and aquaceuticals

Unit IV Functional Foods 10 h

Definition, Relation of functional foods and Nutraceutical (FFN) to foods and drugs, applications of herbs to functional foods, Concept of free radicals and antioxidants; In vitro and in vivo methods for the assessment of antioxidant activity. Nutritive and Non-nutritive food components with potential health effects, Soy proteins and soy isoflavones in human health;Functional foods from wheat and rice and their health effects.Vegetables, Cereals, milk and dairy products as Functional foods, Health effects of prebiotics, probiotic and synbiotic foods and effects

Unit V Food as remedies 9 h

Nutraceuticals in treatment for cognitive decline, Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers and Gastrointestinal disorder, Cancer, CVD, Diabetic Mellitus,

HIV etc, Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina, etc.Nutrigenomics-concept of personalized medicine. Use of Nanotechnology in functional food industry.

Text Books

1 Wildman,R.E.C., 2000, "Handbook of Nutraceuticals and Functional Foods", CRC Press, Boca Raton.

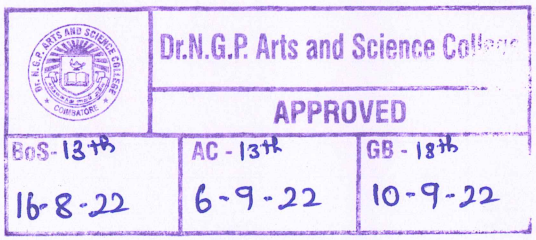
2 Jeffery, H. W. 2002, "Methods of Analysis for Functional Foods and Neutraceuticals", 1st Edn, CRC Press, New York.

References

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

2 Murray Robert, 1990, "Harper`s Biochemistry", 24th Edn, Prentice Hall International UK Ltd , UK.

3 Degbasis Bagchi,2010,"Biotechnologyin Functional FoodsandNutraceuticals". 10 Edn, CRC press Taylor & Francis group, London.



Course Code	Course Name	Category	L	T	P	Credit
223FN2A1DB	FOOD PRODUCT DEVELOPMENT	DSE	4	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The various aspects of food product develop food science and technology, packaging, nutrition values and marketing
- Modern aspects of nutritional science and novel food usage
- Recognize the potential for entrepreneurship through marketing

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A1DB	FOOD PRODUCT DEVELOPMENT	SEMESTER I

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I New product development 10 h

Definition and classification, characterization and factors shaping new product development. Phases in Food Product Development factors influencing in new product development Health concerns impact of technology and market place influence.

Unit II Formulation of new product development 10 h

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

Unit III Sensory evaluation 9 h

Evaluation of food quality- Analytical Test - Conduct a sensory Evaluation Test - Designing score card, objective evaluation, Instruments used for texture evaluation. Maintaining suitable environmental conditions: laboratory setup and equipment

Unit IV Packaging 10 h

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

Unit V Marketing 9 h

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

Text Books

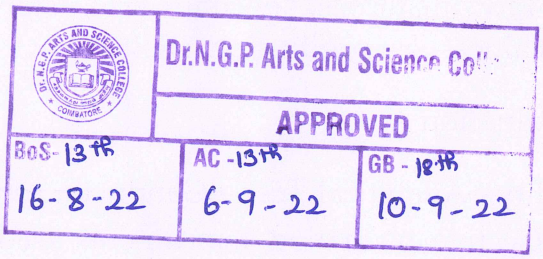
1 Baker, R.C 1988, " Fundamentals of New Food Product Development", 8th Edn. New Age International Private Ltd. New Delhi.

2 Fuller,. G.W2008, "New Food Product Development from Concept to Market place", New Age International Private Ltd, NewDelhi.

References

1 Sivarama Prasad ,A., 1985., "Agricultural marketing in India", Mittal Publication, New Delhi.

2 Aaron, Brody, JohaLord.,L& B., 2005, "New Food Product for a changing Market place", 2nd Edn.



Course Code	Course Name	Category	L	T	P	Credit
223FN2A1DC	HARVEST TECHNOLOGY OF AGRICULTURAL PRODUCE	DSE	4	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The safety control measures in handling foods from harvest to consumption agencies of control.
- Good agricultural and horticultural practices for food safety management
- Importance of pre- harvest physiology for the long term storage of horticultural crops

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A1DC	HARVEST TECHNOLOGY OF AGRICULTURAL PRODUCE	SEMESTER I

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Post harvest Technology 9 h

Introduction to Post Harvest Technology - Definition, importance and problem encountered.Conservation Agriculture- scope and need. Food loss in the post-harvest period, extent of losses from filed to market. Role of Post-Harvest Technology in combating malnutrition in India.

Unit II Agent causing food loss 10 h

Agents Causing Food Losses - Physical agents (moisture, temperature), Chemical agents, biological agents- insects- detection of insect infestation, rodents, birds, animals- Nature of damage, identification and preventive measures.

Unit III Spoiling Agents 11 h

Control of Spoilage Agents - Importance and methods of sanitary handling. Insect control methods- Physical methods and chemical methods including fumigation techniques. Improved methods of handling and transport of Food Commodities, Nutrient losses in spoiled grains.

Unit IV Storage and grains 10 h

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

Unit V Food Processing 8 h

Food Processing of Selected Food Items – wheat, rice, breakfast cereals, pulses, oil seeds. National programs to save grains, Agencies Controlling Food Losses - Role of SGC, FCI in controlling food losses.

Text Books

1 Norman N. Potter, 2007, "Food Science" 5th Edition, CBS Publishers & Distributor.

2 AlmalenduChakraverty, 2017, " Post Harvest Technology of Cereals, Pulses and Oilseeds" 3rd Edition, Oxford & IBH Publishing Co Pvt.Ltd

References

1 Boumans.G, 2012, "Grain Handling and Storage , 4th Edition, Elsevier Science Publishing, Netherlands.

2 Avantina Sharma, 2018, " Food Product Development" 1st Edition, CBS Publishers & Distributors.

16/8/22
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BOS 13th	AC - 13th	GB - 18th
16-8-22	6-9-22	10.9.22

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

Course Code	Course Name	Category	L	T	P	Credit
223FN2A2CA	FOOD PROCESSING	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- about food processing sectors and strategies
- the latest techniques involved in processing of food groups
- the method of preservation and packaging

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Analyze the food processing sectors illustrate the different types of food commodities used for processing	K3
CO2	Choose the processing method of cereals and millets to reduce the Nutrients lost	K3
CO3	Compare the different processing techniques and fortification of Legumes and oil seeds	K4
CO4	Classify and integrate the processing methods of animal-based products and its by products	K4
CO5	Distinguish the thermal and non-thermal processing. Summarize the Recent trends in packaging technology	K5

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A2CA	FOOD PROCESSING	SEMESTER II

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Food Processing Sector 11 h

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

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

Unit II Cereals and Millets Processing 12 h

Rice – Parboiling, Milling, by products of milling and processed products-Rice flakes, puffed rice, popped rice, rice cakes, rice paper, instant rice and rice flour.

Wheat - Milling, by products of milling and processed products -whole wheat flour, refined flour, semolina, popped and puffed wheat.

Millets – Milling of Millet and it's by product, processed products - vermicelli and pasta.

Methods to eliminate anti-nutritional factors, fortified and enriched cereals and millets.

Unit III Legumes and Oil Seeds 12 h

Pulses and Legumes - Modern methods of milling and it's by product, process to eliminate the anti-nutritional factors. Processing of pulse-based products

Nuts and Oil Seeds – Milling and it's by products, extraction of oil - Lemon and moringa seed oil, preparation of hydrogenated fats, industrial fats, and low-fat spreads and virgin oil, Fortification of fats and oils. Processing of fat substitute and fat replacer. Concentration and isolation - peanut, soybean and coconut and other fortified and enriched foods.

Unit IV Milk, Meat, Fish and Egg 12 h

Milk and Milk products- Processing, Flavored milk and toned milk, by product of Cream- Butter, Buttermilk and ghee. Fermented (Cheese, yoghurt, and kefir) and

non- fermented (paneer, gelato and ice cream) milk products. Vegan milk - almond and soy milk.

Meat & poultry- Slaughtering, Processing and Preservation -chilled, frozen, cured and smoked meat. Processing of meat-based products-sausage & Nuggets

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

Egg- preparation of egg white and egg yolk powder.

Unit V Fruits and Vegetable Processing Technologies 13 h

Fruits and vegetable processing- Drying and dehydration- Drum drying, tunnel, spray drying, freeze drying, solar drying and fluidized bed drying. Thermal processing (canning, blanching, and sterilization) and non-thermal processing (High Pressure Processing, Ozone and Pulse Electric Field Technology), Minimal Processing.

Mushroom - Production & Processing

Processing of beverages -Cocoa, processing of spices -Onion, garlic, ginger and masala powder. Extraction of volatile oil in spices-oleoresin

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

Text Books

1 DS Warris, 2020. "Food Processing and Preservation" (Volume -I), CBS Publishers and Distributors & New Delhi.

2 Subulakshmi.G and Shoba A Udipi V.K, 2017, "Food Processing and Preservation"(volume –I Edn.), New age International publishers & New Delhi.

References

1 Avantina Sharma, 2010, "Text Book of Food Science and Technology", 2nd Edn. IBDC Publishers, Lucknow.

2 Fellows.P.J., 2009,"Food Processing Technology- principle and practice", Wood head Publishing Ltd, Cambridge.

Course Code	Course Name	Category	L	T	P	Credit
223FN2A2CB	APPLIED PHYSIOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the structure and functions of various systems in human body
- the functions of all the systems and its disease conditions
- the physiological aspects of hormones, drugs and nutrient interactions

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Illustrate the structure and functions of digestive and circulatory system	K2
CO2	Identify the anatomy and physiology of respiration, respiratory volumes and mechanism of excretory system	K3
CO3	Know the structure and functions of brain, classification and functions of nervous system	K4
CO4	Elaborate the structure and functions of endocrine system and immune system	K4
CO5	Classify the different types of enzymes and elaborate drug and nutrient interaction	K5

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A2CB	APPLIED PHYSIOLOGY	SEMESTER II

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Digestive system and circulatory System 9 h

Digestive system - Structure and functions of salivary gland, oesophagus, stomach, small intestine, large intestine, liver, gall bladder and spleen.

Circulatory System - Structure and functions of Heart and blood vessels, cardiac cycle and cardiac output. Heart beat - origin, conduction and regulation, circadian rhythm - bradycardia and tachycardia, ECG.

Unit II Respiratory system and excretory system 10 h

Respiratory system – Basic anatomy of the respiratory system, types of respiration, mechanism of respiration, transport of gases - oxygen (Bohr effect) and carbon dioxide, chloride shift (Hamburger Phenomenon), respiratory volumes - spirometer.

Excretory system - Excretory organs - structure of kidney and components and functions of nephron, formation and composition of urine, Hormonal regulation of kidney - diuresis and micturition.

Unit III Nervous system 9 h

Nervous system - Nerve cell and nerve fibre, reflex action - nerve impulse, receptors and reflex arc, classification and functions of nervous system - central nervous system - structure and functions of brain and spinal cord, autonomic nervous system - sympathetic and parasympathetic - transmitters.

Unit IV Endocrine and Immune system 10 h

Endocrine glands – Structure, function, hormonal secretion and actions - pineal, pituitary, thyroid, parathyroid, thymus, adrenal gland, pancreas, islets of Langerhans, ovary and testis.

Immune system: cells of the immune system, role of immune cells, Types of immunity - innate immunity and acquired immunity, Antigens and its functions, Immune responses - cell mediated and humoral immunity, antigen - antibody reactions, auto-immunity and hypersensitivity.

Unit V Enzymes and Drug 10 h

Enzyme – Introduction, classifications and biological functions of enzymes, enzyme activation, properties of enzymes, difference between enzyme, catalyst and whole cell.

Nutrient and drug interaction – Introduction, absorption, route of drug administration, excretion, basic concept, effect of nutrition on drugs, drug's effects on nutritional status, clinical significance and risk factors for drug nutrient interaction.

Text Books

1 Sarada Subramanyam, Madhavankutty. K and Singh .H.D 2020. "Textbook of Human Physiology, S.Chand & company Ltd, New Delhi.

2 Sembulingam K&P 2013, "Essentials of Medical Physiology", 6th Edn., JAYPEE Brothers, Medical Publishers, New Delhi

References

1 Subrahmanyam, S. 2007, "Text Book of Human Physiology", S.Chand Publications, New Delhi, India.

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

3 Stites .D.P., Terr.A.I., and Parsiow. T.G., 1994, "Basic and Clinical Immunology", 10th Edition., Prentice Hall International Inc., New Jersey.

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Course Code	Course Name	Category	L	T	P	Credit
223FN2A2CC	THERAPEUTIC NUTRITION - I	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the principles of medical nutrition therapy
- the causes and complications of different disease condition
- the importance of diet planning for various disease condition

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Summarize the principles of diet therapy and nutrition care process	K2
CO2	Explain the etiological factors and diet therapy for fever and infections	K2
CO3	Interpret the physiological changes and dietary modification for gastro intestinal and inflammatory diseases	K3
CO4	Infer the physiological changes and nutritional modifications for diabetes mellitus	K4
CO5	Explain the physiological changes and nutritional modifications for renal disease	K4

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A2CC	THERAPEUTIC NUTRITION-I	SEMESTER II

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Therapeutic Diets 9 h

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

Unit II Fever and Infections 10 h

Etiological factors and Dietary modifications for fever and infections, COVID -19 and allergy. Burns – Complications, Dietary management & mode of nutrition support and wound management of burns. Sepsis - Definition and Dietary management of Sepsis with or without Multiple Organ Dysfunction Syndrome (MODS). Dietary management for pre- and post-surgical diet.

Epidemiology, transmission of HIV, pathophysiology, clinical manifestations, HIV infection and other diseases, Immunity and AIDS virus, dietary management, Prevention and Control.

Unit III Gastro Intestinal Diseases 10 h

Diseases of Oesophagus: Esophagitis and Hiatus hernia. Disease of Stomach: Indigestion, acute and chronic gastritis and peptic ulcer, Gastroesophageal reflux disease. Disease of Intestine: constipation - atonic, spastic, and obstructive, diarrhoea - acute and chronic and steatorrhea. Inflammatory Diseases -Diverticulosis, diverticulitis, regional enteritis, ulcerative colitis, irritable bowel syndrome, malabsorption syndrome - sprue, Lactose Intolerance, Post-surgical complications and management.

Unit IV Obesity and Diabetes Mellitus 10 h

Nutritional Imbalances- Obesity and underweight, types of obesity, etiological factors, assessment of obesity, grades of obesity, theories - set point and fat cell theory, thermogenesis in obesity. Life style and Dietary modifications.

Diabetes Mellitus (Type I and II) - Epidemiology / Incidence - Classification - symptoms. Metabolic changes: complications, clinical findings -diagnostic tests.

Management of Diabetes - Food exchange list, Glycaemia index of foods, Carbohydrate counting and Resistant starch, Dietary management, Meal planning approaches - With and without Insulin and during sickness. Herbal plant remedies for diabetes mellitus.

Unit V Renal Diseases 9 h

Kidney – Etiology, Pathogenesis, Clinical manifestation, dietary management for kidney disease- acute and chronic glomerulonephritis, nephrosis, nephrotic syndrome, urinary calculi, acute and chronic kidney disease, End stage renal disease, renal agenesis, renal dysplasia, kidney transplant and dialysis.

Case study on lifestyle disorders.

Text Books

1 Srilakshmi B., "Dietetics, 2014", 7th Edition, New Age International (P) Limited Publishers, New Delhi.

2 Mahan. B and Escott.S, 2007. "Krause's Food and nutrition Therapy", 12th Edition, Philadelphia, W.S. Saunder's Company, USA.

References

1 Garrow.J.S & James.W.P.T, J. 2006, Human Nutrition &dietetics, Churchill Livingstone, New York.

2 Mahan. B and Escott.S, 2000. "Food Nutrition and Diet Therapy", 12th edition Philadelphia, W.S. Saunder's Company, USA.

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Course Code	Course Name	Category	L	T	P	Credit
223FN2A2CD	MACRONUTRIENTS	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the classification, and nutrient composition of foods
- the food sources and requirements for macronutrients
- the absorption and metabolism of macronutrients

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Interpret the utilization of energy, basal metabolism, and energy requirement.	K4
CO2	Explain the digestion, absorption and metabolism of carbohydrates and dietary fiber	K4
CO3	Summarize the protein digestion, absorption, metabolism, and its requirements	K5
CO4	Illustrate dietary fat, brown fat thermogenesis and therapeutic inhibition of fat absorption	K5
CO5	Ensure the importance of water and electrolyte balance	K5

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A2CD	MACRONUTRIENTS	SEMESTER II

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Energy 10 h

Energy - Definition, Units, Components of energy requirement, Determination of Energy Value of Food, Total energy Requirement, Basal Metabolic Rate and its measurements, Factors Affecting Basal Metabolic Rate, Thermic Effect of food Factors Affecting, Energy requirement during work, Resting Energy Expenditure, Specific dynamic actions, Recommended Dietary Allowances

Unit II Carbohydrates 10 h

Carbohydrates- Classification, Functions, Digestion, Absorption, Metabolism, Maintenance of Blood Glucose Levels, Hormonal control of blood sugar levels.

Dietary Fiber- Classification of dietary fiber, physiological and metabolic effects of fiber, role of fiber in the prevention of disease. Recommended dietary allowances and sources.

Unit III Proteins 10 h

Proteins & Amino acids – Functions, classification, sources, Digestion, absorption, metabolism, utilization and factors affecting, storage, assessment of quality of proteins, complimentary value of proteins and requirements. Factorial estimation for arriving at RDA of proteins for Indians.

Unit IV Lipids 8 h

Lipids- Classification, Fats in the Body and Food, Functions, Digestion and Absorption, Transport and Metabolism, Essential Fatty Acids, Brown Fat Thermogenesis, Therapeutic Inhibition of Fat Absorption and Sources.

Unit V Water and Electrolytes 10 h

Water- Definition, Distribution, Functions, Water Balance, Maintenance of Fluid /Water Balance, Water Depletion, Water Excess (Water Intoxication), Distribution of Electrolytes, Maintenance of Electrolyte balance, Acid Base Balance- The Control of Hydrogen Ion Concentration, Acid Base Buffers, Respiratory Regulation of pH, Renal Regulation of pH.

Text Books

1 Srilakshmi,B 2020, " Nutrition Science", 6th edition., New Age International Private Ltd. New Delhi.

2 Groffer.S.S, Smith.J.L & Groff.J.L , 2009, " Advanced Nutrition and Human Metabolism", 5th edition, Wadsworth, USA.

References

1 Nicola Anderson & Claire Thomson, 2016, "Food and Nutrition" 1st edition, Hodder Education, London.

2 Berdainer.C.D & Zempleni., 2009, "Advanced Nutrition Macronutrients, Micronutrients and Metabolism". CRC Press, Taylor and Francis Group, USA.

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Course Code	Course Name	Category	L	T	P	Credit
223FN2A2CE	COMPUTER APPLICATION IN NUTRITION	EDC	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the concept of microsoft office
- the fundamentals of word, excel and power point
- the computer networks and multimedia in nutrition education

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals of MS word	K1
CO2	Apply the knowledge for creating a document and presentation	K2
CO3	Build and analysis the table and database for nutrition using MS Excel	K3
CO4	Apply the knowledge for creating nutrition web page. Expose the concepts of computer networks	K4
CO5	Develop the online application in nutrition education using multimedia tools	K5

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A2CE	COMPUTER APPLICATION IN NUTRITION	SEMESTER II

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Word Basics 10 h

Word Basics: Creating a new document, Formatting Text and Documents, Working with Headers and Footers, creating a simple table using the table menu, using menus and toolbars.

TEXT: Copy, delete, move, spell check character & page formatting, size, font, header, footer, bordering, coloring, margins, justification and graph. Understanding the concept of mail merge. Creating an article for publication.

PICTURE: Creation, editing, import and printing. Use of other available features.

Unit II PowerPoint Basics 10 h

Creating presentations - Insert, format, and modify slides. Insert and format tables, charts, and SmartArt graphics. Application of slide transitions and animations. Inserting audio, video and animating multimedia playback, recording sound. Presentation using google slides. Creating food and nutrition presentation.

Unit III MS Excel 10 h

Excel Basics: Overview of Excel features, creating a new worksheet, Selecting cells, moving cells, copying cells, sorting cell data, inserting rows, inserting columns, Deleting parts of a worksheet, entering and editing Formulas, Creating Nutrition database using MS Access.

Unit IV Multimedia 9 h

Introduction to Multimedia: Components of Multimedia, Multimedia software tools, Multimedia Applications, Multimedia and hypermedia, online applications in nutrition education, webpage creation and app development - nutrient calculation, pamphlet and brochures.

Unit V Applications of computer in nutrition 9 h

Nutrition Education and Counseling, Spread sheets in Nutrient and Diet calculations, Use of statistical software - R software, SPSS, and Graph pad prism Accessing Digital Library, barcode and QR code, e-Journals in Food Science and Nutrition, Relevant Nutrition software's.

Text Books

1 Gurvinder Singh and Rachhpal Singh, 2015, "P.C. Software and Programming in C", 4th Edition, Kalyani Publishers, Hyderabad.

2 Deepak Bharihoke., 2010, "Fundamentals of Information Technology", 3rd Edition, Excel Book Publishers, Kerala.

References

1 Srivastava Chetan, 2014, "Fundamentals of Information Technology", 3rd edition, Kalyani Publishers, Hyderabad.

2 Ze Niam Li and Mark S.Drew, 2005, "Fundamentals of Multimedia", 1st edition, Prentice Hall India Learning Private Limited, New Delhi.

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223FN2A2CP	FOOD ANALYSIS	SEMESTER II

Total Credits: 3
Total Instructions Hours: 72 h

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

Note: Out of 15- 13 mandatory

Course Code	Course Name	Category	L	T	P	Credit
223FN2A2DA	FOOD BIOTECHNOLOGY	DSE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the application of biotechnology in the field of Food and Nutrition
- the concepts of fermentation techniques and GM foods
- the fundamentals of enzymes and carbon footprint

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Elaborate the ethical aspects of food and agricultural biotechnology	K2
CO2	Interpret the fermentation techniques and emphasize the characteristics of probiotics product	K3
CO3	Examine the characteristics regulations and ethical concerns of GM foods	K4
CO4	Justify the role of biotechnology in meat, poultry, fish and milk processing	K4
CO5	Illustrate the effect of enzyme and inspect the components of footprint	K4

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A2DA	FOOD BIOTECHNOLOGY	SEMESTER II

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Food biotechnology 7 h

Biotechnology-Introduction, goals, ethical aspects of food and agricultural biotechnology, limitations, variety of changes shaping bioethics, hazardous materials used in biotechnology-handling and disposal, GMP, GLP.

Food biotechnology-Introduction, methods, food production, regulatory, safety and socio-economic considerations, Safety of food biotechnology, modern food biotechnology-definition, overview, potential benefits & risks.

Unit II Role of biotechnology in fermentation & Probiotics 7 h

Fermentation –Types of fermentation and fermenters, recovery and purification of products, fermentation and product recovery costs, factors affecting fermentation economics.

Probiotics - Features and composition, characteristics of a good probiotics, factors affecting viability in foods, probiotics products - quality assurance and regulatory issues, guidelines for the evaluation of probiotics in food.

Unit III Genetically modified foods 7 h

Genetically modified foods- Introduction, regulation and role of government, labeling, advantages of GM foods and assessment of the impact of GM foods on human health, social & ethical concerns about GM foods. Characteristics of Genetically modified fruits-apple, citrus, cherry, guava, papaya.

Characteristics of Genetically modified vegetables - tomato, soya bean, carrot, potato. Mushroom-identification, nutritional values, essentials of mushroom cultivation, opportunities and challenges.

Unit IV Role of biotechnology in animal source foods 7 h

Meat- Introduction, tenderization process, enzymatic tenderization.

Poultry- Introduction, slaughtering & processing, poultry nutrition impact.

Fish- Introduction, genetically engineered fish, fish feed biotechnology, benefits and disadvantages.

Milk-Natural components, milk processing operations, key products in dairy industry.

Unit V Enzymes and carbon footprint 8 h

Enzymes-Introduction, sources, purification, formulation of the final enzyme product, enzyme recovery, future of industrial enzymes. Enzymes sources, mechanism, functions -amylase, pectic, lactase, protease.

Carbon footprint-Introduction, ecological footprint of the global food system-primary components of footprint, Impact on other food system.

Text Books

1 GN Foster,2020, "Food biotechnology",1st edition ,CBS Publishers & Distributors Pvt. Ltd, New delhi.

2 V Sree Krishna, 2017, "Bioethics and Biosafety in Biotechnology", New Age International Publishers, New Delhi.

References

1 Johnson-Green Perry, 2018, "Introduction To Food Biotechnology", Taylor and Francis, England.

2 Byong H. Lee, 2014, "Fundamentals of Food Biotechnology", John Wiley & Sons Ltd, New York.

Course Code	Course Name	Category	L	T	P	Credit
223FN2A2DB	FOOD WASTE AND BY-PRODUCT UTILIZATION	DSE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the food processing by-products and their utilization
- the incorporation of by-products into various food products
- the emerging technologies to extract valuable bioactive chemicals from food waste

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Elaborate on the waste related to food industry	K3
CO2	Illustrate the principles and applications of the food processing by products	K3
CO3	Summarize the valorization of fruit and vegetable waste and loss quantification after harvest	K3
CO4	Explain the use of food by-products in industrial sector	K4
CO5	Illuminate the bio processing of meat waste to value-added bio-medical products	K4

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A2DB	FOOD WASTE AND BY-PRODUCT UTILIZATION	SEMESTER II

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Industrial Food waste 7 h

Food waste: classification and properties, disposal and recycling in the context of change in the agricultural industry and emerging nutritional trends, origin of food waste, generated mass of the most important types of product-specific food waste. Possible mitigation measures for food processing wastes. Impact of waste disposal on environment and human health.

Unit II Cereals, Pulses and Sugar 8 h

Rice Processing Industries - Rice bran - Protein extraction method, rice hull and rice bran fiber.

Soyabean - Major Soybean by-products, tofu whey and its uses, source of various enzymes and applications of important soybean products.

Sugar Processing Industries - By-Products - flavorings and aromas, agglomerated product production from bagasse.

Unit III Fruit, Vegetables and Dietary Fiber 7 h

Fruit - Phenolic compounds as functional foods, fruit by-products sources and value-added products from fruit by-products.

Vegetable - Valorization of vegetable wastes, reasons and overall prevention of wastes, loss quantification of fruits and vegetables after harvest.

Dietary Fiber - Dietary fiber from fruits, vegetables, cereals and pulses, utilization of dietary fiber in different food industries.

Unit IV Dairy and Pre - Biotics 7 h

Dairy - By-products from the dairy processing industries, proteins from dairy waste and advances in milk fractionation for value addition.

Prebiotics from food processing by-products, oligosaccharides and polysaccharides from food processing and agricultural by-products.

Unit V Meat, Poultry and Seafood 7 h

Meat - By-Products and wastes generated during meat, beef and pork processing waste - Collagen, Gelatin.

Poultry - Proteins and Peptides derived from Chicken Processing By-Products and Waste, Valorization of Egg Waste.

Seafood processing - By-Products, bio medicals – fish protein hydrolyzate, peptides, chitin and chitosan.

Text Books

1 Anil Kumar Anal., 2018, "Food Processing By-Products and their Utilization", John Wiley & Sons Ltd., New York.

2 Vassoreopoulou and Winfried Russ., 2007,"Utilization of By-Products and Treatment of Waste in the Food Industry", Springer, New York.

References

1 Charis M. Galanakis., 2020, "Food Waste Recovery Processing Technologies Industrial Techniques and Applications", Elsevier Inc., Netherlands.

2 J. Saxena., 2011, "Food Processing Waste Management Treatment and Utilization Technology", New India Publishing Agency, New Delhi.

3 Keith Waldron., 2007, "Handbook of Waste Management and Co-Product Recovery in Food Processing", Elsevier Inc., Netherlands.

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Course Code	Course Name	Category	L	T	P	Credit
223FN2A2DC	FOOD TOXICOLOGY	DSE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the principles of toxicology
- the clinical, emergency, environmental, medico-legal and occupational aspects of toxicology
- to prevent the toxic substances in food products

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Editorialize the mechanism of toxicology and biotransformation	K3
CO2	Determination of toxicants in food and its effects	K3
CO3	Summarize the regulations for genetically modified foods and allergenisity	K3
CO4	Infer food contaminants and heavy metal contamination and radioactive contamination	K4
CO5	Speculate the application of food additives and its toxicological effects	K4

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A2DC	FOOD TOXICOLOGY	SEMESTER II

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Toxicology 7 h

Introduction to Toxicology – Definition, scope, history, principles, classification of toxic agents, characteristics of toxic exposure, interaction and tolerance, biotransformation. Mutagenesis, Mechanism of toxicity- Oncogenesis, Teratogenesis.

Unit II Food Toxins 7 h

Food Toxins – Natural and synthetic toxicants in foods, importance of natural toxins in food, toxicants of plant and animal origin. Microbial toxins (e.g. Algal toxins, bacterial toxins and fungal toxins). Food poisoning, toxin determination in foods and their management. Toxicity of macro and micro nutrient.

Unit III Food allergies and allergens 8 h

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

Manifestations of organ toxicity – neurotoxicity, hepatotoxicity, nephrotoxicity, hematotocicity and immunotoxicity.

Unit IV Contaminants in Food 7 h

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

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

Unit V Food Additives and Adulterants 7 h

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

Agencies and statutes involved in regulation of toxic chemicals in India.

Text Books

1 Shibamoto & Bjeldanes, T & L, 2009, "Introduction to Food Toxicology", 2nd Edition, Elsevier Inc., Burlington.

2 Helferich, and Winter, W & C.K, 2001, "Food Toxicology", CRC Press, New Delhi.

References

1 Ernets Hodson, 2010, "A Text book of Modern Toxicology". A John Wiley & sons Inc, New York.

2 Stine.K.E and Brown.T.M., 2006, "Principles of Toxicology", 2nd Edition, CRC Press, New Delhi.

3 Duffus.J.H and Worth.H.G.J., 2006, "Fundamental Toxicology", The Royal Society of Chemistry, New Delhi.

BoS Chairman/HoD
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APPROVED		
BoS- 14th	AC - 14th	GB - 19th
30.11.2022	19.01.2023	30.01.2023

Academic Council
Dr.V. Rajendran
CHAIRMAN
Dr.N.G.P. Arts and Science College

Course Code	Course Name	Category	L	T	P	Credit
223FN2A3CA	MICRONUTRIENTS	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The Physiological and metabolic role of micro nutrients and its role in maintaining the human body
- The bio availability of vitamins and minerals and their inter relationship
- The importance of pseudo vitamins and antioxidants for maintenance of human health

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Elaborate the chemistry, biosynthesis, transport, utilization, storage of Fat-soluble vitamins.	K3
CO2	Determine the chemistry, physiological action, storage, transport, and biosynthesis of water-soluble vitamins	K3
CO3	Enumerate the absorption, utilization, deficiency, toxicity, sources and requirements of minerals.	K4
CO4	En detail the functions, intake, utilization, bio availability, storage, and output of trace elements.	K4
CO5	Express the chemistry, functions and Sources of the pseudo vitamins and antioxidant's role in maintaining human health.	K5

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A3CA	MICRONUTRIENTS	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Fat Soluble Vitamins 10 h

Vitamins - Introduction, Factors Influencing the Utilization of Vitamins.

Fat Soluble Vitamins - Vitamin A, D, E and K, Structure, Chemistry, biosynthesis, metabolism, absorption, transport, utilization, storage, bio availability and Methods of Assay. Deficiency and Diagnosis, Hyper Vitaminosis, Recommended Intakes and Dietary Sources.

Unit II Water Soluble Vitamins 9 h

Thiamine, riboflavin, niacin, vitamin B12, folic acid, pyridoxine, pantothenic acid, biotin and ascorbic acid - Structure, chemistry, biosynthesis, metabolism, Absorption, Transport, utilization, storage, bio availability and Methods of Assay. Deficiency and Diagnosis, Hyper Vitaminosis, Recommended Intakes, deficiency and Dietary Sources.

Unit III Macro Minerals 10 h

Calcium – Distribution of calcium in the body, functions, absorption, metabolism, transport, utilization, deficiency, toxicity and requirements. Regulation of calcium (Calcium Balance).

Phosphorus - Concentration in the body, functions, absorption, metabolism, transport, utilization, deficiency, toxicity, sources and requirements. Calcium - phosphorus ratio. Inter relationship between Calcium, Phosphorus and Parathyroid Hormone.

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

Unit IV Micro Minerals 10 h

Iron- Distribution, absorption, metabolism, functions, intake, transport and utilization, storage, Sources, requirements, deficiency, toxicity, bio availability of iron, Iron Turnover.

Iodine, Flourine and Zinc - Functions, absorption, metabolism, sources, requirements, deficiency and toxicity.

Trace Elements

Physiology, Functions, sources, requirements, deficiency and toxicity of copper, cobalt, molybdenum, manganese, selenium, boron, chromium.

Unit V Pseudo Vitamins and Antioxidants 9 h

Choline, carnitine, inositol, taurine, flavonoid, pangamate - Chemistry, functions, and Sources. Antioxidants - Reactive Oxygen Species, Free radical, Mechanism of Antioxidants, Functions. Relationship with aging, cancer, CVD, CRD, CKD, Diabetes, Stroke, Liver diseases.

Text Books

1 Srilakshmi, E. 2021, "Nutrition Science", New Age International Publishers, New Delhi.

2 Swaminathan, M. 2000, "Advanced Text Book foods Nutrition", Vol.1., Bappco Publication, Bangalore, India.

References

1 Mahan, Kathleen L. Krause 's, 2004, "Food, Nutrition and Diet Therapy", 11th edition, Elsevier Publishers, USA.

2 Mahtab S. Bamji, Prahalad Rao. N and Vinodhini Reddy, 2004," Text Book of Human Nutrition", Oxford IBH Publishing Co Pvt Ltd., USA.

3 Swaminathan, M. 2000, "Essentials of Foods and Nutrition", Volume I and II, Ganesh and Co., Madras, India.

4 Williams. S.R. 2013, "Nutrition and Diet Therapy", Times Mirror Masby College Publishing St. Laws, Toronto, Boston.

5 National Institute of Nutrition, 2020, "Recommended Dietary Allowances", ICMR, , Hyderabad.

Course Code	Course Name	Category	L	T	P	Credit
223FN2A3CB	THERAPEUTIC NUTRITION - II	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The theoretical bases for nutrition intervention strategies with the physiological and biochemical changes of selected disease conditions
- The theories and principles of medical nutrition therapy into clinical practice
- The appropriate recommendations for the management of disease conditions

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Gain insight into the nutritional problems of liver and pancreatic disorders and the efforts to overcome them	K3
CO2	Understand the relationship between nutrition and cardiovascular diseases	K2
CO3	Develop knowledge in mineral metabolic disorders	K3
CO4	Interpret and apply the nutritional therapy in neuro and respiratory disorders	K4
CO5	Justify the various dietary modifications critically with evidence-based knowledge in cancer treatment	K5

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A3CB	THERAPEUTIC NUTRITION - II	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Nutrition therapy in liver, biliary and pancreas diseases 10 h

Diseases of the liver: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for acute and chronic hepatitis, alcoholic and non-alcoholic fatty liver disease, cirrhosis, hepatic encephalopathy/coma.

Diseases of the hepatobiliary and pancreas: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for cholelithiasis, cholecystitis, choledocholithiasis, acute and chronic pancreatitis.

Unit II Nutrition therapy in cardiovascular diseases 10 h

Diseases of the cardiovascular system: atherosclerotic risk factors, etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for hypertension, atherosclerosis, metabolic syndrome, ischemic heart disease, peripheral arterial disease and congestive heart failure.

Role of metabolic factors in clinical interpretation of ECG. Role of functional foods in cardiovascular health. Stress- definition, types and management.

Unit III Nutrition therapy in musculoskeletal, bone and mineral metabolic disorders 9 h

Disorders of the musculoskeletal, bone and mineral metabolism: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for osteoarthritis, gout, osteoporosis, rickets, osteomalacia, hypophosphatemia, hyperphosphatemia, hypomagnesemia, hypermagnesemia, hypercalcemia, hypocalcemia.

Disorders of the endocrine system: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for hypothyroidism, hyperthyroidism, polycystic ovarian syndrome.

Unit IV Nutrition therapy in neurological and respiratory disorders 10 h

Disorders of the neurological system: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for dysphagia, Alzheimer's

disease, Parkinson's disease, epilepsy. Nutritional management in spinal trauma and Neuro trauma.

Diseases of the respiratory system: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for LRTI and URTI, asthma, chronic obstructive pulmonary disease, tuberculosis, cystic fibrosis, pneumonia, acute respiratory distress syndrome, respiratory failure.

Unit V Nutrition therapy in cancer 9 h

Neoplastic diseases: Development, Characteristics and identification of cancer cells. Etiological risk factors in cancer. Role of diet in the etiology of cancer. Metabolic alterations during cancer. Nutritional manifestations associated with cancer. Feeding problems related to cancer therapy (surgery, radiation therapy and chemotherapy). Role of functional foods in prevention of cancer.

Text Books

1 Mahan L. K. & Escott-Stump S., 2021, Krause's "Food & nutrition therapy", 15th ed., Saunders/Elsevier, Netherlands.

2 Escott-Stump S., 2015, "Nutrition and diagnosis-related care", 8th ed., Wolters Kluwer, United States.

References

1 Whitney E. N. Rolfes S. R. Crowe T. & Walsh A., 2023, "Understanding nutrition", 5th edn., Cengage Learning, Boston.

2 Nix S. Williams S. R. & Mowry L, 2022, "Williams' basic nutrition and diet therapy", Elsevier, Netherlands.

3 Krause and Mahan's, 2021, "Food & the Nutrition Care Process", 15th ed., Elsevier, Netherlands.

4 Kane K. & Prelack K., 2019, "Advanced medical nutrition therapy" Jones & Bartlett Learning, Burlington.

Course Code	Course Name	Category	L	T	P	Credit
223FN2A3CC	RESEARCH METHODOLOGY AND STATISTICS	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The details of sampling designs, measurement, scaling techniques and methods of data collection.
- The procedure of interpretation and writing research reports.
- Application of statistical procedure in numerical data analyzes to draw inferences.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Classify research and choose a hypothesis to plan research along with sampling techniques.	K4
CO2	Choose and simplify the data collection methods. Organize and analyze the data.	K5
CO3	Comparison and contrast the results obtained from the data.	K5
CO4	Statistically analyze the acquired data and explain the results. Measure the reliability of the research data.	K5
CO5	Justify the results using the test of significance. Provide a theoretical conclusion from the obtained data.	K6

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A3CC	RESEARCH METHODOLOGY AND STATISTICS	SEMESTER III

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Fundamentals of Research 10 h

Meaning of research, objectives of research, types of research and their application, selection and formulation of research problems- hypothesis, research design, sampling methods – random sampling methods and non-random sampling methods, sampling errors & sample size calculation.

Unit II Collection and organization of data 14 h

Primary Data collection methods - Questionnaire, schedule method, interview method, case study method & experimentation method, sources of secondary data, precautions while using secondary data.

Editing and Coding the Data

Organization of Data - classification of data, formation of discrete and continuous frequency distribution, tabulation - role, general rules of tabulation, types of tables.

Unit III Report writing 12 h

Representation of Data - Diagrammatic and graphical representation - significance of diagrams, graphs and charts- general rules for constructing diagrams - types of diagrams.

Interpretation and Report Writing - Meaning of interpretation and precautions , Format of thesis writing - front page, main text, bibliographical citations and appendices.

Publishing the research work - writing of abstract and article- content, style, grammar, reference citation.

Plagiarism - Definition, types, importance and examples of plagiarism.

Unit IV Measures of Central Tendency 12 h

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

Unit V Tests of significance 12 h

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

Text Books

1 Pillai .R.S.N., Bagavathi .V., 2019, "Statistics (Theory & Practice)", 8th Edition, S Chand Publishing Company, New Delhi.

2 Gupta, S.P., 2017, "Statistical Methods", Sultan Chand & Sons Publication, New Delhi.

References

1 C.R. Kothari , Gaurav Garg, 2019, "Research Methodology, Methods and Techniques", 4th Edition, New Age International Publishers, New Delhi.

2 Ramakrishnan, P., 2019, "Biostatistics", Sara Publication, India.

Course Code	Course Name	Category	L	T	P	Credit
223FN2A3CD	FOOD ADDITIVES AND CONTAMINANTS	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Gain insight about the food additives
- The significance of food additives
- The impact of contaminants on human health

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Elaborate the role of Food additives	K2
CO2	Explicate the regulatory aspects of food additives	K3
CO3	Illustrate the principle and applications of food additives in food processing sectors	K4
CO4	Summarize the importance of flavors in foods and its significance as food additives	K4
CO5	Illuminate the harmness of adulteration and contaminants and explicate the Consumer Protection Act	K5

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A3CD	FOOD ADDITIVES AND CONTAMINANTS	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Food additives 10 h

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

Unit II Functionality of food additives 08 h

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

Unit III Additives to improve acceptability 10 h

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

Unit IV Flavor technology 10 h

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

Unit V Food adulteration 10 h

Food adulteration, definition, reasons for food adulteration, methods of adulteration, and methods of detection. Consumer's responsibilities, consumer organizations. The

prevention of food adulteration Act, 1954. The consumer protection Act 1986, normal food adulterants in coffee, tea leaves, edible oil, milk, spice powders

Text Books

1 Gerorge, A.B., 2006, "Encyclopedia of Food and Color Additives" Vol. III. CRC Press, United States.

2 Branen, A.L., Davidson PM & Salminen S, 2001, "Food Additives", 2nd Ed.Marcel Dekker, New York.

References

1 Madhavi, D.L., Deshpande, S.S & Salunkhe, D.K. 2006, "Food Antioxidants: Technological, toxicological and Health Perspective", Marcel Dekker, New York.

2 Nakai S & Modler HW. 2000. "Food Proteins and Processing Applications" Wiley VCH, New Jersey.

223FN2A3CP	FOOD ANALYTICAL TECHNIQUES	SEMESTER III

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Different plant sample extraction methods
2	Qualitative phytochemical analysis in various plant samples
3	Estimation of chlorophyll
4	Estimation of curcumin in turmeric
5	Estimation of total phenol content present in fresh fruits
6	Estimation of capsaicin in calorimetric method
7	Determination of trypsin inhibitor in pulses
8	Determination of tannin content
9	Determination of phytic acid in millets
10	Determination of Gossypol
11	Determination of Cyanogen
12	Estimation of Cellulose in plant material
13	Invitro Protein Digestibility
14	Determination of Amylose
15	Estimation of alkaloids (Quantitative test)

Note: Out of 15- 13 mandatory

References

1. Sadasivam. S., and Manickam. A., 2008, "Biochemical Methods", 3rd Edition, New Age International Publishers, New Delhi.
2. Suzanne Nielsen.S., 2007 "Food Analysis", 4th Edition, Springer, New York.
3. AOAC International, 2005, "Official Methods of Food Analysis", 18th Edition, Maryland.
4. Suzanne Nielsen.S., 2017, "Food Analysis Lab Manual", 3rd Edition,Springer, New York.

223FN2A3CQ	THERAPEUTIC NUTRITION	SEMESTER III

Total Credits: 2
Total Instructions Hours: 48 h

S. No	Contents
1	Diet for chronic energy deficiency, overweight, obesity, diabetes mellitus
2	Diet for pre and post-operative period
3	Diet for fever and convalescence
4	Diet for nutritional deficiencies – PEM, VAD, IDA, IDD, Osteoporosis, B-complex vitamin deficiency, Vit-D deficiency
5	Diet for HIV/AIDS
6	Diet for burns
7	Diet for critically ill – enteral nutrition
8	Diet for critically ill – parenteral nutrition
9	Diet for GI diseases
10	Diet for liver diseases
11	Diet for cardiovascular diseases
12	Diet for respiratory disorder
13	Diet for neurological disorder and neuro trauma
14	Diet for cancer and immunity

Note: Out of 14 - 12 mandatory

References

1 Kane K. & Prelack K., 2019, "Advanced medical nutrition therapy", Jones & Bartlett Learning, Burlington.

2 Escott-Stump S., 2015, "Nutrition and diagnosis-related care", Wolters Kluwer, United States.

3 Nix S. Williams S. R. & Mowry L., 2022, "Williams' basic nutrition and diet therapy", Elsevier, Netherlands.

Course Code	Course Name	Category	L	T	P	Credit
223FN2A3DA	INSTRUMENTATION IN FOOD INDUSTRY	DSE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The instruments used in food industries for food analysis
- The working principle and instrumentation of various instruments used for food analysis
- The various methods, strategies, proper selection and identification of instruments, Installation and operation of instrumentation

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the basic working principle of instruments used for food analysis	K4
CO2	Determine the rheological properties of food	K5
CO3	Illustrate the working principle and applications of spectroscopic analysis of food components	K4
CO4	Summarize the applications of chromatographic techniques	K5
CO5	Appraise the techniques and applications of isotopic and immune techniques in food	K5

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability		Innovations
✓	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A3DA	INSTRUMENTATION IN FOOD INDUSTRY	SEMESTER III

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Nature and Concept of Food analysis 7 h

Basic instrumentation: Working principle, components and applications of pH meter, Dialysis machine, ultra filtration, Reverse osmosis. Principle for Centrifugation and Ultracentrifugation, Calorimetry: Bomb calorimeter.

Unit II Principle of Rheological Analysis 7 h

Rheological parameters, rheological methods, instruments and application, Refractometer, viscometer, penetrometer, farinograph, extensiograph, amylograph, tenderometer. Analysis of texture and flavor profile.

Unit III Spectroscopic analysis of food components 7 h

Principle, instrumentation & application of Colorimetric (colorimeter, UV-Vis spectrophotometer, IR Spectroscopy, Inductively coupled plasma atomic emission spectroscopy (ICP-AES) and NMR.

Unit IV Chromatographic analysis of food components 8 h

Theory & Principle, chromatographic parameter components of chromatography & types (paper, thin layer, partition) Advance chromatography: GC, HPLC, HPTLC, UHPC (principle, instrumentation &application) and types of detector.

Unit V Electrophoresis analysis of Food Components 7 h

Working Principles, Application, Separation technique & analysis: Electrophoresis: Paper & gel, Agarose 2D Gel Electrophoresis.

Text Books

1 Suzanne Nielsen.S., 2002, "Introduction to the Chemical Analysis of Foods", CBS Publishers, New Delhi.

2 Fennama, O.R., 1976, "Principles of Food Science and Food Chemistry". Marcel Dekker, New York.

References

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

2 Fung, D.Y.C. and Matthews, R., 1983, "Instrumental Methods for Quality Assurance in Foods", Marcel Dekker, Inc. New York.

3 Raghuramulu N., Madhavan Nair K. and Kalyansundaram S, 1970, "A manual of laboratory techniques" edited by NIN, ICMR, Hyderabad.

Course Code	Course Name	Category	L	T	P	Credit
223FN2A3DB	FOOD PACKAGING TECHNIQUES	DSE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The purpose and the need for food packaging technology
- To impart knowledge and skills related to designing packaging system in food products
- The developing skills in handling of packaging equipment

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Identify the functions of packaging materials for different foods.	K3
CO2	Elucidate the characteristics, application of packaging of foods	K4
CO3	Analyze the packaging techniques, implication and its application.	K4
CO4	Compare the recent advancements in food packaging industry	K5
CO5	Choose the Standards for labeling concerned in food industries.	K5

MAPPING WITH PROGRAMME OUTOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A3DB	FOOD PACKAGING TECHNIQUES	SEMESTER III

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Food packages 7 h

Introduction of Food packaging, Need of food packaging, Role of packaging in extending shelf life of foods, Types of Packaging material-primary, secondary & tertiary, characteristics, applications in food industry. Different forms of packaging-Rigid, semi- rigid, flexible,Brik -pak system,Bag in Box ystem.

Packaging Materials-Glass, Metal (steel and Aluminum cans),Aluminum Foils and metalized Films, Paper and paper boards, BOPP,CPVC, Plastics and its application.

Unit II Packaging of cereal and pulse products & edible oil 7 h

Packaging of cereal products- Spoilage factors, Packaging of whole grains(Bulk &Consumer Packs) - Jute bags, HDPE sacks, Packaging of milled grains(flours)-LDPE, LLDPE, HMHDPE,BOPP, Co- extruded films, Packaging of Cereal based convenience products and weaning products.

Trends in packaging of Biscuits- wrapping material, packaging style and preparation stages.

Packaging of Edible oil- spoilage factors, package types, critical polymers & Indian standards of packaging edible oil, vanaspati and ghee

Unit III Packaging of Milk, Egg, Sugars and Confectioneries 7 h

Packaging of Milk and milk products (Milk Powder,Butter,Yogurt,Cheese. Packaging Materials for Egg and its technique.

Sugar and chocolate confectioneries-Packaging requirements, packaging materials-cellulosics, polyolefins, vinyls, Polyester & polyamides, Aluminium foils, Metallised films.

Unit IV Technology in development of Food packaging 8 h

MAP packaging- Techniques of MAP, Different Modified Atmospheres, Packaging Materials, ,Role of Gases in MAP, Application of Gas Packing for Shelf Life Extension of Foods-Effect of MAP on fresh meat, fish ,poultry & processed meats, Advantages and Disadvantages of MAP

Active and Intelligent Packaging, Sustainable Packaging, Degradable Packaging Polyermers-Biodegradable, Photodegradable Packaging, Packaging Waste Management.

Unit V Labeling & Laws 7 h

Labeling- Purpose of labels, , Critical elements of food label, type of label, Labels for freight containers, labeling regulations, bar code, Nutrition labeling, health claims, mandatory labeling provisions. Recent Trends in Labeling

Packaging Laws and regulations -SWMA, PFA Rule, Other Labelling Rules.

Text Books

1 N. I. I. R. Board, 2010, "Handbook on modern packaging industries". Asia Pacific Business Press Inc., New Delhi.

2 NIIR Board, "Food Packaging technology", 2020, 3rd edition, NIIR Project Consultancy Services., New Delhi.

References

1 Lee, D. S., Yam, K. L., and Piergiovanni, L. 2008. "Food packaging science and Technology". CRC press, New York.

2 Francis, F. J. (1999). Wiley encyclopedia of food science and technology. John Wiley and Sons Inc. Germany

3 Griffrin, R.C, "Principles of Food Packaging", 2002, 2nd Edition, Avi pub Co. Westport.

4 Gordon L. Robertson, "Food Packaging Principles and Practice", 2013, 3rd Edition, CRC Press, Baco Raton.

Course Code	Course Name	Category	L	T	P	Credit
223FN2A3DC	FOOD MICROBIOLOGY	DSE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The interactions between microorganisms and the food environment
- Effects of fermentation in food production and the microbiological quality of the food product
- The role of microorganisms in food safety

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	eness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A3DC	FOOD MICROBIOLOGY	SEMESTER III

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Food and Microorganisms 07 h

Important microorganisms in food- Bacteria, Mold and Yeast, Factors affecting the growth of microorganisms in food – pH, moisture, oxidation– reduction potential, nutrient content and inhibitory substances and biological structure.

Unit II Microbes In Food Fermentation 07 h

Microbes associated with typical food fermentation- Bread, pickle, Sauerkraut, fermented fish and meat products, Fermented dairy products : Yoghurt and cheese & Fermented beverages : Wine and beer.

Unit III Control of microorganisms in foods: Food Preservation 07 h

Microbiological spoilage problems and preventive measures associated with typical food products- Vegetables, fruits, Meat, Fish, Poultry, egg and milk & canned foods.

Unit IV Bacterial Agents of Food Borne Illness 08 h

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

Unit V Non- Bacterial Agents of Food Borne Illness 07 h

Food borne viruses; helminths, nematodes and protozoa. Detection & Enumeration of microbes in foods

Text Books

1 Frazier. W.C and D.C West off., 2017, "Food Microbiology", 5th Edition, McGraw Hill Education Publishers, Boston.

2 Martin R Adams, Maurice O Moss, Peter McClure, 2015, "Food Microbiology", 4th edition, Royal Society of Chemistry Publication, Burlington.

References

1 David A. Golden, James M. Jay, Martin J. Loessner, 2006 ,"Modern Food Microbiology" 7th edition, Springer-Verlag, New York.

2 Roger. Y. Stainer, 2003, "Basic Food Microbiology", 2nd edition, CBS Publishers, United States.

223FN2ASSA	SELF STUDY: COMPOSITE HOME SCIENCE	SEMESTER III

Total Credits: 1

Syllabus

Unit I Food and Nutrition

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

Unit II Institutional Management and Dietetics

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

Unit III Child and Human Development

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

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

Unit IV Home and Community Resource Management

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

Laws protecting consumer; Role of consumer society in protecting consumer; Kinds of adulteration; Identification of adulteration.

Unit V Home Science Extension Education

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

Text Books

1. Premlata Mullick, 2012."Textbook of Home science", Kalyani publications, Coimbatore.
2. Serena Shekar, 2013, "Text book of Home science", Extension education, New Delhi.

223FN2ASSB	SELF STUDY: DIET COUNSELING	SEMESTER III

Total Credits: 1

Syllabus

Unit I Practical consideration in giving dietary advice and counselling

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

Unit II Counselling and educating patient

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

Unit III Teaching aids used by dietitians

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

Unit IV Use of Computers in Counseling

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

Unit V Computer applications for counseling

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

Text Books

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

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

References

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

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

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Course Code	Course Name	Category	L	T	P	Credit
223FN2A4CA	PUBLIC HEALTH NUTRITION	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the concept of health and nutrition interrelationship
- the assessment techniques of health status in the community
- the factors to organize nutritional intervention programmes

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the role of public health nutritionist and concept of public health nutrition	K1
CO2	Explain the nutritional status assessment of different age group	K2
CO3	Identify the preventive measures of non-communicable diseases	K3
CO4	Justify the role of nutrition intervention and nutrition education programmes	K4
CO5	Infer the functions of various national and international organizations in public health	K1

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization.
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A4CA	PUBLIC HEALTH NUTRITION	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Concept of public nutrition 10 h

Relationship between health and nutrition, role of public nutritionists in the health care delivery system; Population dynamics - Demographic transition, population structure, population policy, nutrition and quality of life interrelationship; determinants and indicators of health status.

Unit II Nutritional status Assessment techniques 8 h

Definition, Methods of assessments – anthropometry, clinical, biochemical and biochemical and biophysical assessment. Dietary assessment – Food weighment survey, 24 hour recall, food dairy and food frequency, food surveillance and security status.

Unit III Preventive measures of communicable diseases 10 h

Definition of epidemiology – causes, signs and symptoms, treatment and prevention of communicable diseases, respiratory infections, intestinal infections, other infections – dengue, filarisis. Types of immunity – active and passive, Immunization agents – vaccine, Immunization schedules, Expanded programme on Immunization, chemoprophylaxis, non-specific measures.

Unit IV Nutrition Intervention 10 h

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

Nutrition Education: Objectives and Methods used, integration of nutrition education principles of planning, executing and evaluating, and problems in conducting nutrition education programmes.

Unit V National and International Organization 10 h

National organization – History, objectives and functions of ICAR, ICMR, NIN, CFTRI, DFRL, NIPCCID, NFI and FSSAI – Food fortification Resource Center, Eat Right India Movement, E – Public Distribution System.

International Organizations – History, objectives and functions of WHO, FAO, UNICEF, FFHC, WFP, CARE, CRS, AFPRO.

Text Books

1 Park K, 2005, "Textbook of Preventive and Social Medicine", 26th Edition, Banarsidas Bhanot Publishers, Jabalpur.,

2 Owen, A.Y. and Frackle, R.T., 2002, "Nutrition in the Community". The Art of Delivering Services, 2nd Edition Times Mirror/Mosby.

References

1 Bamji, M.S., Rao, P.N. Reddy, V., 2003, "Textbook of Human Nutrition", Oxford and IBH Publishing Co. Pvt.Ltd., New Delhi.

2 Beaton, G.H. and Bengoa, J.M., 2000, "Textbook of Human Nutrition", Oxford and IBH Publishing Co. Pvt. Ltd., NewDelhi.

3 Beghin I. Cap, M. and Dujardan, B., 1988, "A guide to nutritional status assessment", WHO, Geneva.

4 Bhatt D.P., 2008, "Health Education", Khel Sahitys Kendra, New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
223FN2A4CB	FOOD SAFETY AND QUALITY MANAGEMENT	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- to understand about the food safety and quality assurance
- to know about national and international food standards
- to gain knowledge on food laws

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Develop the knowledge about the quality control and quality assurance in food Industry.	K2
CO2	Explain various Government regulations and its application in quality control.	K3
CO3	Categorize the food standards for each food commodity	K3
CO4	Prioritize the food laws and develop knowledge on patent	K4
CO5	Examines the risk associated with food and its safety measures	K1

MAPPING WITH PROGRAMME OUTCOMES

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

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223FN2A4CB	FOOD SAFETY AND QUALITY MANAGEMENT	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Food safety and Quality control 10 h

Principles of food safety and quality - Food Safety System - Quality attributes - Total Quality Management. Good Manufacturing Practices - Risk Analysis, Risk Management, Risk Assessment, Risk Communication - Traceability and authentication. Quality control - Importance, Functions and stages of quality control in food industry. Food quality assurance - HACCP structured approach, principles, benefits and limitations,Role of Food quality control officer.

Unit II Government regulations in quality control 10 h

Indian Standards - FAO/WHO, FSSAI, AGMARK, BIS, ISI, CPA, PFA, FPO, MPO. International Standards Codex Alimentarious, ISO - 9001:2000, 22000:2005 Standards,WTO, FAO,APEDA, JECFA, EPA.

Unit III Food Standards 10 h

Food Standards - Cereal and Cereal Products - bread, biscuits, cakes, pasta products. Fruit Products - jam, jellies, ketchup, sauce, squashes. Oil and Fats - coconut oil, groundnut oil, palm oil, rice bran oil, olive oil, sunflower oil, ghee, vanaspati. Milk and products -Skimmed milk powder, partly skimmed milk powder, condensed sweetened milk. Other products-coffee, tea, sugar, honey, toffees.

Unit IV Food safety laws 10 h

Food Laws and regulation, Food labeling and Packaging laws. Role of central and state government in imparting quality control-Role of central food laboratory and state food laboratories. Patent -Definition, requirements, patent laws in India, administrator, need for patent system, guidelines for application, non-patentable

Unit V Food safety risks and its management 8 h

Dimensions of risk perception-Consumer perception on food risks and safety, risk and benefits associated with new food technologies. Risk communication. Food Adulteration and cross contamination, Food additives - Intentional and unintentional additives, regulatory bodies. Hygiene practices, GRAS.

Text Books

1 Potter.N.N and Hotchkins. J. H., 2007, "Food Science", CBS Publishers., India.

2 Singh A.K., 2018. "Managing food safety risks in the Agri-food industries". Oxford Publication, New Delhi.

References

1 Neal D. Fortin. 2009. Food regulation, Wiley Publishers.

2 Naomi Rees. David Watson. 2000," International standards for food safety", An Aspen Publications.

3 Vasconcellos, J. A. 2003, "Quality assurance for the food industry: a practical approach". CRC press.

4 Kilcast, D. (Ed.) 2010, "Sensory analysis for food and beverage quality control: a practical guide". Elsevier.

223FN2A4CV	PROJECT WORK AND VIVA VOCE	SEMESTER IV

Total Credits: 8

Total Instruction Hours: 192 h

Syllabus

OBJECTIVES

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

CONTENTS

Project can be done in any specialized area

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

RULES

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

223FN2A4DP	FOOD QUALITY CONTROL	SEMESTER IV

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Estimation of moisture and ash content in food samples
2	Qualitative tests for pectin in fruits
3	Estimation of titratable acidity in fruits
4	Determination of citric acid in fruits & vegetables
5	Determination of acetic acid in fruits & vegetables
6	Determination of chlorophyll and anthocyanins in fruits & vegetables
7	Determination of methylene blue dye reduction test in milk
8	Estimation of lactose in milk
9	Estimation of total soluble solids in milk
10	Estimation of specific gravity in foods
11	Test for rancidity in oils – Kreis Test
12	Food adulteration – Test to detect adulteration

Note: Out of 12 - 10 Mandatory

References

1. King, R.D., 2008, "Developments in Food Analysis Techniques-1. Applied Science", Ed Publishers Ltd., London.
2. 2023, "Manual of method of analysis of various food products", FSSAI, New Delhi.

223FN2A4DQ	NUTRITION IN HEALTH	SEMESTER IV

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Menu planning for pregnant mother carrying twins
2	Menu planning for preterm delivery
3	Menu planning for lactating mother carrying twins
4	Menu planning for adult & geriatrics
5	Menu planning for mountaineering & sea voyage
6	Menu planning for adolescents
7	Menu planning for IT professionals working on different shifts
8	Menu planning for soldiers
9	Menu planning for swimmers
10	Menu planning for weight lifters
11	Menu planning for athletes
12	Menu planning for astronauts

Note: Out of 12 - 10 Mandatory

References

1. Avantina Sharma, 2019, "Principles of Therapeutic Nutrition and Dietetics", CBS Publishers & Distributors Pvt.Ltd, New Delhi.
2. National Institute of Nutrition, 2020, "Dietary Guidelines for Indians -A Manual", New Delhi.
3. Mudambi R., & Rajagopal M.V., 2007, "Fundamental of Foods, Nutrition and Diet Therapy", New Age International Publishers, New Delhi.
4. Paul J. McVetty., Bradley J.Ware., & Claudette Levesque, 2004, "Fundamentals of Menu Planning", John Wiley & Sons publishers.

223FN2A4DR	FOOD FERMENTATION TECHNIQUES	SEMESTER IV

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Preparation of bread
2	Preparation of idly dosa batter
3	Preparation of probiotic drink-rice water
4	Preparation of curd, yogurt
5	Preparation of cheese, kefir
6	Preparation of sauerkraut, kimchi
7	Preparation of vinegar - honey, coconut
8	Preparation of fermented pickled cucumber
9	Preparation of wine - grape, pineapple
10	Preparation of kombucha
11	Preparation of natto, tempeh
12	Preparation of soy sauce and miso

Note: Out of 12- 10 mandatory

References

1. Dr.Caroline Gilmartin, 2020, "Fermented foods- A practical guide", The Crowood Press Ltd, United States.
2. Fraizer.W.C.,Westhoff.D.C, 2019, "Food Microbiology", Mc Graw Hill Education (India) Pvt Ltd, New Delhi.
3. Adams.M.R, Moss.M.O, 2017, "Food Microbiology", New Age International Publishers, New Delhi.

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