File Ref.No.5802/GA - IV - J1/2012/CU

UNIVERSITY OF CALICUT

Abstract

BSc in Food Technology-CUCBCSS UG 2014-Scheme and Syllabus- revised w.e.f 2017 Admissions- Approved-Implemented- orders issued.

G & A - IV - J

U.O.No. 8868/2017/Admn Dated, Calicut University.P.O, 18.07.2017

Read:-1. Minutes of the meeting of Board of Studies in Food Technology held on 01-12-2016.

2. Minutes of the Faculty of Science held on 07.12.2016 item. No.7
3. Item F of the Minutes of the LXXV meeting of Academic Council held on 13.12.16.
4. Orders of the Vice Chancellor in the file of 191466/GA IV J/2016/Admn. dated 22.12.16.

ORDER

Vide paper read first above,the Board of Studies in Food Technology as item No.1 has decided to make revision in syllabus of BSc Food Technology 2014 by introducing a practical course on Analysis of Food in fifth semester.

Vide paper second above, the Faculty of Science at its meeting held on 07.12.2016 item. No.7 has resolved to approve the minutes of the Board of Studies in Food Technology.

Vide paper read third above,the Academic Council at its meeting held on 13.12.16 as Item F resolved to approve the Faculty of Science and the Board of Studies minutes.

Vide paper read fourth above,the Vice Chancellor has accorded sanction to implement the Academic Council resolutions.

Accordingly orders are issued to implement the modified syllabus of BSc Food Technology CUCBCSS UG 2014 by introducing a practical course on Analysis of Food in fifth semester w.e.f. 2017 admission onwards.

Orders are issued accordingly.

(Revised Syllabus is enclosed herewith) .

Ajitha P.P

Joint Registrar

To

1. The Controller of Examinations, Digital wing.
2. The Principal affiliated colleges.

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Forwarded / By Order

Section Officer

UNIVERSITY OF CALICUT

Syllabus for Under Graduate Programme

in

B.Sc. Food Technology

2017-18 Admission onwards

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B.Sc. FOOD TECHNOLOGY DEGREE PROGRAMME-LRP (LANGUAGE REDUCED PATTERN)

The B.Sc. Degree Programme means the entire course study and examinations for the award of degree. The duration of BSc Food Technology under graduate programme shall be of 6 semesters distributed over a period of 3 years. A sequence of 18 academic weeks with a unit of five working days constitute one semester.

Course means a segment of subject matter to be covered in a semester (traditionally referred to as a paper). BSc Food Technology degree programme is a language reduced pattern has common courses of compulsory English and additional languages in 1st and 2nd semester which is taught by language teachers. Those are Common English course I, Common English course II, Common English course III, Common English course lV, Additional language course I and Additional language course II. It may be Hindi, Arabic or Malayalam. Additional language may be chosen by the students according to their wish. General Course I, II, III and IV are Numerical Skill, General informatics, Entrepreneurship Development and Environmental pollution and Health Hazards, respectively with a code of A which may be taught by either parent or Language Teachers depend upon their work load. Core courses in BSc Food Technology are 17 numbers with a code of B will be taught by parent department. Complimentary courses refer to course related to core course of BSc Food Technology degree programme which has Physics & Chemistry and are distributed in first four semesters. Food Science & Quality Control is chosen as complimentary course for BSc Chemistry degree programme with a code of C and finally open course which is taught to the students of other than B.Sc. Food Technology degree programme from parent department. There are 3 open courses, of which one course will be selected by student at his / her choice and will be studied in fifth semester with a code of D.

Credits means a unit of academic input measured in terms of weekly contact hours/course contents assigned to a course. Each course shall have certain credits. For passing the degree programme the student shall be required to achieve a minimum of 120 credits of which 38 credits shall be from common courses (14 credits for common English courses, 8 credits for Additional language courses and 16 credits for General Courses.) 56 credits from core ,complimentary(24 credits) and 2 credits from open course. Students of BSc Food Technology should undergo a project work for a period of 15 days during 5th or 6th semester which is done as 'In plant Training'.

Credit Distribution of B.Sc. Food Technology Programme

Sem	Common Course			General		Core Course							Complementary Course		Open Course	Total
	English		Additional Language										I	II		
I	3	3	4			3							2	2		17
II	4	4	4			3							2	2		19
III				4	4	3	-						2	2		15
IV				4	4	4	3						2+ 4	2+4		27
V						3	4	4	3	-	-				2	16
VI						3	2	4	3	3 + 3	3 + 3	2				26
Total	14 Credits (400 Marks)		8 Credits (200 Marks)	16 credits (400 Marks)		56 Credits (1750 Marks)							12 Credits (400 Marks)	12 credits (400 Marks)	2 Credits (50 Marks)	120
	38 Credits (1000 Marks)					82 Credits (2600 Marks)										**120**
														Total Marks		**3600**

Mark distribution

Common: English	4x100	400	600
Additional: Mal/Hindi.....	2x100	200	
General	4x100	400	400
Core	11 x 100 4 x 150	1100 600	1700
Project		50	50
Open		50	50
Complementary	4x2x100	800	800
Total marks			**3600**

Examinations

There shall be University Examinations at the end of semester. A student shall be permitted to appear for the semester examination, only if he or she secures not less than 75% attendance in each semester.

Practical Examination shall be conducted by the University at the end of 4th & 6th semester

Evaluation and Grading

Mark System is followed instead of direct grading for each Question. For each course in the semester letter grade, grade point and % marks are introduced in 7 point. Indirect grading system is given below. Each course is evaluated by assigning marks with a letter grades (A+, A, B, C, D, E or F) to that course by method of indirect grading. E grade or 40% marks is required for a pass in each course.

% of Marks	Grade	Interpretation	Grade Point Average	Range of Grade Points	Class
90 and above	A+	Outstanding	6	5.5 – 6	First Class with Distinction
80 to below 90	A	Excellent	5	4.5 – 5.49	
70 to below 80	B	Very Good	4	3.5 – 4.49	First Class
60 to below 70	C	Good	3	2.5 – 3.49	
50 to below 60	D	Satisfactory	2	1.5 – 2.49	Second Class
40 to below 50	E	Pass/Adequate	1	0.5 – 1.49	Pass
Below 40	F	Failure	0	0 – 0.49	Failure

A student who fails to secure a minimum grade for a pass in a course is permitted to write the exam along next batch.

Course Evaluation

The evaluation Scheme for each course shall contain two parts. They are

1) External Evaluation

2) Internal Evaluation

External Evaluation

External Evaluation carries 80% of marks. External Evaluation of even semesters (2, 4, and 6) will be conducted in centralized valuation campus immediately after their Examination. Answer scripts of odd semester (1, 3 & 5) exam will be evaluated by home valuation. The theory Exam has duration of 3 hours.

Questions Pattern for Core Courses (Theory)

Question Type	Part A	Number of Questions	Marks	Total Marks
Objective	A	10 out of 10	1	10x1= 10
Short Answer	B	5 out of 7	2	5x2 = 10
Short Essay	C	6 out of 8	5	6x5 = 30
Essay	D	2 out of 4	15	15x2 = 30
Total Marks				**80**

Questions Pattern for Complimentary Courses (Theory)

Question Type	Part A	Number of Questions	Marks	Total Marks
Objective	A	10 out of 10	1	10x1= 10
Short Answer	B	7 out of 7	2	7x2 = 14
Short Essay	C	5 out of 8	4	5x4 = 20
Essay	D	2 out of 3	10	10x2 = 20
Total Marks				**64**

Questions Pattern for open Courses

Question Type	Part A	Number of Questions	Marks	Total Marks
Objective	A	5out of 5	1	5x1= 5
Short Answer	B	5 out of 5	2	5x2 = 10
Short Essay	C	3out of 5	5	3x5= 15
Essay	D	1out of 2	10	1x10= 10
Total Marks				**40**

Practical Examination

The external examination in practical courses shall be conducted by two examiners - one internal and an external, appointed by the University. The project evaluation can be conducted by external examiner only.

Technology of Food Preservation (FTL 3 B 06 P), Food Chemistry & Analytical Instrumentation (FTL 4 B 08 P) courses practical examination will be combined, the course code stands FTL 4 B 08 P(Credits 3) and conducted at the end of second year, similarly Cereals, Pulses and Oilseeds Technology (FTL 5 B 12 P) and Technology of Fruit , Vegetables, Spices & Plantation crops (FTL 6 B 18 P) courses practical examination will be

combined, the course code stands FTL 6 B 18 P(Credits 6) , Technology of Animal Foods FTL 6 B 20 P (Credits 6) and Analysis of Foods FTL6 B 19 (Credits 2)will be conducted at the end of third year including Project work / In Plant training evaluation (Credit 2).

Question Pattern of Practical Exam (Core)

Record	Procedure	Work done	Spot test	Viva-voce	Total
20	20	20x2	20	20	**120**

Question Pattern of Practical Exam (Complementary)

Record	Procedure	Work done	Spot test	Viva-voce	Total
5	14	10x2	10	15	**64**

Internal Evaluation

Internal evaluation will be of 20% in each course. The college has to send the marks obtained by the students in internal exam to the university by head of department through principal of the college. Internal assessment marks should be published in the department notice board. A grievance committee is constituted at department level to look in to the matter of any discrepancy.

The internal assessment shall be based on a pre-determined transparent system involving written test, assignments, seminars and attendance in respect of theory course and on tests/records/viva-voce/attendance in respect of practical course. Internal evaluation for project shall be based on content and Method of presentation.

Distribution of Marks for Theory (Core)

Attendance		**Test paper (1st & 2nd)**		**Seminar/Assignment/Viva**	
Above 90%	5 marks	Above 90%	10 marks	Excellent	5 marks
85 to 89%	4 marks	85 to 89%	9 marks	Very good	4 marks
80 to 84%	3 marks	80 to 84%	8 marks	Good	3 marks
76 to 79%	2 marks	70 to 79%	7 marks	Average	2 marks
75%	1 mark	60 to 69%	6 marks	Poor	1 mark
Maximum	**5 marks**	**Maximum**	**10 marks**	**Maximum**	**5 marks**

Distribution of Marks for Theory (Complementary)

Attendance		**Test paper (1st & 2nd)**		**Seminar/Assignment/Viva**	
Above 90%	3 marks	90 & > 90%	10 marks	Excellent	3marks
80 to 89%	2 marks	85 to 89%	9Marks	good	2 marks
75 to 80 %	1 mark	80 to 84	8 Marks	Average	1 mark
		70 to 79% 60 to 69%	7Marks 6 Marks		
Maximum	**3marks**	**Maximum**	**10 marks**	**Maximum**	**3 marks**

Distribution of Marks for Theory (Open)

Attendance		Test paper (1st & 2nd)		Seminar/Assignment/Viva	
Above 90%	2 marks	Above 90%	6 marks	Excellent	2 marks
85 to 89%	1.5 marks	85 to 89%	5 marks	Very good	1.5 marks
80 to 84%	1 marks	80 to 84%	4 marks	Good	1marks
76 to 79%	0 .5 marks	70 to 79%	3 marks	Average	0.5marks
75%	0.25 mark	60 to 69%	2 marks	Poor	0.25 mark
Maximum	**2 marks**	**Maximum**	**6 marks**	**Maximum**	**2 marks**

Distribution of Marks for Practical (Core)

Components	Maximum 30 Marks
Attendance	10
Lab performance	10
Viva-voce	10

Distribution of Marks for Practical (Complimentary)

Components	Maximum 16 Marks
Attendance	8
Lab performance	5
Viva-voce	3

Project work / in plant training

Students of B.Sc. Food Technology should undergo a project/ in plant training work for a period of 15 days during the sixth semester. The programme is arranged by the department of Food Technology in consultation with the food industries inside and outside Kerala. The purpose of the programme is to get hands-on experience on various aspects of food industries that form the strong foundation for the young food technologists. The department will allot students to the industry, in consultation with the industry concerned and based on merit of the students. The selected student should report for the programme on the stipulated date and attend the programme regularly without any lapse. On completion, each student should prepare a project / training report duly certified by the supervisor in the industry, a seminar should be conducted in the department. The bonafide project/ training report attested by the head of the department will be evaluated by the external examiner and a viva voce will be conducted. The scheme of the project report evaluation and viva-voce is as given below.

Project / In plant training /industrial Visit Total 50 Marks (External 40 Marks & Internal 10 Marks)

Components	External	Internal
Report	10 Marks	-
Presentation	20 Marks	5
Viva	10 Marks	-
Industrial Visit	-	5
Total	**40 Marks**	**10**

BSc Food Technology – Programme – Core Course structure, work load and credit distribution:

Course Code	Instructional Hours per week		Credits	Marks				Total
	Theory	Practical		Theory		Practical		
FTL 1 B 01 FTL 1 B 02 P	2	1	2+1=3	80	20	-	-	100
FTL 2 B 03 FTL 2 B 04 P	2	1	2+1=3	80	20	-	-	100
FTL 3 B 05 FTL 3 B 06 P	3	2	3	80	20	-	-	100
FTL 4 B 07	3	-	4	80	20	-	-	100
FTL 4 B 08 P	-	2	3	-	-	120	30	150
FTL 5 B 09	4	-	3	80	20	-	-	100
FTL 5 B 10	5	-	4	80	20	-	-	100
FTL 5 B 11	5	-	4	80	20	-	-	100
FTL 5 B 14	4	-	3	80	20	-	-	100
FTL 5 D 01 / 02 / 03	2	-	2	40	10	-	-	50
FTL 6 B 15 E	4	-	3	80	20	-	-	100
FTL 6 B 16	4	-	4	80	20	-	-	100
FTL 6 B 17	4	-	3	80	20	-	-	100
FTL 6 B 18 P		4	3+3=6			120	30	150
FTL 6 B 19 P	-	3	2	-	-	120	30	150
FTL 6 B 20 P		4	3+3=6			120	30	150
FTL 6 B 20 Pr	-	2	2	-	-	40	10	50
Total	**-**	**-**	**58**	**920**	**230**	**520**	**130**	**1800**

Semester I

Course code	Title of course	Hours per week	No. of credits	Total credits
A01	The four skills for Communication	4	3	
A11	Numerical Skill	5	4	
A12	General Informatics	5	4	
A03	Modern Prose & Dramma	5	3	
FTL 3 B 05	Technology of Food Preservation	3	3	15
MAL1A07 A07 AR1A07	Malayalam Bhasayum Sahithyamum 1 2.Communication Skill in Hindi 3.Communication Skill in Arabic	5	4	17
FTL 1 B 01	Perspectives of Food Science & Technology	2+1(P)	2+1=3	
PHY1C01	Properties of matter & Thermodyamics Complementary Practical	2 2	2 -	
CHE 1 C0 1 T CHE 1 C0 1 P	General chemistry Complementary Practical	2 2	2 -	

Semester II

Course code	Title of course	Hours per week	No. of credits	Total credits
A03	Inspiring Expression	4	4	
A04	Reading on society	5	4	
MAL2A08 A08 AR2A08	Malayalam Bhashayum Sahithyavum II Literature in Hindi Literature in Arabic	5	4	19
FTL 2 B 03	Food Microbiology I	2+1(P)	2+1=3	
PHY2C02	Mechanics, relativity, Weights & oscillation Complementary Practical	2 2	2 -	
CHE 2 C0 2 T CHE 2 C0 1 P	Physical chemistry Complementary Practical	2 2	2 -	

Semester III

FTL 3 B 06 (P)	Technology of Food Preservation	2	-	
PHY3C03	Optics,laser,electronics &communication	3	2	
	Complementary Practical	2	-	
CHE 3 C0 3 T	Organic chemistry	3	2	
CHE 3 C0 3 P	Complementary practical	2	-	3

Course code	Title of course	Hours per week	No. of credits	Total credits
FTL 5 B 09	Food Microbiology II	4	3	
FTL 5 B 10	Cereals, Pulses and Oil seeds Technology	5	4	
FTL 5 B 11	Technology of Animal Foods	5	4	16
FTL 5 B 12 P	Cereals, Pulses and Oil seeds Technology	4	-	
FTL 5 B 13 P	Food Microbiology II	1	-	
FTL 5 B 14	Dairy Technology	4	3	
FTL 5 D 01 / 02	01. Technology of Spices	2	2	

Semester IV

Course code	Title of course	Hours per week	No. of credits	Total credits
A13	Entrepreneurship Development Programme	5	4	27
A14	Nutrition & Health	5	4	
FTL 4 B 07	Food Chemistry & Analytical Instrumentation	3	4	
FTL 4 B 08 P	Food Chemistry & Analytical Instrumentation	2	3	
PHY4C04	Electricity, Magnetism & Nuclear physics	3	2	
PHY4C05	Complementary Practical	2	4	
CHE 4 C0 4 T	Physical & Applied chemistry	3	2	
CHE 4 C05 P	Complementary Practical	2	4	

Semester V

/ 03	02. Fruits and Vegetables Processing 03. Food & Health			

Semester VI

Complementary course

Course code	Title of course	No. of credits	Total credits
FTL1C01	Principles of Nutrition	2	12
FTL2C02	Food Chemistry	2	
FTL2 C03(P)	Food Chemistry P	-	
FTL 3 C 04	Principles of Food Science	2	
FTL3 C05(P)	Principles of Food Science P	-	
FTL 4C06	Food Preservation & Quality Control	2	
FTL4C07(P)	Food Science P	4	

Course code	Title of course	Hours per week	No. of credits	Total credits
FTL 6 B 15 E	Food Engineering	4	3	26
FTL 6 B 16	Food Safety, Regulations & Packaging	4	4	
FTL 6 B 17	Technology of Fruits ,Vegetables, Spices & Plantation Crops	4	3	
FTL 6 B 18 P	Technology of Fruits ,Vegetables, Spices & Plantation Crops	4	3+3=6	
FTL 6 B 19 P	Analysis of Foods	3	2	
FTL 6 B 20 P	Technology of Animal Foods	4	3+3=6	
FTL 6 B 21Pr	Project work	2	2	

B.Sc. Food Technology

FTL 1 B 01 Perspectives of Food Science & Technology (2 Credits)

SI No:	Topic	Course outline	Hrs
1	**Introduction**	Scope of food science and Technology. Functions of food. Nutrients, Water, Carbohydrates, Proteins, Lipids, Vitamins and Minerals.	5
2	**Composition and nutritive value**	Pulses & Legumes, Nuts & Oilseeds, Meat, Fish, Egg and Milk Structure and composition of wheat and Rice. Classification and Composition of Fruits,	14

		Vegetables and Spices.	
3	**Food Quality Assessment**	Sensory assessment-Appearance of food- visual perception, colour of foods, smell, flavour and taste. Threshold tests, difference tests, ranking test & hedonic scale	5
4	**Food Additives**	Presevatives, coluring agents, flavour and flavour enhancer, Anti-oxidants, Artificial sweeteners,stabilizers,thickening agents, anticaking agents, bleaching and maturing agents, flour improvers, leavening agents, surface active agents.	5
5	**Health foods**	Functional foods, Prebiotics, Probiotics, Neutraceuticals, organic foods, GM foods	2
6	**Food Research & Food Technology updates**	Major centres of food research in India –CFTRI, DFRL, NIFTEM, IICPT & CIFT. Major Food Industries in India. Journals of Food Science & Technology, Indian Food Industry, Beverage Food World, Indian Food Packer, AFST (I)	5

References

- Potter NN , Hotchkiss JH. Food Science. CBS publishers and distributers
- S. Manany, N S. Swamy Food Facts and Principles. New Age International Publishers
- Murano, Peter S. Understanding Food Science and Technology .Thomson
- Sumati R Mudambi , Rajagopal M V. Fundamentals of Food and Nutrition. New Age International Publishers
- Shubhangini A Joshi . Nutrition and Dietics. Tata McGraw Hill Education Private Limited
- Vijaya Khader. Text Book of Food Science and Technology. ICAR
- Swaminathan M. Food Science Chemistry and Experimental Foods. Bappco
- Journals:
  Indian Food Industry

	Food packer Journal of Food Science and Technology Beverage Food World

FTL 1 B 02 P Perspectives of Food Science and Technology (1 Credit)

SI No:	Practicals
1	Standardization of NaOH.
2	Standardization of HCl
3	Determination of Moisture using a) Hot air oven b) Distillation method c). Infrared method
4	Determination of Acidity & pH
5	Determination of T S S
6	Qualitative test for carbohydrates – Molisch's test, Benedict's test, Iodine test, Anthrone test, Selivanoff's test.
7	. Qualitative Test of Proteins
8	Practical Demonstration- Pilot / Industrial scale Food Production / Processing
9	**Industrial Visit I: Food Processing Unit.**

FTL 2 B 03 Food Microbiology – I (2 Credits)

SI No:	Topic	Course outline	Hrs
1	**Evolution**	History of Microbiology, - theory of spontaneous generation, Germ theory of disease, Koch's postulates, Pure culture concept.	5
2	**Microscopy**	Parts of microscope, Resolving power, Limits of resolution, Refractive index, Magnification. Light microscope – Bright field, Dark field. Electron microscope-Transmission Electron	6

		microscope, Scanning electron microscope.	
3	**Microorganisms** **a) Bacteria**	Structure, Morphology, Physical condition required for growth, growth curve. Reproduction – Binary fission, Transformation, Transduction and Conjugation. Nutritional requirements- Phototrophs, Chemotrophs, Autotrophs, Heterotrophs.	12
	b) Fungi	Morphology, Classification, Phycomycetes, Ascomycetes, Basidiomycetes.	5
	c) Yeasts	Structure, Morphology, Reproduction – Budding. Deutromycetes Reproduction-Sexual and Asexual	4
	d) Virus	Classification, Composition, Morphology, Replication of virus.	4

References

- Banwart G J ,1989. Basic Food Microbiology. AVI publishers
- Jay JM, Loessner MJ & Golden D A,2005. Modern Food Microbiology .Springer Verlag
- Ananthanarayanan R Jayaram Paniker CK ,2009 Text book of microbiology.University Press Pvt Ltd, Hyderabad
- Prescott, L.M, Harley, J.P and Klein, D.A Microbiology . McGraw Hill New York
- Frazier J& Westhoff DC,1988. Food Microbiology. McGraw Hill, New York.
- Pelczar JM & Reid RD . Microbiology. Tata McGraw Hill
- Stainer R. General Microbiology. MacMillan
- Black, JG. Microbiology .Principles and Explorations John Wiley

FTL 2 B 04 P Food Microbiology I (1Credit)

SI No:	Practicals
1	Introduction to equipments and glassware used in microbiology

2	Sterilization techniques: Dry heat and moist heat
3	Staining techniques – simple staining, gram staining

FTL 3 B 05 Technology of Food Preservation (3 Credits)

SI No:	Topic	Course outline	Hrs
1	**Thermal Processing**	Principles and application–Blanching, Pasteurization, Sterilization, Ultra high temperature sterilization, Aseptic processing.	5
2	**Drying**	Significance: Natural drying- Sun and Solar drying, Artificial drying- Hot air drying, Drum	10

		drying, Spray drying, Dehydrofreezing, Freeze drying, Drying pre-treatments – blanching & sulphuring.	
3	**Low Temperature Processing**	**Refrigeration**, Low temperature preservation of Fresh Fruits, Vegetables, Meat & Fish products. Chilling injury.	5
		Freezing, Principle, Freezing rate, Quick freezing, Slow freezing, Types of freezers- Air blast, Contact, Immersion,Fluidized bed and Cryogenic freezers.	8
		Quality of frozen foods- Retrogradation, Protein denaturation, Freezer burn.	
4	**Irradiation**	Source of ionization irradiation, Dose and Dosimetry, Mode of action, Scope of irradiation.	5
5	**Fermentation**	Principles, Significance, Types of fermentation- Acetic, Lactic and Alcoholic.	6
6	**Chemical Preservation**	Natural preservatives-Mode of action. Chemical Preservatives - Sulphur dioxide, Benzoic acid, Sorbic acid, Propionic acid, Acetic acid.	7
7	**Recent Trends**	Food preservation applications– Pulsed electric fields, High pressure technology, Ohmic heating, Microwave heating, Ultrasonics, Nanotechnology, Hurdle technology.	6
8	**New Product Development**	Food needs, consumer preference and Market survey, Steps in new product development.	2

FTL 3 B 06 P Technology of Food Preservation

SI No:	**Practicals**
1	Qualitative determination of SO2
2	Qualitative determination of benzoic acid
3	Sensory evaluation
4	Dehydration of fruits in sugar syrup

5	Drying Kinetics of vegetables using cabinet drier
6	Determination of moisture content
7	**Industrial Visit II: Well established Food Processing Unit.**

References

- Fennema Owen R. Princi[les of food Science. Marcel Dekkar, Inc
- Murano, Peter S. Understanding Food Science and Technology .Thomson
- Khader, Vijaya Textbook on Food Storage and Preservation Kalyani Publishers
- Pruthi JS Quick Freezing Preservation of Foods Allied publishers Limited
- Potter N N.& Hotchkiss 1997 Food Science CBS Publishers
- Desrosier NW James N,1977 Technology of Food Preservation CBS Publishers
- Arti Sanhla Food Preservation. Principles and practices
- Manay,N.S,Shadaksharaswamy,M.,Foods:New Age international (P) publishers, New Delhi 2004
- Shafiur Rahman M., 1999, Hand book of food preservation. Marcel Dekker, Inc, New York.
- Subbulakshmi G and Udippi S.A Food Processing and PreservstionI Foods:New Age international (P) publishers, New Delhi 2001

FTL 4 B 07 Food Chemistry & Analytical Instrumentation (4 Credits)

SI No:	Topic	Course outline	Hrs
1	**Carbohydrates**	Classification , properties and reactions of 1) Monosaccharides:Glucose& Fructose 2)Oligosaccharides : Maltose, lactose. Sucrose-properties- crystallization and inversion. 3) Polysaccharides:starch : components of starch, gelatization, retrogradation, modified starch.Cellulose, hemicellulose, pectic substances, gums, dietary fibre	8

2	**Proteins**	Introduction to food protein, structure of protein, classification of proteins, amino acids, physicochemical properties, denaturation, reactions, protein determination	6
3	**Lipids**	Classification, fatty acids, saturated, unsaturated, polyunsaturated fatty acids, chemical properties, reactions, rancidity, auto-oxidation, antioxidants.	6
4	**Water**	Introduction, physical & chemical properties of water, moisture in foods, methods of moisture determination,hydrogen bonding, Free & bound water	6
6	**Pigments**	Properties and Occurrence: Chlorophyll, Carotenoids,.Flavanoids,Anthocyanins,Anthoxanthins , Myoglobin.	6
7	**Enzymes**	Introduction,Definition,Occurrence, Classification. Properties of Enzymes- Specificity, Factors affecting enzyme activity. Enzymes in food Industry.	8
8	**Colloids**	Colloidal chemistry, Properties of solutions, Sols & Suspensions, Food colloids.	4
9	**Emulsions**	Emulsion, Types, Emulsifying Agents	2
10	**Instrumentation Colorimetry**	Principles, Beer – Lambert's Law, Techniques and Instrumentation. Flurimetry.	6
11	**Spectrophotometry**	Principles, Instrumentation, Parts of Spectrophotometers.Atomic Absorption spectrophotometry	6
12	**Chromatography**	Classification- Adsorption chromatography, Partition chromatography, Ion exchange.Paper chromatography, Column chromatography, Thin layer chromatography, Gas chromatography, High Pressure Liquid Chromatography. GCMS	10

References

- Ranganna S 2001.Hand book of analysis and quality control of fruits and vegetable

products Tata- McGraw- Hill. .
- Meyer, L.H 1987 Food Chemistry CBS publishers.
- Belitz, H.D 1999 Food Chemistry Springer Verlag
- Fennema,OR. 1996 Food Chemistry Marcel Dekker
- Nielson S 1994 Introduction to Chemical Analysis of Foods Jones & Bartlett
- Pomrenz Y& Meloan CE 1996 Food Analysis Theory and Practice CBS
- Manay,N.S,Shadaksharaswamy,M.,Foods:Facts andPrinciples New Age International Publishers
- Miller, Dennis D. Food Chemistry John Wiley and sons
- Wong, Dominic W.S Mechanism and Theory in Food Chemistry. CBS publishers.
- Sharma B.K. 2004, Instrumental Methods of Chemical Analysis. Goel Publishing House, New Delhi.

FTL 4 B 08 P Food Chemistry & Analytical Instrumentation (3 Credits)

SI No:	Practicals
1	**Chemical Analysis of Lipids** a) Determination of Iodine value b) Determination of saponification value c) Determination of peroxide value

	d) Determination of Free Fatty Acid
2	**Analysis of Protein** Kjeldahl's methods
3	**Analysis of Water** Total solids, Acidity of water, Alkalinity of water, Determination of Chloride, Hardness of water.
4	Paper chromatography
5	Ash content

FTL 5 B 09 Food Microbiology II (3 Credits)

SI No:	Topic	Course outline	Hrs
1	**Culture Media**	Bacteriological Media – Selective, Differential, Enrichment Media.	4
2	**Methods of isolating Pure culture**	Serial dilution, Pour plate, streak plate, stroke Culture.	4

3	**Control of Microorganism**	Physical agents – high temperature, low temperature, desiccation, osmotic pressure radiation, filtration. Chemical agents-Characteristics of an ideal antimicrobial chemical agent, Alcohols, Aldehydes, Dyes, Halogens, Phenols, Acids, Alkalis, Gases.	8
4	**Food spoilage**	**Food spoilage:** Sources of contamination, factors responsible for spoilage, factors affecting kinds and number of microorganisms in food. Chemical changes due to spoilage.	8
5	**Effect of spoilage**	Contamination and spoilage of Fruits and Vegetables, Meat & Meat products, Milk & Cream, Cereal & Cereal products, Spoilage of canned food.	8
6	**Microbial intoxications & Infections**	Definition, Exotoxin, Endotoxin, intoxications and infections – sources, symptoms Methods of Prevention and investigation of food borne disease outbreak.	8
7	**Microbes in fermented foods**	Fermented vegetable products, Sauer Kraut, pickles, soy sauces, idli Fermented dairy products – Cheese, yoghurt	8
8	**Water & Milk testing**	Microbiological testing of water & milk	6

References

- Banwart GJ ,1989. Basic Food Microbiology. AVI publishers
- Jay JM, Loessner MJ & Golden D A 2005. Modern Food Microbiology .Springer Verlag
- Ananthanarayanan R Jayaram Paniker CK 2009 Text book of microbiology.University Press Pvt Ltd, Hyderabad
- Prescott, L.M, Harley, J.P and Klein, D.A Microbiology . McGraw Hill New York
- Frazier J& Westhoff DC . 1988. Food Microbiology. McGraw Hill, New York.
- Pelczar JM & Reid RD . Microbiology. Tata McGraw Hill

- Black, JG. Microbiology .Principles and Explorations John Wiley

FTL 5 B 13 P Food Microbiology II

SI No:	Practicals
1	Isolation of pure culture: Pourplate, Streak plate
2	Microbial analysis of meats – Total plate count – *Staphylococcus*
3	Microbial analysis of Milk- Total plate count, Spices-Yeast and Mold,TPC
4	Microbial analysis of water – Coliforms

FTL 5 B 10 Cereals, Pulses and Oil seeds Technology (4 Credits)

SI No:	Topic	Course outline	Hrs
1	**Technology of Wheat and Rice**	**Wheat** Milling of wheat, by-products – Whole wheat flour, Maida, semolina, Gluten. **Rice** Milling of rice, by-products of rice milling – Husk, Bran, Broken rice Parboiling- Merits and demerits, Curing, Aging of rice, Rice	22

		products – Flaked rice, Puffed rice. **Technology of Oats and Barley**	
2	**Bakery and confectionary**	**Baking** Principles of baking, classification of baked foods. **Bread:** Bread making –Role of ingredients, Bread faults & remedies, staling of bread. **Cake:** Cake making, Role of ingredients, Types of making, cake faults and remedies. **Biscuit:** Biscuits & Cookies, Crackers and Wafers, technology of Biscuits, faults & Remedies. **Confectionary:** Raw materials, Hard candy, Toffee, Caramel.	4 10 10 8
3	**Millets**	Pearl millet, Finger millet	5
4	**Pulses**	Processing- Soaking, Germination, Decortication, Cooking and Fermentation. Changes during germination, Antinutritional factors, Factors affecting cooking time.	5
5	**Nuts & Oil seeds**	Sources, Composition, Processing of oil seeds – Soya bean, coconut. Hydrogenation. Refining of fats & oils, bleaching, de-odourising, hydroxylation, shortening, margarine. Protein isolates, Texturised vegetable protein	8

References

- Hui, Y.H, Bakery products, Science and Technology , Black Well publishing, 2006
- Matz S.A; Bakery Technology and Engineering; 3 edn, CBS Publishers and distributers
- Faridi H, The science of cookie and cracker production; CBS Publishers and distributers
- Dendy D A V & Dobraszczyk BJ Cereals and cereal products, Aspen

- Kent NL 1983Technology of cereals Pergamon press
- E J Pyler. Bakery science Technology. Vol I, II. Sosland Publications.
- Manley D. 2000. Technology of Biscuits, Crackers and Cookies. CRC press.
- Faridi H. Science of Cookie & Cracker Production
- S. Manany, N S. Swamy Food Facts and Principles. New Age International Publishers
- Srivastava RP & Kumar S .2003 Fruit and Vegetable preservation Principles and Practices. Interntional Book Distributors
- Srilakshmi B. Food Science . New Age International Publishers
- Sahay KM &. Singh KK, 1994. Unit operations of Agricultural processing Vikas Publishing House
- Vijaya khader.Text book of Food Science and Technology. ICAR

FTL 5 B 11 Technology of Animal Foods (4 Credits)

SI No:	Topic	Course outline	Hrs
1	**Slaughter and Inspection of Meat**	Humane method, Inspection of meat- Ante mortem and post-mortem inspection. Slaughter of sheep, pigs, poultry. Post mortem changes, ageing. Structure of meat,	26

		Factors affecting tenderness of meat, Effect of cooking on texture, colour and flavour.	
2	**Cured Meat**	Role of ingredients, Methods of curing, Processing of Ham, Bacon. Sausage - classification, emulsion, ground sausage, processing, casings, Factors affecting quality of cured meat.	10
3	**Preservation**	Refrigeration, freezing, thermal processing, dehydration, irradiation, chemical, antibiotics.	6
4	**By products**	Rendering, Feeds, Hides, Skins, Hoofs, Horns.	6
5	**Egg**	Grading, Changes during storage. Egg quality- Factors affecting egg quality, Measures of egg quality, Effect of cooking, Factors affecting coagulation, Industrial use of egg. **Preservation of egg** Refrigeration, Freezing, Thermal processing, Dehydration, Coating.	12
6	**Fish & Fish Products**	Introduction, Spoilage indices **Preservation** Cold storage, freezing, smoking, pickling, canning of fish, Drying **Fish products** Fish protein concentrate, Fish oils- Body oil, Liver oil, Fish meal, Fish Ensilage, Chitosan, pearl Essence, Glue, Gelatin.	12

References

- Gracey JF Collins DS Meat Hygiene ELBS
- Person AM Gillet T A Processed Meats. CBS publishers
- Lawrie R A Lawries Meat Science Tata McGrawHhill
- Mountney T. Carmen G Prakhurst R Poultry Products Technology CBS Publishers
- Ockerman H W Hancen C L Animal Byproduct Processing Elis Horwood
- Gopakumar K Tropical Fishery Products Oxford
- Jhingran VG Fish & Fisheries of India Hindustan Publishing Company
- Biswas KP A Text Book of Fish and Fisheries Technology Tata McGraw hill
- Stadelman, William J.. .Egg Science and Technology. CBS.
- Parkhurst, Carmen R .Poultry Meat and Egg Production.CBS

FTL 5 B 12 P Cereals, Pulses & Oil Seeds Technology

SI No:	Practicals
1	Determination of Moisture
2	Determination of Ash
3	Sedimentation value
4	Determination alcoholic acidity
5	Estimation of Gluten
6	Determination of Water absorption power
7	Qualitative analysis of gluten – Belshanke value
8	Determination of falling number
9	Preparation of Bread
10	Preparation of Biscuit
11	Preparation of Cake
12	Determination of Physical parameters of wheat and rice
13	**Industrial Visit III: Food research laboratory.**

FTL 5 B 14 Dairy Technology (3 Credits)

SI No:	Topic	Course outline	Hrs
1	**Composition**	Composition of milk from various sources, factors affecting composition of milk.	6
2	**Properties**	Physical and Chemical properties- Flavour, Colour, acidity, viscosity, Specific gravity,	7

		Freezing point, Boiling point, Effect of- heat, enzymes, acids and alkali.	
3	**Types of Milk**	Toned, Double toned milk, Standardized milk, Homogenized milk, and Recombined milk.	6
4	**Processing of Milk**	Processing, distribution and storage of liquid milk.	4
5	**Dairy Products**		
	a) Cream and Butter	Composition, Processing and Technology.	4
	b) Ice cream	Technology of Ice cream: Ingredients, formulations, Freezing, Hardening, Storage, Distribution and defects. Frozen dessert.	5
	c) Cheese	Introduction, Classification of cheese. Processing of cheese: Cottage and Cheddar.	5
	d) Fermented milk Products	Curd, yoghurt, Acidophilus milk, Kefir, koumiss, Probiotic	4
	e) Milk powder	Whole and skim milk powders, Instant milk powder.	6
6	**Technology of Dairy by-products**	Whey protein products.	1
7	**Dairy plant sanitation**	Objectives, CIP, Sanitizers.	6

References

- Sukumar D E. Outlines of Dairy Technology, Oxford University Press.
- Johnson, Webb .Fundamentals of Dairy Chemistry.CBS Publishers and Distributers
- Eckles, Clarence, Henry Milk and Milk Products, Tata MCGraw Hill publishers
- Kurmann, Joseph A. Encyclopedia of Fermented Fresh Milk Products, CBS Publishers and Distributers
- Atherton, Henry V. Chemistry and Testing of Dairy Products CBS Publishers and

Distributers

- Johnson, Webb Fundamentals of Dairy Chemistry CBS Publishers
- Ananthakrishnan C P, Khan A Q, Padmanabhan P N. Technology of Milk Processing. Srilakshmi Publishers.
- Walstra P, Geurts T. Dairy Technology. Marcel Dekker
- Edgar Spreer. Milk and dairy product technology. Marcel Dekker

FTL 6 B 15 E Food Engineering (3 Credits)

SI No:	Topic	Course outline	Hrs
1	**Unit operations & Heat transfer**	Mode of heat transfer– Conduction, Convection, Radiation.	6

2	**Heat exchanger**	Classification, contact type heat exchange - Immersion, Non-contact type heat exchanger, Plate Heat exchanger, Scraped surface Heat exchanger, Tubular Heat exchanger, Double & Triple tube Heat exchanger, Shell & Tube Heat exchanger. **Pasteurization:** LTLT, HTST, UHT, Pasteurizing equipments.	20
3	**Refrigeration & Freezing**	**Refrigeration** Principle of refrigeration, Vapour compression refrigeration cycle. **Freezing** Principle of freezing & freezing rate.	6
4	**Evaporation**	Principle, single effect evaporation, multiple effect evaporation. Types of evaporators - Horizontal tube, Vertical tube, Falling film evaporator, Raising film Evaporator.	8
5	**Driers & Boilers**	**Driers** Principle , constant rate & falling rate of period of drying. Types of driers -Drum drier, Cabinet drier, Tunnel drier, Spray drier, Fluidized bed drier. **Boiler-** Principle, working of water tube & fire tube boiler.	8
6	**Rheology**	Definition, Rheological characteristics of foods, viscosity, apparent viscosity- Newtonian and Non Newtonian.	6

References

- Rao D G. Fundamentals of Food Engineering. PHI learning private limited
- Sahay KM &. Singh KK, 1994. Unit operations of Agricultural processing Vikas Publishing House
- R S Khurmi & J K Gupta, A Textbook of Refrigeration & Air conditioning, S Chand
- Singh RP, Heldman DR1993 Introduction to Food Engineering Academic Press

- Romeo. Toledo T Fundamentals Food Process Engineering CBSPublishers
- Charm SE,Macabe, WL Smith JC & Hariot P 1993. Unit Operations of Chemical Engineering. McGraw Hills.

FTL 6 B 16 Food Safety, Regulations and Packaging (4 Credits)

SI No:	Topic	Course outline	Hrs
1	**Food Safety & Hygiene**	Importance of Food Safety, Food Hygiene, High risk food, Low risk food, Danger Zone, Personal hygiene.	5

2	**Food Safety and Quality Management**	GHP, GMP, SOP, HACCP(Food contaminants- Physical, Chemical, Biological and Allergens), ISO 22000, ISO 9001, Codex Alimentarius Commission (Codex), FAO	15
3	**Traceability & Recalling**	Objectives and Applications	3
4	**Food Plant Sanitation**	Structural requirements, SSOP, CIP, Chlorination, Detergents, Disinfectants and Sanitizers,	6
5	**Food Laws & Regulations**	Food Safety and Standards Act, FDA, Evolution in Food laws and regulations- PFA, FPO, AGMARK, BIS,	10
6	**Food Adulteration**	Common Food adulterants and their tests: Milk, Vegetable oil, Spices, Tea, Pulses, Sugar, Honey.	10
7	**Food Sampling**	Objectives, Sample collection, Sampling tools, Sampling procedure, Analysis.	8
8	**Packaging Technology**	Package evolution, Functions and design of different types of packaging materials – Metal, Glass, Paper, Plastic, Retortable Pouches, CAP, MAP, Smart, active, Aseptic, Biodegradable, Edible packages.	15

References

- Mathlouthi, M Food Packaging and Preservation . Aspen
- Richard A Sprenger, Hygiene for Management, Highfield.
- Larousse, Jean Food Canning Technology Wiley-VCH
- Mahadeviah M & Gowramma RV 1996 Food Packaging Materials. Tata McGraw Hill

- Painy FA.1992 A Hand Book of Food Packaging. Blackie Academic
- Stanley S & Roger CG 1970 FoodPackaging AVIPubl
- Srinivasa Gopal TK Sea Food Packaging CIFT.Cochin
- Robertson, Gordon L. Food Packaging Marcel Dekker Inc.
- Gupta, Ajay KR Handbook on Modern Packaging Industries Asia Pacific Business Press Inc.
- Hand book of Packaging Technology. Engineering India Research Institute.

FTL 6 B 17 Technology of Fruits, Vegetables, Spices & Plantation Crops
(3 Credits)

SI No:	Topic	Course outline	Hrs
1	**Post harvest management**	Maturity indices, Ripening, Changes during ripening-Climacteric & Non-Climacteric, storage-Controlled Atmospheric & Modified	4

		Atmospheric Storage	
2	**Pectin , Jam, Jelly and Marmalade**	Pectin Definition of pectin, classification, Pectic enzymes, Properties, jelly grade of pectin, Testing of pectin. Jam, Jelly and Marmalade Definition, jam making, jelly making, Defects.	6
3	**Fruits juices & Fruit preparations**	**Fruit Juices** Ready to serve beverages, Squashes Cordials, Nectars, Concentrates Fruit juice powder- Freeze drying, Foam mat drying. **Fruit preparations** Preserves, Candies Crystallized fruits & Glazed fruits. **Pickle and chutneys** - Action of preservatives Pickling process, defects.	8
3	**Tomato products**	Tomato juice, puree, paste& Ketchup specification of the above products.	6
4	**Canning**	**Classification of canning of fruits**- Pineapple, Oranges, Canning of vegetables - Peas, Carrots, syrups & brines for canning.	6
5	**Drying & Dehydration**	Enzyme Inactivation, Sulphuring Sun drying - grapes and dates. Dehydration of vegetables and Fruits. Tunnel & cabinet drier	2
6	**Browning**	Enzyme activity, enzymatic browning Non enzymatic browning, its prevention.	2
7	**Spices**	Definition, classification, chemical composition, uses of spices.	4
8	**Major Spices**	Refining and processing of pepper. Pepper products – white pepper, dehydrated green pepper. Processing of Turmeric,Ginger,Chillies and Cardamom. Spice oils & oleoresins.	8
9	**Tea, coffee & Cocoa**	Chemical composition, processing & grading	8

FTL 6 B 18 P Technology of Fruits, Vegetables, Spices & Plantation Crops
(3+3=6 Credits)

SI	Practicals

No:	
1	Determination of Sulphur dioxide
2	Estimation of Vitamin C
3	Estimation of tannin – colori metric method
4	Estimation of alcohol content
5	Determination of salt content in pickles
6	Determination of reducing sugar
7	Lye peeling
8	Adequacy of blanching
9	Preparation of ketchup
10	Preparation of Jam & Jelly
11	Preparation of squash

References

- Pandey PH Principle of Practices of post harvest Technology Kalyani publication
- Cruess WV., 1997. Commercial fruit and vegetables Products. Anees offset press, New delhi.
- Lal,G Siddappa S and Tandon GL. Presrvation of fruit and vegetables. ICAR
- Thompson AK 1995 Post harvest Technology of Fruits and Vegetables Black well Sci
- Verma LR& Joshi V.K .,2000 Post Harvest Technology of Fruits & Vegetables. Indus Publ
- Potter NN , Hotchkiss JH. Food Science. CBS Publishers
- Manany S, N S. Swamy Food Facts and Principles. New Age International Publishers
- Srivastava RP & Kumar S .2003 Fruit and Vegetable preservation Principles and Practices. Interntional Book Distributor

FT 6 B 19 P Analysis of Foods (2 Credits)

SI No:	Practicals
1	Determination of reducing sugar, total reducing sugar in honey/ jaggery / sugar (Lane & Eynone Method).
2	Determination of Fructose: glucose ratio in honey (Iodiometry).

3	Determination of Gum Base Content in Bubble gum/ chewing gum/ Cocoa butter (soxhlet extraction method)
4	Detection and identification of synthetic food colours (Paper chromatographic method/ TLC)
5	Determination of Fat content in cocoa butter
6	Determination of acidity of extracted fat in cashewnuts / biscuts (Soxhlet extraction method)
7	Estimation of crude fibre in fruits
8	Estimation of starch content in vegetables
9	Estimation of Protein (Colorimetric method) content in food
10	Estimation of invert sugar in Jaggery / Honey
11	Test for chicory in coffee
12	Determination of Peroxidase enzyme
13	Rehydration ratio of dried foods

References

- Ranganna S 2001.Hand book of analysis and quality control of fruits and vegetable products Tata- McGraw- Hill. .
- Nielson S 1994 Introduction to Chemical Analysis of Foods Jones & Bartlett
- Pomrenz Y& Meloan CE 1996 Food Analysis Theory and Practice CBS
- Food Safety Standard authority of India site manual

FTL 6 B 20 P Technology of Animal Foods (3+3=6 Credits)

SI No:	Practicals
1	Acidity of Milk & curd
2	Fat content in Milk
3	Determination of total solids, SNF and specific gravity of milk

4	Determination of Total ash in milk
5	Acidity of butter
6	Moisture content of butter
7	Salt content in butter
8	Adulteration in milk
9	Preparation of Khoa, Peda
10	Moisture content in Ghee
11	FFA of Ghee
12	Internal & External quality of egg
13	Proximate composition of Meat & Fish

Open course

FTL 5 D 01 Technology of Spices (2 Credits)

SI No:	Topic	Course outline	Hrs
1	**Spices, Spice oils & Oleoresin**	Definition, Classification, Chemical composition,Use of Spices. Spice oil and Oleoresins—Definition,	8

		Technology of Manufacturing	
2	**Major Spices: Pepper**	Refining and processing of pepper Pepper products:- White pepper, dehydrated green pepper, Pepper oil, Oleoresin.	8
	Chillies	Drying of chillies, quality attributes of chillies and paprika	5
	Cardamom	Composition, Drying of fruits, Bleaching, Grading, Cardamom products, Essential oil and oleoresins	5
	Ginger	Curing, Bleaching, Grading Ginger Products, Ginger oils, Ginger oleoresin, Dehydrated Ginger, Bleached Ginger	5
	Turmeric	Curing, Grading, Turmeric powder, Essential oil, oleoresin	5

References

- Major spices of India J S Pruthi
- Quality assurance in spices and spice products J S Pruthi

FTL 5 D 02 Fruits and Vegetables Processing (2 Credits)

SI No:	Topic	Course outline	Hrs
1	**Fruits and Vegetables**	Definition, Composition, Classification, Nutritive value, changes during ripening. Flavors of Fruits and Vegetables. Vegetable cookery, changes during cooking Browning and its prevention	12

2	**Preservation of Fruits and Vegetables**	Heat, Salt, Sugar, Freezing , Food additives and Preservatives.	6
3	**Fruit and Vegetable Products**	Fruit Juice, Squashes, Cordials, Nectar, Concentrates, Fruit juice Powder, Jam, Jelly. Different types of Pickles and Chutneys. Product Specification	12
4	**Tomato Products**	Tomato juice, Puree, Paste, Ketchup	6

References

- Commercial Fruits and Vegetable Products: WVCruess
- Preservation of Fruits & Vegetables: Girdharilal, G S Siddappa, & G LTandon.
- Fruit and Vegetable Preservation and Practice: Kumar Sanjeev & RPSrivastava.
- Fruit and Vegetable Processing: Suman Bhatti.
- Food Science: Norman. N. Potter, Joseph H Hotchkis.

FTL 5 D 03 Food & Health (2 credits)

SI No:	Topic	Course outline	Hrs
1	**Introduction to Food**	Definition, Types and classification of Food- junk food, functional food, Nutritional composition of Food-Carbohydrate, Protein, Fat, Water, Mineral, Vitamins, Food Groups. Sources of Food - carbohydrate, protein, fat. Recommended daily	10

		allowance of nutrients. Types of work and energy requirements. Body Mass Index	
2	**Life style and Food related diseases**	Obesity, Diabetics , cardio vascular Disease, constipation, Intolerance-Lactose & Gluten, Chinese syndrome	8
3	**Food Additives**	Definition, importance in food preparation, functions of Food additives -anti-oxidants, preservatives, coluring agent, flavours, and emulsifiers.	6
4	**Food Adulteration**	Definition, common adulterants found in food.	6
5	**Food allergens and food poison**	Common food allergens. Food poisoning, symptoms and control ,*Botulism, Staphylococcus, E.coli and salmonella*	6

References

- Swaminathan,M.Essential of Food & Nutrition,1974.Bappco,Bangalore
- Jussawalla,JM.Natural Dietics,A hand book on Food,Nutrion and Health.Wikas publishing house
- Sumati R Mudambi,Rajogopal,M.V.Fundamentals Food,nutrition & Diet Therapy,1982.New Age PLtd.
- Education planning group.Food & Nutrition,1980.Arya publishing group, New Delhi
- National Institute of Nutrition, Food & Health,I.C.M.R,Hydrabad
- Yashpal Bedi,Hygeine and public health,Atmaram & Sons,New Delhi
- V.N.Bhave and et.al,You and your Health,1969.National Book Trust,India

A 014 Nutrition and Health (4 credits)

Unit	Topic	Course outline	Hrs
1	**Concept of Health**	Definition of physical health, mental health, social health, spiritual health-determinants of health, indication of health	4
2	**Concept of Nutrition**	Definition of terms: Nutrition, under nutrition,	6

		Malnutrition, Health & Nutritional status – adequate, optimum & good nutrition. Relation of good nutrition to normal physical development & sound health	
3	**Energy**	Definition of Caloric & Joule.Measurement of calorific values of food, basal metabolism, specific dynamic action of foods, energy needs of body, measurement of energy balance of body	6
4	**Food Guide**	Nutrients supplied by foods. Basic food groups	4
5	**Carbohydrates**	Sources, Classification, digestion, absorption, transportation & utilization, functions, sources, requirements and effect of deficiency. Dietry Fibre- Definition, classification, sources, role of fibre in human nutrition	10
6	**Proteins**	Classification, digestion absorption, transportation & utilization, functions, sources & requirements. Essential aminoacids, evaluation of protein quality, supplementation and deficiency.	10
7	**Lipids**	Classification, saturated and unsaturated fatty acids, digestion, absorption, transportation & utilization, functions, sources & requirements and effect of deficiency	10
8	**Minerals**	Functions, sources, absorption and factors affecting the utilization of Calcium, Phosphorus, Iron, Iodine, Copper and Flouride, effects of deficiency	6
9	**Vitamins**	Classification, functions, sources, factors affecting destruction, factors enhancing vitamins in foods, absorption, requirements & deficiency conditions – Vit A, D, E, K, Ascorbic acid, Thiamine, Riboflavin, Niacin, Pyridoxine, Folic acid, Pantothenic acid	8
10	**Water**	Importance, distribution in body, function sources, requirements, water balance	6

References

1. Essential of food & Nutrition –Vol. 1 M. Swaminathan,Bappco,Bangalore.
2. Human Nutrition and Dietetics –Davidson S. Passmore
3. Normal and Therapeutic Nutrition- Corinne .H.Robinson & Marilyn Lawler
4. Contemporary Nutrition - Gordon M. Wardlaw, Paul Insel et, al., (2000) Mosby,Chicago.
5. Nutrition- concepts and controversies- Eleanor Whitney –Eighth Edition (2000)
6. Basic principles of Nutrition- Seema Yadav, First edition (1997)
7. Essentials of Nutrition and Diet therapy -Sue Rodwell Williams, fifth edition, Times Mirror Mosby College Publishing, 1990.
8. Understanding Nutrition -Whitney P.N. and Roes S.R., West Publication Co, 1996.
9. Swaminathan,M.Essential of Food & Nutrition,1974.Bappco,Bangalore.
10. Jussawalla,JM.Natural Dietics,A hand book on Food,Nutrion and Health.Wikas publishing house.
11. Sumati R Mudambi,Rajogopal,M.V.Fundamentals Food,nutrition & Diet Therapy,1982.New Age PLtd.
12. Education planning group.Food & Nutrition,1980.Arya publishing group, New Delhi
13. National Institute of Nutrition, Food & Health,I.C.M.R,Hydrabad

MODEL QUESTION PAPERS
FTL 1 B 01 Perspectives of Food Science & Technology

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10**

Multiple Choice

1. Glucose belongs to

[a) Monosaccharide, b. Disaccharide, c. Oligosaccharide, d. Polysaccharide]

2. GM foods means
   [a) General Main Foods, b. General Major Foods, c. General Modified Foods, d. Genetically modified foods]
3. Which is not a major spice
   [a. Ginger, b. Turmeric, c. Pepper d. Cumin)
4. Average weight of an egg is (a. 50g b.100g c.150g d. 200g)

Name the following

5. Proteins are made up of
6. Name one anti -oxidant
7. Expand IICPT.
8. The linkage between two amino acids in a protein

Fill in the blanks

9. CIFT stands for _____
10. pH of water is _____

PART B

Answer Any Five questions **5x2 = 10**

11. What are amino acids? Give example
12. What you mean by organic foods?
13. Write the importance of pulses in nutrition
14. Classify spices.
15. Name any four oil seeds
16. Give two flavour enhancer?
17. Define Anti-Oxidant?

PART C

Answer any Six questions **6X5 = 30 Marks**

18. What are GM Foods? What is its importance?
19. Write a note on structure of Rice Kernel
20. Outline the importance of fish in human nutrition
21. Write a note on Carbohydrates.
22. Write a note on anti-nutritional factors
23. Write a short note on health foods?
24. Composition of Egg
25. Discuss in detail about food research centres CFTRI & DFRL

PART D

Answer any two of the following **2x15 = 30 Marks**

26. . Write the Classification of Fruits. Write the importance of Fruits and vegetables in human nutrition.
27. Briefly explain the structure of meat? What is the nutritional significance?
28. Explain the term health foods.
29. Explain the structure of Egg with the help of a neat diagram.

FTL 2 B 03 Food Microbiology – I

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

Multiple Choice

1. Pure culture concept was first introduced by
   [a) Pastuer, b) Koch, c) Fleming, d) Jenner]

2. Agar solidifies at

[a). 30^{0}C b). 0^{0}C c) 45^{0}C d) 100^{0}C]

3. Rod shaped bacteria are called

[a) *Bacilli b)Cocci*, c) *Vibrio d) spiral*

4. The body of fungi is known as

[a) filament b). thallus c). spore d). conidia]

Name the following

5. Who is the father of microbiology?
6. Method of reproduction in Yeast.
7. Who disproved the spontaneous generation theory?
8. Name an anaerobic bacteria

Fill in the blanks

9. Sexual spore of ascomycetes is ----------
10. Virus that infect bacteria is ----------

PART B

Answer any Five questions **5x2 = 10 Marks**

11. What is fungi imperfecti?
12. What you mean by resolving power of a microscope?
13. What is autotroph?
14. What are Koch's postulate?
15. Write Germ theory of disease
16. Classify bacteria based on temperature.
17. Define water activity

PART C

Answer any Six questions **6X5 = 30 Marks**

18. Differentiate Transformation and Transduction
19. Briefly write on parts of a microscope.
20. Differentiate Prokaryotes and eukaryotes
21. What are contributions of Pasteur?
22. Explain Growth Curve.
23. Write a note Morphology of Virus.
24. Differentiate Bright field and dark field microscopy.
25. Classify fungi.

PART D

Answer any two of the following **2x15 = 30 Marks**

26. What are the characteristic features of viruses? Differentiate lytic & lysogenic cycle in virus
27. Describe the internal and external structure of bacteria with a neat diagram.
28. Write in detail the sexual and asexual reproduction of fungi.
29. What is electron microscope? Differentiate TEM & SEM?

FTL 3 B 05 Technology of Food Preservation

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

Multiple Choice

1. Examples for class II preservative is
   i. [a) Pepper b) Salt c) Oil d) Benzoic acid
2. Syruping is performed in

i. [a) Vegetables b) Fruits c) Fruits & vegetables d) None

3. HTST pasteurization stands for
   [a) High Time slow Treatment b) High temperature slow treatment
   c) High Temperature short Time d) High Thermal slow time]
4. Which among the following is not a fermented food
   [a) Beer b) Bread c) Jam d) Idli]

Name the following

5. Preservation method for foods below zero degree is known as----------
6. Bleached appearance on frozen food is ----------
7. Combination of preservation method is ----------
8. Irradiation is known as----------
9. The active component of the preservative potassium Meta bisulphate is-------
10. Method used for inactivation of enzyme.

PART B

Answer Any Five questions 5x2 = 10 Marks

11. Differentiate between quick and slow freezing.
12. Importance of Blanching in fruit processing
13. . What are food preservatives? Give one example
14. . What you meant by chill injury?
15. What is fermentation and give example?
16. Principle of microwave heating
17. Write a note on Ultrasonics.

PART C

Answer any Six questions 6X5 = 30 Marks

18. Give an outline of food irradiation
19. Write a note on ohmic heating
20. Write a note on high pressure technology
21. Explain drum drying process
22. What do you mean by cryogenic freezing
23. Write a note on freeze drying
24. Differentiate acetic and lactic fermentation
25. Action of sulphur dioxide as a preservative

PART D

Answer any two of the following 2x15 = 30 Marks

26. Explain the principle of drying. Differentiate between spray and drum driers?
27. What you mean by freezing of foods? What are different methods of freezing
28. What are you mean by thermal processing? Explain the canning of foods?
29. Write in detail(i)Aseptic method of food preservation.(ii)UHT sterilization(iii) Dehydro freezing

FTL 4 B 07 Food Chemistry & Analytical Instrumentation

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

Multiple Choice

1. Kjeldhal's method is for estimation of
   a) Carbohydrate b) Fat c) Protein d) Minerals

2. Pectin belongs to
   a) Monosaccharide b) disaccharide c) Polysaccharide d) Peptone
3. Pigment present in meat
   a) Heamoglobin b) Myoglobin c)Anthocyanin d) Carotenoids
4. Emulsion is a type of colloid with
   a) Gas in solid b) Solid in gas c) Liquid in solid d) Liquid in Liquid
5. Paper chromatography is based on
   a) Ion exchange chromatography b) Size exclusion chromatography
   c) Partition chromatography d) Adsorption chromatography

Name the following

6. Enzymes involved in inter conversion of various isomers are ----------
7. _____ is used as an adsorbent in thin layer chromatography
8. The basic units of proteins are called as _____
9. PUFA stands for _____
10. Solid dispersed in liquid is called ----------

PART B

Answer Any Five questions **5x2 = 10 Marks**

11. What you mean by emulsion?
12. How are proteins classified?
13. Mention different gases used in gas chromatography
14. Write down the principles of TLC
15. State Beer-lamberts law
16. Mention the important part of HPLC
17. What are essential amino acids? Give any two examples.

PART C

Answer any Six questions **6X5 = 30 Marks**

18. Kjeldahl's Methods for estimation of Protein
19. Classification of Carbohydrates
20. Hydrogenation
21. Discuss the steps in Thin layer chromatography.
22. Non-Enzymatic browning reaction
23. Write the principle of HPLC
24. Write a note on Column Chromatography
25. Classify fatty acids. Give examples.

PART D

Answer any two of the following **2x15 = 30 Marks**

26. What are enzymes? What are the uses of enzymes in food industry?
27. Explain in detail about the determination of moisture?
28. Discuss briefly about chromatography techniques? How paper chromatography is applicable in food analysis?
29. Explain in detail of working of Atomic Absorption Spectrophotometer ?

FTL 5 B 09 Food Microbiology II

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

Multiple Choice

1. Micro-organism associated with food poisoning

[a) *Streptococcus*, b) *C. Tetanii*, c) *C . botulinum*, d). Lactic acid bacteria)

2. MPN test is used for the analysis of

[a). Meat b). Water c). Blood d). Fish]

3. Psychrophiles grow at a temperature of

[a). OoC, b). 45oC, c). 70oC, d). 100oC]

4. Sauerkraut is fermented by

[a). *Acetobacter,* b). *Pediococcus,* c). *Pseudomonas*, d).*Salmonella*]

Name the following

5. Study of fungi?
6. Name a chemical used for the control of micro-organisms
7. Which is the bread mold?
8. Which is the organism responsible for fermentation of yoghurt?

Fill in the blanks

9. Fermentation of grape juice is brought about by _____
10. Decomposition of protein under anaerobic condition is _____

PART B

Answer Any Five questions **5x2 = 10 Marks**

11. What do you mean by Asepsis?
12. What is food intoxication? Give an example
13. Name any three viruses associated with food poisoning
14. Differentiate between exotoxin and endotoxin.
15. Differentiate yeast and mold
16. Name any two bacteria and two molds involved in spoilage of meat
17. Define coli forms

PART C

Answer any Six questions **6X5 = 30 Marks**

18. Explain food poisoning caused by *C. Botulinum*
19. Explain preservation by high temperature
20. What is sauerkraut? Describe the process involved in the production of sauerkraut
21. Differentiate pour plate and streak plate
22. Explain microbiological testing of milk
23. Describe the spoilage canned by thermophillic spore foaming bacteria in canned foods.
24. What is serial dilution?
25. Differentiate selective and differential media.

PART D

Answer any two of the following **2x15 = 30 Marks**

26. Explain food poisoning caused by bacteria
27. What is MPN? Describe the methods involved in testing of water
28. Physical and chemical agents used for controlling micro-organism
29. Explain the spoilage in canned food.

FTL 5 B 10 Cereals, Pulses & Oil Seeds & Technology

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

Multiple choice questions

1. The ratio of ----- to------ in bread is about 3:1

a) Flour : Water. b) Gluten : Waterc) Water : Gluten d) Water : Flour

2. Which sequence is the correct one for bread making? a) Mixing, Sheeting, Panning, Fermentation. b) Mixing, Fermenting, Proofing, and Baking. c) Mixing, Proofing, Fermentation, Baking. d) Moulding, Kneading, Proofing, Panning.
3. Which term does not belong to wheat?
a) Gluten, b) Glutamine, c) Glutelin, d) Glutenin.
4. Parboiled rice is superior than Raw Rice because.
a) Milling recovery is more. b) Retains more protein, vitamins, minerals.
c) More digestible. d) Increased shelf life. e) All the above.

Name the following.

5. Which is the variety suitable for the production of biscuit from wheat?
6. Which is the vitamin available more in rice bran?
7. Pulses are deficient in ----------amino acid.
8. Give an example for a bread improver.
9. -------- is an example of a biological leavening agent.
10. Tempering of Wheat refers to the addition of ----- to bran and endosperm.

PART B

Answer any Five questions **5x2 = 10 Marks**

11. What do you mean by leavening action.
12. What is Gluten? Give its importance.
13. Name the Anti nutritional Factors in pulses.
14. What is parboiling, write its advantages.
15. What do you mean by curing of rice?
16. Give the principle of baking.
17. What is liquid glucose? Give its importance in candy preparation.

PART C

Answer any Six questions **6X5 = 30 Marks**

18. What is staling of bread?
19. Write the importance of role of ingredients in bread.
20. Explain toffee manufacturing briefly.
21. What is the impact of ageing of wheat flour? How ageing could be Minimized by using chemicals?
22. Write on TVP
23. Explain the action of fast acting baking powder with suitable example.
24. Crackers and Wafers.
25. Cookies and Biscuits.

PART D

Answer any two of the following **2x15 = 30 Marks**

26. Explain the milling of wheat in detail.
27. What is parboiling and differentiate between single boiled and double boiled rice. Write the merits and demerits of Parboiling.
28. Write in detail about various processing steps of bread manufacture.
29. Describe in detail on the processing of oil seeds.

FTL 5 B 11 Technology of Animal Foods

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

Multiple Choice

1. Temperature for cold storage of eggs

[a) 0 to – 1^0C b) 10^0C c) -18 to -23^0C]

2. Fish liver oil is rich in
[a) Vit A, b) Vit C, c) Vit B]
3. AA quality egg has Haugh unit
(a. above 72, b. 60-72, c. 31-60)
4. Fish Fat is composed of
(a. PUFA, b. Unsaturated Fatty acid, c. Cholesterol, d Saturated Fatty acid)
5. _____acid is formed during Rigor Mortis
6. _____portion of pig is Bacon
7. Egg shell is rich in _____.
8. Bone meal is rich in _____and _____.
9. Distribution of fat in Meat is called _____.
10. _____is removed during drying of egg to prevent Millard reaction.

PART B

Answer all the questions **5x2 = 10 Marks**

11. What is humane method of slaughter?
12. What is the role of nitrite in curing of meat?
13. How is egg preserved by coating?
14. What is candling?
15. What is ageing of meat?
16. What are the changes that occur during storage of eggs?
17. What is ultimate pH.

PART C

Answer any Six questions **6X5 = 30 Marks**

18. Egg quality determination
19. Post Mortem Inspection
20. Fish Meal
21. Meat curing Method
22. Freezing of eggs
23. Write a note on canning of fish
24. Explain any two by products in fish processing industry
25. Factors affecting tenderness of meat

PART D

Answer any two of the following **2x15 = 30 Marks**

26. Explain steps in slaughter of pig.
27. Explain the Technology of sausage preparation.
28. What is industrial importance of eggs?
29. Write notes on;
a) Fish protein concentrate b) Fish ensilage c) Chitosan

FTL 5 B 14 Dairy Technology

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

Multiple Choice

1. Percentage of fat present in cow milk
   [a) 3% b) 5% c) 7% d) 8%]
2. pH of fresh cow milk
   [a) Below 4, b) 5, c) 6.5 - 6.6 d) 7]

3. Pigment responsible for yellow color of milk
[a) carotene, b) Riboflavin c) xanthophyll, d) Calcium Caseinete]

Name the following

4. The carbohydrate present in milk
5. Acid form during fermentation of milk
6. Organism added in manufacture of Yoghurt
7. Enzyme added for coagulation of cheese

Fill in the blanks

8. The protein present in milk is _____.
9. Milk is rich in _____ mineral.
10. Write colour of milk is due to _____

PART B

Answer Any five questions **5x2 = 10 Marks**

11. What is SNF
12. What is table butter?
13. Which are the importance fermented milk products?
14. What is homogenized milk?
15. Define whey of milk.
16. What is CIP?
17. Write the classification of cheese?

PART C

Answer any Six questions **6X5 = 30 Marks**

18. What are the factors affecting composition of milk?
19. How is skim milk powder different from whole milk powder
20. Write short note on Yoghurt
21. What are the major components of milk?
22. Steps in manufacture of instant milk powder.
23. Write a note on the cleaning of dairy equipments
24. List different types of milk based on fat content
25. Define cream, what is neutralisation of cream?

PART D

Answer any two of the following **2x15 = 30 Marks**

26. Explain the technology of butter
27. Describe the production of skim milk powder with flow chart
28. Explain the process of cheddar cheese.
29. Write the steps in manufacture of Ice-cream.

FTL 6 B 15 E Food Engineering

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

Multiple Choice

1. Heat Exchanges are used to--------a) Heat the product b) Cool the product c) Heat or cool the product d) Maintain constant temperature

2. Freezing temperature of brine is-------a) Lower than water b) Higher than water c) Equal d) Less than equal to water

3. Solid food materials are generally---a) Elastic b) Viscoplastic c) Visco elastic d) Plastic
4. Thermal energy is transmitted by conduction in a solid medium by
   a) Collision between free Molecules b) Vibration of bound Molecules
   c) Collision between free electrons d) None of these

Name the following

5. Temperature for UHT pasteurization is----------?
6. The heat of pasteurized milk was used to warm up cold incoming raw milk. What is the Method called?
7. What is the nature of curve between shear stress (Y-axis) and rate of shear (x-axis) for Bingham plastic liquid?
8. What is the equation for the Fourier's law of conduction?

Fill in the blanks

9. An example for non- contact type heat exchanger is----------.
10. The difference between a pasteurizer sterilizer is only in ----------

PART B

Answer all the questions **5x2 = 20 Marks**

11. Differentiate driers and Evaporators
12. Differentiate Newtonian and Non Newtonian fluid?
13. What are the laws involved in conduction and convection.
14. Differentiate Sterilization & pasteurization process
15. Define Rheology?
16. Which evaporator is having more steam economy? Why?
17. What do you mean by the term heat transfer coefficient?

PART C

Answer any Six questions **6X5 = 30 Marks**

18. Explain the working at plate heat exchanger with Diagram
19. Explain Single and Multiple effect evaporator schematically?
20. Differentiate water tube & fire tube boilers.
21. Explain different drying rate period involved in grain drying?
22. Explain different methods of drying? Brief any one
23. Differentiate Quick freezing & slow freezing
24. Explain Vapour compression refrigeration cycle.
25. Explain about HTST and UHT.

PART D

Answer any two of the following **2x15= 30 Marks**

26. Describe the classification of heat exchangers?
27. Describe different types of driers employed in food industries.
28. Explain single and multiple effect evaporators schematically.
29. What is refrigeration, Ton of refrigeration and Explain the application of refrigeration in food industries?

FTL 6 B 16 Food Safety Regulations and Packaging

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

Multiple Choice

1. HACCP stands for _____
2. Expand SSOP
3. _____ is a common adulterant in Tea.
4. Give example for a high risk food.

5. GMP stands for_____
6 HDPE stands for_____
7. FAO constituted in the year _____
8. Mention any two tools used for sampling.
9. CAP stands for_____
10. Asepsis means_____

PART B

Answer Any Five questions **5x2 = 10 Marks**

11. Differentiate Primary and Secondary packaging.
12. What you mean by physical hazards? Give Examples.
13. Name the different phases in a bacterial growth curve.
14. What do you mean by biodegradable packaging?
15. List four important functions of packaging.
16. What do you understand by traceability and recalling?
17. What do you meant by active packaging?

PART C

Answer any Six questions **6X5 = 30 Marks**

18. Write a note on AGMARK
19. Write short note on Food poisoning.
20. Discuss briefly on food allergens.
21. Describe CAP and MAP.
22. Outline the structural requirements of a food plant.
23. Differentiate between sanitizers and disinfectants.
24. BIS
25. Write a note on aseptic packaging.

PART D

Answer any two of the following **2x15 = 30 Marks**

26. What are high risk and low risk foods? Discuss the significance of food safety and hygiene.
27. What do you meant by food adulteration? Briefly discuss any four common food adulterants and their tests?
28. Briefly discuss food sampling techniques.
29. Briefly discuss the recent trends in packaging?

FTL 6 B 18 Technology of Fruits , Vegetables,spices & plantation Crops

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

Multiple Choice

1. PH of High acid food

[a) above 5.0, b) 5.0-4.5, c. 4.5-3.7, d) 3.7 and below]

2. Which acid is present in apple

[a. Malic acid, b. Citric acid, c. Tartaric acid, d.. Oxalic acid]

3. Which instrument is used for measuring total soluble solids

[a. Hydrometer, b. Refractometer, c. pH meter d. Salinometer]

4. FPO specification for total soluble solids in Jam

[a. 68.5o B b. 70oB c. 75oB d. 65o B]

Name the following

5. Name the pungent principle present in spices.
6. Acid formed during fermentation of pickle
7. Instrument used to measure salt content
8. _____ gives stimulating effect of coffee.

Fill in the blanks

9. Pigment present in Tomato _____
10. Enzyme responsible for browning of fruits

PART B

Answer Any Five questions **5x2 = 10 Marks**

11. What is blanching ?
12. What is Cocoa Butter?
13. What is the function of salt in pickling
14. Differentiate between squash and cordials.
15. What are the factors affecting gel formation
16. How is browning prevented?
17. What are spice oils?

PART C

Answer any Six questions **6X5 = 30 Marks**

18. Describe the process preparation of fruit cordial
19. Describe the steps in processing of black Tea.
20. What are pectic enzymes? Discuss their importance in ripening of fruits.
21. What are all the steps in manufacture of oleoresins?
22. Which are the different methods of peeling?
23. Explain manufacture of Chocolate.
24. Differentiate glazed fruit and candied fruit
25. Briefly explain preparation of tomato ketchup. Give the specification.

PART D

Answer any two of the following **2x15 = 30 Marks**

26. What are the steps involved in canning of fruits.
27. Steps involved in manufacture of Jams. Discuss defects in Jam preparation.
28. Give the different steps involved in Cocoa bean processing? Discuss the steps involved in coffee processing.
29. Discuss browning of fruits and vegetables and its prevention.

Open course

FTL 5 D 01 Technology of Spices

Time 2 Hours **Total 40 Marks**

PART A

Answer all the questions **5x1= 5 Marks**

Name the following.

1. Name an Aromatic spice.
2. Name a Pungent spice.
3. Chemical used for bleaching Cardamom.

4. Name the alkaloid responsible for biting taste of Pepper.
5 King of Spices.

PART B

Answer Any Five questions **5x2 = 10 Marks**

6. Name the major spices of India.
7. What do you mean by "Garbling"?.
8. Define Spice.
9. What is the important use of Paprika?.
10. Mention the uses of Ginger oils.
11. Mention the important factors that affect quality of Chillies
12. What is function of "Aspirator" in processing Spices?.

PART C

Answer any three questions **3X5 = 15 Marks**

13.What are Spice oils?.
14. How are Spices classified?.
15. Briefly explain production of Oleoresin.
16. Explain steps in curing of Turmeric.
17.Explain the processing of cardamom

PART D

Answer any one of the following **1x10 =10 Mark**.

18. Explain the different steps involved in processing of Black Pepper.
19. Explain important steps in extraction of Oleoresin.

FTL 5 D 02 Fruit and Vegetable Processing

Time 2 Hours **Total 40 Marks**

PART A

Answer all the questions **5x1= 5 Marks**

Name the following:

1. Name a Tomato based product.
2. Instruments to measure sugar
3. Type of browning reaction in cut surface of Apples.
4. Name a fruit coming under the group Drupe.

5. Name a food additive.

PART B

Answer Any Five questions **5x2 = 10 Marks**

6.What are Non-climatric Fruits ? (Give example)
7. What do you mean by Encymatic browning ?
8. Write any four changes during ripening of fruits.
9. What do you mean by fermentation? Name a fermented fruit based product.
10. Name four mango based products available in market.
11. What do you mean by blanching of vegetables.
12. What are class 11 preservatives.

PART C

Answer any three questions **3X5 = 15 Marks**

13. Write the Ph of low acid and High acid foods.
14. Which are the different methods of peeling.
15. Browning of fruits.
16. Ripening of Fruits.
17. Composition of leafy vegetables.

PART D

Answer any one of the following **1x10 = 10 Marks**.

18.Write a note on classification of fruits. Discuss the general
19.Write a note on pickling. Give the function of ingredients.

FTL 5 D 03 Food & Health

Time 3 Hours **Total 40 Marks**

PART A

Answer all the questions **5x1= 5 Marks**

Name the following

1. Name a water soluble vitamin
2. Which food group is known as body builders
3. Example for cereal crop is ----------
4. Name one chemical preservative
5. Lack of lactase leads to ----------

PART B

Answer Any Five questions **5x2 = 10 Marks**

6. What are carbohydrates? Give example.
7. What are fat soluble vitamins? Give example.
8. Name any four food source for fat.
9. What are nutrients? Name any two.
10. What do you mean by Body Mass Index?
11. What are preservatives? Give example.
12. Define Adulterants?

PART C

Answer any three questions

Write on **3X5 = 15 Marks**

13. Common food Allergens.
14. Common adulterants in food
15. Functions of Preservatives
16. Vitamins
17. Functions of protein in body?

PART D

Answer any one of the following **1x10 = 10 Mark**.

18. Explain briefly about the Digestion and absorption of nutrients?
19. What are Life style diseases? Briefly discuss each of them?

A014 Nutrition & Health

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10**

Multiple Choice

1. Glucose belongs to _____
2. [a) Monosaccharide, b. Disaccharide, c. Oligosaccharide, d. Polysaccharide]
3. Deficiency of iodine leads to _____

4. [a) Night Blindness b. Scurvy, c. Beri-Beri d. Goitre]
5. Vitamine responsible for clotting of blood is_____
6. [a. Vit.-K b. Vit.-E, c. Vit.-B d. Vit.-C)

Name the following

7. The linkage between two amino acids in a protein
8. Milk protein is called

Fill in the blanks

9. Cellulose cannot be digested in human intestine because_____
10. Cellulose cannot be digested in human intestine because_____

PART B

Answer Any Five questions **5x2 = 10**

11. Essential Amino acids
12. What is the Energy value of carbohydrate and fats
13. Define Under Nutrition
14. Define Protein Efficiency Ratio.
15. Classify the type of water
16. What is saturated fatty acids and Give one example.
17. Two important factors affecting BMR

PART C

Answer any Six questions **6X5 = 30 Marks**

18. Classify the carbohydrates and give one example to each
19. Specific dynamic action of Food
20. How protein quality will calculate?
21. Role of Iodine in Diet
22. Write the functions of fats
23. Write a short note on BMR?
24. Write a note on dietery fibre
25. Write the digestive enzymes present in Gestro Intestinal Tract.

PART D

Answer any two of the following **2x15 = 30 Marks**

26. How minerals are classified. Explain in detail the role of any two minerals in human nutrition
27. How are fats digested and absorped in the body .Mention the role of bile juice in fat digestion
28. Explain in detail the role of water soluble vitamins in the human system. Give any four deficiency disease
29. How nutrients are important to human health? Discuss in detail.

Complimentary Course
Food Science and Quality Control

FTL 1 C 01 Principles of Nutrition

Theory 2 credits

SI No:	Topic	Course outline	Hrs
1	**Concept of nutrition: Definition of terms**	Nutrition, under nutrition, malnutrition, symptoms	10

		and remedy, Health and nutritional status-adequate optimum and good nutrition Energy – Definition of calorie and Joule, Energy value of foods, Basal Metabolic Rate (BMR), factors affecting BMR	
2	**Food Guide**	Nutrients supplied by foods. Basic five food groups – Cereals, pulses, fruits and vegetables, milk and meat, fats and sugar.	5
3	**Nutrients and Health: Water**	Importance, distribution in body, function, sources, water balance, regulation and requirement, abnormalities in water balance.	5
4	**Carbohydrates**	Functions, sources, requirement digestion and absorption, effects of deficiency.	5
5	**Fibers**	Definition, classification, sources, role of fiber in human nutrition	5
6	**Protein**	Functions, sources, requirement, essential amino acids, determination of nutritional quality of proteins, digestion and absorption.	4
7	**Lipids**	Functions, sources, digestion and absorption, role of essential fatty acids, Health concerns in lipid nutrition-obesity, hypertension, atherosclerosis, requirements and effects of deficiency,	5
8	**Vitamins**	Classification, sources, requirement, deficiency of Vitamin A, D, E,K, Ascorbic acid, Thiamine, Riboflavin, Niacin, Pyridoxine, Folic acid,Pantothenic acid.	7
9	**Minerals**	Functions, sources, deficiency of calcium, phosphorus, sodium, potassium, iron, iodine and fluorine.	4
10	**Balanced diet**	Meal planning, factors affecting meal planning, principles of meal planning.	3
11	**RDA**	Factors affecting RDA, principles deriving RDA	3

References

- Fundamentals of Food & Nutrition S R Mudambi & M V Rajagopal
- A text book of foods, Nutrition and Dietetics M Raheena Begum
- Handbook of Food and Nutrition M Swaminathan

FTL 2 C 02 Food Chemistry

SI No:	Topic	Course outline	Hrs
1	**Carbohydrates**	Classification, Structure, browning reaction, changes during cooking	5
2	**Pectin**	Composition & structure	2
3	**Protein**	Introduction to food proteins, classification, structure, physico chemical properties, denatuaration, reactions, protein determination, changes during cooking	8
4	**Fats & Oils**	Classification, saturated, unsaturated, polyunsaturated fatty acids physical and chemical properties, refining of fats and oils,-bleaching, deodorizing, hydroxylation, shortening, Products of fat - margarine, vanaspati, lard, tallow.	10
5	**Enzymes**	Classification, nomenclature, enzyme specificity, factors affecting enzyme activity, enzyme inhibition, role in food processing	5
6	**Water**	Introduction, physical and chemical properties of water, moisture in foods, hydrogen bonding, bound water	6
7	**Pigments**	Pigments in foods, chlorophyll, flavanoids, anthocyanin, anthoxanthins, quinines, xanthones, betalains, Effect of processing and storage on pigments, physical and chemical properties	7
8	**Flavours**	Flavour compounds in foods - terpenoids, flavanoids, and sulphur compounds, effect of processing and storage on flavours	6
9	**Properties of foods**	Colloids – Properties, sols, gels, foam, emulsion and suspension	5

FTL 2 C 03 P Food Chemistry

Practicals
1) Colour reactions of carbohydratesb) Estimation of reducing sugar 2) Colour reactions of proteins b) Estimation of protein. 3) Determination of acid value and free fatty acid. **4)** Determination of acidity in fruit juices. 5) Determination of ascorbic acid

.

References

- FoodChemistry Owen R Fennema
- Food Chemistry Lillian Hoagland Meyer
- Foods Facts and Principles N Shakuntalamanay
- M Shadaksharaswamy
- Food science Norman N. Potter

FTL 3 C 04 Principles of Food Science

SI No:	Topic	Course outline	Hrs
1	**Plant Foods**	Introduction to food science.	3
2	**Cereals, pulses and legumes**	Composition, nutritive value, antinutritional factors, changes during cooking. Germination and changes Germination.	5
3	**Fruits and vegetables**	classification, composition, nutritive value, changes during cooking of vegetables, ripening of fruits	7
4	**Spices and**	Classification, composition and use	5

	condiments		
5	**Animal Foods: Milk and milk products**	Composition, nutritive value, effect of acid, heat, enzyme, salt on milk, Processing of milk – clarification, pasteurization and homogenization, cheese, butter, skim milk powder, whole milk powder, condensed milk, yoghurt.	8
6	**Egg**	Structure, composition, nutritive value, grading, changes during storage, role of egg in food industry.	6
7	**Meat**	Structure, composition, nutritive value, post mortem changes, changes during cooking, ageing.	6
8	**Fish and poultry**	Composition and nutritive value, fish products – fish meal, fish flour and fish oils.	5
9	**Sugars**	Liquid sweetners, properties of sugar, reactions of sugar, stages of heating.	9

FTL 3 C 05 P – Principles of Food Science

Practicals 2 credits

Practicals
1. Determination of Moisture content – Hot air oven method. 2. Determination of Ash content. 3. Determination of Gluten content in wheat flour. 4. Determination of Water absorption power of Maida **5.** Preparation of jam.

References

- Foods : Facts and principles N Shakuntalamanay & M S Swamy

- Food Science - B Srilakshmi
- Food science, Chemistry & Experimental foods M Swaminathan
- Text Book on Foods storage And preservation Vijayakhader

FTL 4 C 06 Food Preservation and Quality Control

Theory 3 credits

SI No:	Topic	Course outline	Hrs
1	**Food Preservation**	Significance of preservation, Methods of food preservation - low temperature, high temperature, preservatives, osmotic pressure, dehydration, irradiation.	20
2	**Food Additives**	Food additives – Role of food additives, antioxidants, chelating agents, colouring agents, curing agents, emulsifiers, flavour enhancers, flavour improvers, humectants and ant caking agents, leavening agents, stabilizers and thickners, artificial sweeteners, preservatives, food fortifiers.	15
3	**Food Adulteration**	Food adulteration – types of adulterants, common adulterants in foods, toxicants in foods, impact of food adulteration in humans.	10
4	**Food Laws and Quality**	Food laws and quality control – HACCP, Codex alimentarius, PFA, FPO, MFPO, BIS, AGMARK.	10

FTL 4 C 07 (P) Food Preservation and Quality Control

Practicals 2 credits

SI No:	Practicals
1	Detection of adulterants in foods such as milk, honey etc.
2	Estimation of SO_2 in fruit products.
3	Estimation of purity of potassium metabisulphite
4	Qualitative determination of benzoic acid

Model Question Paper

FTL 1 C 01 Principles of Nutrition

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

1. Deficiency of iodine leads to ----a) Night blindness b) Scurvy c) Beriberi d) Goiter
2. Fat soluble vitamins are vit A D E &-----a) Vit B b)Vit K c) Vit B d) Vit B
3. Calorificvalue of protein is-------a)4.1 b)9.5 c) 5.7 d) 3.0
4. Energy Value of food is expressed in--------(a) Calories b) Kilo calories c) Joule d) Celsius

Name the following

5. Chemical name of Vitamin E is
6. Mineral present in haemoglobin?
7. Name two flavin coenzymes.

8. Mineral required for growth of bones

Fill in the blanks

9. _____ is the hormone which regulate water balance.
10. RDA stands for _____

PART B

Answer Any Five questions **5x2 = 10 Marks**

11. What is the daily energy requirement for a man and woman?
12. What is flurosis?
13. What is PER?
14. Name the hormones in which iodine plays an important role.
15. Write two sources of calcium.
16. What is Kwashiorkor?
17. Write two sources of Vitamin B_6.

PART C

Answer any Six questions **6X5 = 30 Marks**

18. What are the functions of sodium?
19. What is Osteoporosis? Why it occurs?
20. What are the functions of protein?
21. What is the role of bile in fat digestion?
22. What are micro minerals? Give two examples.
23. What are the deficiency symptoms of riboflavin?
24. Define balanced diet.

PART D

Answer any two of the following **2x15 = 30 Mark**.

25. Write the basic five food groups. Write the principles of meal planning.
26. How is nutritive value of protein determined? Compare animal and plant protein quality .
27. Name the vitamins which come under the category of Vitamin B complex.
28. Briefly indicate their importance in human nutrition.
29. Classify minerals based on their requirement. Write about the role, sources and daily requirement of any two minerals

FTL 2 C 02 Food Chemistry

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

1. Percentage of protein present in Cow's milk------a) 3.5% b). 6% c).7% d).2%
2. Which is an example for a complete protein.---a). Egg b) Milk c).Fish d) Meat
3. Which is the storage polysaccharide in animals.----a) Glucose b) Glycogen c) Starch d) Cellulose
4. Which pigments are responsible for the red, purple and blue colour of Fruits & Vegetables-----a). Anthocyanins b).Anthoxanthins c) Carotenoids d) Chlorophyll

Name the following

5. Name a reducing sugar
6. W which is the simplest amino acid?
7. What is wood sugar?
8. Name the ester responsible for the flavour of banana.

Fill in the blanks

9. Enzymatic browning in fruits is due to the action of the enzyme _____

10. _____ is the enzyme that hydrolyses sucrose to glucose and fructose.

PART B

Answer Any Five questions **5x2 = 10 Marks**

11. Give an example for competitive inhibition of an enzyme.
12. Name the element and four rings present in chlorophyll
13. Which is the prosthetic group in haemoglobin?
14. What is citral?
15. What is meant by enzyme specifity?
16. What are essential amino acids? Give 2 examples.
17. Define iodine value of oils.

PART C

Answer any Six questions **6X5 = 30 Marks**

18. What are suspensions
19. Why sucrose is a non-reducing sugar
20. What are betalains?
21. Write the structural difference between chlorophyll a and b.
22. Write the role of fibre?
23. What is native protein?
24. Write the composition of butter.

PART D

Answer any two of the following **2x15 = 30 Mark**.

25. Write the effect of processing and storage on chlorophyll pigments in foods.
26. Write nomenclature and method of classification of enzymes and discuss
27. any four important enzymes of metabolic importance.
28. What are carbohydrates and how they are classified? Explain any one
29. reaction involved in the identification of sugars.
30. Write the classification of lipids. Explain the chemical properties of fats and oils.

FTL 3 C 04 Principles of Food Science

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

1. Pigment present in Tomato
   a (Lycopene, b) Chlorophyll c) Xanthophyll d) Carotene.
2. Egg white injury factor is
   a) Avidin b) Ovalbumin
   c) Ovoglobin d) Ovomucin
3. Enzyme present in meat
   a) Cathepsin b) Amylase
   c) Poly phenolase d) Lipase
4. Egg Shellis rich in
   a)Calcium b)Phosphorou s
   c) Potassium d) Hagnesium.

Name the following

5. The coloring principle of turmeric

6. Example for liquid sweetener.
7. Name the chemical used in “color fixing” in meat.
8. Name the chief muscle pigment?

Fill in the blanks

9. _____ is the neurotoxin responsible for lathyrism.
10. _____ is the functional protein of wheat.

PART B

Answer Any Five questions **5x2 = 10 Marks**

11. What is MFCS?
12. Which are the Muscle proteins
13. Name an enzyme which is used to tenderize meat.
14. Which is the Queen of spices
15. What is ageing of meat?
16. What are the pigments present in fruits and vegetables?
17. Name any antinutritional factor present in pulses

PART C

Answer any Six questions **6X5 = 30 Marks**

18. What is rigor mortis
19. Name the proteins present in egg
20. What is enzymatic browning?
21. What are the properties of sugars?
22. What is phosphatase test?
23. Define retrogradation of starch.
24. What is sterilization of milk?

PART D

Answer any two of the following **2x15 = 30 Mark**.

25. Explain in detail the structure and composition of egg Highlight its importance in food industry.
26. Explain the physical and chemical changes that occur during heating of sugar What is its application in food industry?
27. Explain the composition of milk and effect of heat on it. Explain in detail the production of any one milk product of commercial importance.
28. Write a brief note on changes taking place in meat during curing and smoking.

FT 4 C 06 Food preservation and Quality Control

Time 3 Hours **Total 80 Marks**

PART A

Answer all the questions **10x1= 10 Marks**

1. Sodium nitrate is
   a). anticaking agent b) antioxidant
   c) curing agent d) colorant
2. Which of the following is a sequesterant?
   a) EDTA b) Pectin
   c) Hydrogen peroxide d) vinegar
3. Preservative used in tomato products
   a) ascorbic acid b) benzoic acid
   c) sodium chloride d) sorbic acid]
4. World food day is celebrated on
   a) Oct 16 b) Oct 10
   c) March 8 d) April 23]

Name the following

5. A food emulsifier
6. Anticaking agent
7. Antimicroboial agent
8. Leavening agent

Fill in the blanks

9. Botulism is caused by the toxins of _____
10. _____ is a substance which is used to enhance the flavour

PART B

Answer Any Five questions **5x2 = 10 Marks**

11. What does GRAS stands for?
12. What is MFPO?
13. What is sharp freezing?
14. Name two foods which are preserved by the principle of osmosis.
15. What is the unit of radiation?
16. Name the only permitted inorganic preservative in fruits and vegetable
17. products?
18. Name two natural colours

PART C

Answer any Six questions **6X5 = 30 Marks**

19. Name the pathogen commonly found in cereal products
20. What is food adulteration?
21. What are the causes of food spoilage?
22. What are artificial sweeteners? Name any two.
23. What is codex Alimentarius?
24. What is food fortification?
25. Explain how salt acts as a preservative?

PART D

Answer any two of the following **2x15 = 30 Mark**.

26. Describe food additives with suitable examples? How are they classified?
27. How do you classify preservatives? Give two examples for each category.
28. Write in detail different methods of preservation
29. Explain the incidental contaminants and their harmful effects on the body.