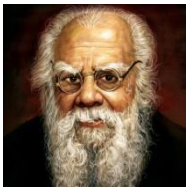
PERIYAR UNIVERSITY

Periyar Palkalai Nagar, Salem-636011

(Reaccredited with 'A' Grade by the NAAC;
National level 85th Rank in NIRF-MHRD Ranking)



School of Professional Studies

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

M.Sc. DEGREE

FOOD SCIENCE TECHNOLOGY AND NUTRITION

[Choice Based Credit System (CBCS)]

REGULATIONS AND SYLLABUS

(Effective from the academic year 2016-2017 and thereafter)

M. Sc. FOOD SCIENCE TECHNOLOGY AND NUTRITION

REGULATIONS AND SYLLABUS

(With effect from the academic year 2016 – 17 onwards)

Preamble

The Department of Food Science and Nutrition was established in the year June 2005 to explore the youth and its application to the society in the discipline of Food Science and Nutrition. The Department fosters teaching, skill, research and extension activities in the major thrust areas like Food Science and Chemistry, Food Processing, Clinical and Public Health Nutrition. The purpose of the programme is to produce post graduate students who will become productive citizens since the employers consistently seek from University graduates:

- Scientific (problem-solving) skills
- Communication skills
- Decision-making skills which enable the students to become leaders
- Well developed analytical skill
- Teamwork skills
- Well practiced leadership skills
- Good interpersonal skills
- Job specific qualification skills (NSDC QPs)

Vision

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

Programme Objectives

Hence to inculcate the importance in developing food and nutritional science among the budding nutritionists and food processing industrialists, the *M. Sc., Food Science Technology and Nutrition* programme is aimed with the following objectives.

- To engineer the students on theoretical and practical aspects of the entire food value chain management.
- To gain insight into the national nutritional problems and their management through diet.
- To generate evidence based nutrition knowledge through research and disseminate to the agrarian and general community.
- To promote interactions with other disciplines which relate to the study of Food Science and Nutrition.

This programme is offered under Choice Based Credit system (CBCS). Students can earn more credits than the stipulated minimum of 90 credits, through self study courses and supportive courses.

Candidate's eligibility for admission

A degree in B.Sc. Nutrition and Dietetics, B.Sc. Home Science, B.Sc. Catering Science, B.Sc. degree with PG Diploma in Nutrition and Dietetics/ Food Processing, B.Tech./B.Sc. Food Technology, B.Sc. Life Science (Biotechnology/Microbiology/Biochemistry), B.Voc. in Food Science and Nutrition related discipline and UG Degree in Allied Health Sciences (B.Pharm. and Nursing Courses) approved by the Association of Indian Universities are eligible to seek admission.

Duration of the programme- Two years.

Programme Outcomes

The student can able to know, understand, apply, analyze, evaluate and create the relationship between food, technology, nutritional status and quality of life.

CBCS- Structure of the Programme
PART –A

Semester I

S.No.	Paper Code	Title of the paper	Hours/ week	L	T	P	C
Core Papers(C)							
1.	16FSNC01	Food Science and Chemistry	5	4	1	0	5
2.	16FSNC02	Food Science and Chemistry Practical	3	-	0	3	2
3.	16FSNC03	Food Processing Technology	5	4	1	0	5
4.	16FSNC04	Research Methodology and Statistics	5	4	1	0	5
Elective Options (One Course per semester) (E)							
5.	16FSNE01	Food Packaging Technology	4	3	1	0	4
5.	16FSNE02	Instrumentation in Food Processing	4	3	1	0	4
Experiential Learning (EL)							
1.	16FSNEL01	Industrial Visit – minimum nine industries - one for each food group	2 (Extra)	-	-	2	-
On-the-Job Training (Skill Component) (SC)							
1.	16FSNSC01	Job Specific Modular Training – Processed Food Entrepreneur (NSDC curriculum)	8	1	1	6	-
		Total	30	16	05	09	21

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

Semester II

S.No.	Paper Code	Title of the paper	Hours/ week	L	T	P	C
Core Papers(C)							
1.	16FSNC05	Food Microbiology and Preservation	4	3	1	-	4
2.	16FSNC06	Food Safety and Quality Control	4	3	1	-	4
3.	16FSNC07	Food Safety and Quality Control Practical	3	-	-	3	2
4.	16FSNC08	Food Composition Analysis Practical	3	-	-	3	2
Elective Options (One Course per semester) (E)							
5.	16FSNE03	Food Industries Waste Management	4	3	1	0	4
5.	16FSNE04	Food Biotechnology	4	3	1	0	4
Supportive Courses (S) for other Department Students							
1.	16FSNS01	Food Preservation Practical	4	1	1	2	4
Experiential Learning (EL)							
1.	16FSNEL01	Visit to Units with ISO systems; Visit to Units	2	-	-	2	-

		with HACCP certification; Visit to Units implementing GMP, GAP	(Extra)				
2.	16FSNC017	Research work – Part I – New Food Product Formulation and Business model (accompanied the internship)	20 days (120 hours)	-	-	-	-
On-the-Job Training (Skill Component) SC							
2.	16FSNSC01	Job Specific Modular Training – Processed Food Entrepreneur (NSDC curriculum)	8	1	1	6	4
Extra Credit Courses (EC)							
1.	16FSNEC01	Four Weeks Internship in Reputed Food Processing Industries (Summer Vocation)	Extra hours	-	-	30 days	4
		Total	30	11	5	14	24+4

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

Semester III

S.No.	Paper Code	Title of the paper	Hours/ week	L	T	P	C
Core Papers(C)							
1.	16FSNC09	Nutritional Biochemistry	4	3	1	0	4
2.	16FSNC10	Nutrition in Life Cycle	4	3	1	0	4
3.	16FSNC11	Public Health Nutrition	4	3	1	0	4
4.	16FSNC12	Computer Aided Diet Planning Practical	3	-	-	3	2
Elective Options (One Course per semester) (E)							
5.	16FSNE05	Specialized Nutrition	4	3	1	0	4
5.	16FSNE06	Nutritional Policies and Programmes	4	3	1	0	4
Supportive Courses (S) for other Department Students							
1.	16FSNS01	Nutrition and Fitness Practical	4	-	1	3	4
Experiential Learning (EL)							
1.	16FSNEL01	Visits to MSSRF Community Nutrition Camp/UNICEF Nutrition Camp, Mid Day Meal Unit, ICDS Unit etc.	2 (Extra)	-	-	2	-
2.	16FSNC017	Research work – Part II – Public Health Nutrition	3 (45 hours)	-	-	3	-
On-the-Job Training (Skill Component) SC							
2.	16FSNSC02	Job Specific Modular Training – Sports Nutritionist (NSDC curriculum)	4	-	1	3	-
		Total	30	12	6	12	22

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

Semester IV

S.No.	Paper Code	Title of the paper	Hours/ week	L	T	P	C
Core Papers(C)							
1.	16FSNC013	Clinical Nutrition I	4	3	1	-	4
2.	16FSNC014	Clinical Nutrition II	4	3	1	-	4
3.	16FSNC015	Biochemical Analysis Practical	3	-	-	3	2
4.	16FSNC016	Computer Aided Clinical Nutrition Practical	3	-	-	3	2
Elective Options (One Course per semester) (E)							
5.	16FSNE07	Physiological Aspects of Nutrition	4	3	1	0	4
5.	16FSNE08	Nutritional Epidemiology	4	3	1	0	4
Experiential Learning (EL)							
1.	16FSNEL01	Visit to National Institute of Epidemiology, Health Centres, Naturopathy Unit, Nutraceutical manufacturing unit	2 (Extra)	-	-	2	-
2.	16FSNC017	Project (Part I and II compilation, publication and viva voce)	6	-	-	6	3
On-the-Job Training (Skill Component) SC							
2.	16FSNSC03	Job Specific Modular Training – Sports Nutritionist (NSDC curriculum)	6	-	1	5	4
Extra Credit Courses (EC)							
1.	16FSNEC02	Four Weeks Internship in Reputed Multi-specialty Hospitals (Summer Vocation)	Extra hours	-	-	30 days	4
		Total	30	09	04	17	23 + 4

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

Internship: The students are required to undertake two four weeks training (preferably during semester break) in a reputed food industry/organization/hospital/health centres mandatorily. On completion of the training, the students are required to submit a report. The departmental committee on the basis of certificate from host industry/organization, training report and viva voce will assess the student's performance and will be awarded Satisfactory/Unsatisfactory grade.

Research Project: The research project will be done in two parts by the students for 225 hours (i.e. 36 days). The students have to do the research in the field of food product development and quality control in the first year and public health nutrition in the second year. The project will be done in the Department/National Laboratories/Relevant Industries. The template for the research report prescribed by the department has to be followed. The research report template comprises research article template, review articles relevant to the research, appendices for detailed methodology, raw data and other documents relevant to the collection of data (Appendix I).

Qualification Pack Assessment (SSC of NSDC): The job specific qualification taught in every year as outcome based skill component is assessed by concerned sector skill councils and industrial partners by following the rules and regulations of NSDC. The separate certificate will be issued to the students in association with SSC and industry.

Co-Curricular Activities

1.Short –term Courses (Extra Credit Courses)

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

S.No.	Short term course Code	Title of the course	Duration (Hours)	L	T	P	C
I year							
1.	16FSNST01	Corel Draw and Adobe Photoshop – Nutritional Labeling	42	3	11	28	2
2.	16FSNST02	Biostatistics using Software	42	5	11	26	2
II Year							
3.	16FSNST03	Advanced Analytical Techniques in Food Quality Control	42	10	10	22	2
4.	16FSNST04	*In vitro* and *in vivo* techniques in Nutrition	42	8	19	15	2

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

2. *UGC – NET Coaching*

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

3. Bridge Course

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

Extra-curricular Activities

The students has to participate in the following activities of the University Departments or outside the University and it is mandatory that the students has to submit two participation/winner certificate in any one of the activity every year to the Department.

1. NSS/NCC/YRC camps and its competitions
2. Inter-institutional/Inter-departmental competitions
3. Personality Development programmes
4. Student Seminar
5. Placement training
6. IAS coaching class
7. Typewriting class
8. Language coaching class

Remedial Coaching

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

a. Basic laboratory techniques
b. Oral presentation skills

c. Notes taking and exam preparation techniques

is conducted for one hour in a weak in rotation by all faculty in the Department as extra workload for teaching. The hour will be mentioned in the time table to motivate the students to attend the remedial classes.

Mentor-Mentee System

The students of Department of Food Science and Nutrition are supported by all faculties in the Department personally and professionally through mentor and mentee system. One hour in the time table in a week will be allocated for mentor-mentee system, faculties are allocated their wards to take care of their wards personal and professional problems. Mentor provide guidelines to mentee on

1. Scholarship details
2. Recent updates in the subject
3. Carrier opportunities
4. Interview facing skills
5. Newspaper reading habits
6. Strategies to overcome the problems
7. Personal hygiene and sanitation
8. Roles and Responsibilities of students in the growth of the Department and University as a whole
9. Motivation to upgrade their skills in extracurricular activities
10. Professional organizations and membership benefits
11. Preparation of CV etc.

Part A

Credits for Core courses	- 58
Credits for Elective courses	- 16
Credits for Supportive courses	- 08
Credits for Skill Component	- 08
Total credits	**- 90**
Human Rights	**- 02**

Part –B

Self study courses (Extra)	- 08 (Internships)
Value Added Courses	- 08 (Short-term courses)
Total credits	**- 16**

CBCS – Scheme of Examinations

Semester I

S.No.	Paper Code	Title of the paper	Exam Hours	I	E	T	C
Core Papers(C)							
1	16FSNC01	Food Science and Chemistry	3	25	75	100	5
2	16FSNC02	Food Science and Chemistry Practical	3	40	60	100	2
3	16FSNC03	Food Processing Technology	3	25	75	100	5
4	16FSNC04	Research Methodology and Statistics	3	25	75	100	5
Elective Options (One Course per semester) (E)							
5	16FSNE01	Food Packaging Technology	3	25	75	100	4
5	16FSNE02	Instrumentation in Food Processing	3	25	75	100	4
On-the-Job Training (Skill Component) (SC)							

		Total	-	140	360	500	21

Note:-I- Internal, E-External, T- Total, C- Credit

Semester II

S.No.	Paper Code	Title of the paper	Exam Hours	I	E	T	C
Core Papers(C)							
1.	16FSNC05	Food Microbiology and Preservation	3	25	75	100	4
2.	16FSNC06	Food Safety and Quality Control	3	25	75	100	4
3.	16FSNC07	Food Safety and Quality Control Practical	3	40	60	100	2
4.	16FSNC08	Food Composition Analysis Practical	3	40	60	100	2
Elective Options (One Course per semester) (E)							
5.	16FSNE03	Food Industries Waste Management	3	25	75	100	4
5.	16FSNE04	Food Biotechnology	3	25	75	100	4
Supportive Courses (S) for other Department Students							
1.	16FSNS01	Food Preservation Practical	3	40	60	100	4
2.	16FSNS02	Nutrition and Fitness Practical	3	40	60	100	4
On-the-Job Training (Skill Component) SC							
2.	16FSNSC01	Job Specific Modular Training – Processed Food Entrepreneur (NSDC curriculum)	4	40	60	100	4
Extra Credit Courses (EC)							
1.	16FSNEC01	Food Industry Internship (Viva Voce)	6	40	60	100 (Extra)	4
		Total		235	465	700	24+4

Note:-I- Internal, E-External, T- Total, C- Credit

Semester III

S.No.	Paper Code	Title of the paper	Exam Hours	I	E	T	C
Core Papers(C)							
1.	16FSNC09	Nutritional Biochemistry	3	25	75	100	4
2.	16FSNC10	Nutrition in Life Cycle	3	25	75	100	4
3.	16FSNC11	Public Health Nutrition	3	25	75	100	4
4.	16FSNC12	Computer Aided Diet Planning Practical	3	40	60	100	2
Elective Options (One Course per semester) (E)							
5.	16FSNE05	Specialized Nutrition	3	25	75	100	4
5.	16FSNE06	Nutritional Policies and Programmes	3	25	75	100	4
Supportive Courses (S) for other Department Students							
1.	16FSNS01	Food Preservation Practical	3	40	60	100	4
2.	16FSNS02	Nutrition and Fitness Practical	3	40	60	100	4
On-the-Job Training (Skill Component) SC							
		Total	-	220	480	600	22

Note:-I- Internal, E-External, T- Total, C- Credit

Semester IV

S.No.	Paper Code	Title of the paper	Exam Hours	I	E	T	C
Core Papers(C)							
1.	16FSNC013	Clinical Nutrition I	3	25	75	100	4
2.	16FSNC014	Clinical Nutrition II	3	25	75	100	4
3.	16FSNC015	Biochemical Analysis Practical	3	40	60	100	2
4.	16FSNC016	Computer Aided Clinical Nutrition Practical	3	40	60	100	2
Elective Options (One Course per semester) (E)							
5.	16FSNE07	Physiological Aspects of Nutrition	3	25	75	100	4
5.	16FSNE08	Nutritional Epidemiology	3	25	75	100	4
Experiential Learning (EL)							
1.	16FSNC017	Project (Viva Voce)	6	40	60	100	3
On-the-Job Training (Skill Component) SC							
2.	16FSNSC04	Job Specific Modular Training – Sports Nutritionist (NSDC curriculum)	4	40	60	100	4
Extra Credit Courses (EC)							
1.	16FSNEC02	Hospital Internship (Viva Voce)	6	40	60	100 (Extra)	4
		Total		235	465	700	23+4

Note:-I- Internal, E-External, T- Total, C- Credit

Examinations

Examinations are conducted in semester pattern. The examination for the Semester I & III will be held in November/December and that for the Semester II and IV will be in the month of April/May.

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

Scheme for valuation

Evaluation will be done on a continuous basis and will be evaluated four times during the course work. The first evaluation will be in the 7th week, the second in the 11th week, third in the 16th week and the end – semester examination in the 19th week. Evaluation may be by objective type questions, short answers, essays or a combination of these, but the end semester examination is a University theory examination with prescribed question paper pattern.

Grading System

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

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

Scheme for Internal Marks in Theory (Max.marks-25)

Seminar and Assignment – 10 (each 5 marks)
Internal Tests- 10 (Best two out of three tests: Each 5 Marks)
Attendance -5 marks

Scheme for Internal Marks in Practical (Max.marks-40)

Internal Tests – 25 (Best two out of three tests: Each 12.5 Marks)
Attendance -5 marks
Record - 10 marks (Average of marks obtained for each experiment in observation note book)

Scheme of valuation for Dissertation

Internal: Part I – Second semester – 20 Marks
Part II – Fourth semester – 20 Marks
External: 40 Marks(Part I – 20 Marks, Part II – 20 Marks)
Viva-voce - 20 marks

Pattern of Question paper (Theory)

Duration of the examination - 3 hours, Maximum marks – 75

Part A
Answer All Questions 1X10 = 10
(Like UGC Question Pattern)
Part B
Answer All Questions
(Internal choice questions) 5X3 = 15
Part C
Answer All questions 5X10 =50
(Internal Choice questions)
Total 75 marks

(All parts of question should have equal importance to all five units in the syllabus)

Appendix I

Title of the Manuscript

(The title of the paper should unambiguously reflect its contents. Title isconcise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible)

First Author#1, Second Author#2, Third Author#3, Fourth Author#4.

A. Abstract

The abstract should be concise not exceeding 250 words. It should mention the techniques used without going into methodological detail and should summarize the most important results. Please do not include any citation in the abstract and avoid using abbreviations if possible.

B. **Keywords**: maximum of 5 keywords separated by commas in the hierarchy of the paper's sequential order is obligatory.

C. Subdivision - numbered sections

Divide your article into clearly defined and numbered sections. Subsections should be numbered as 1.1 (then 1.1.1, 1.1.2), 1.2, etc. (the abstract is not included in section numbering). Each heading should appear on its own separate line.

1. Introduction - The context of the problem with its suitable relevance and objectives in one or two sentences and description of what is expected to be found out.
2. Materials and Methods - outline of the study design, sample selection, analytical methods and data analysis.
3. Results and Discussion – Presentation of data observed with statistical significance in the form of tables or graphs / figures. Figures must be submitted in JEPG or TIFF format. Graphs created in Microsoft Excel have to be attached as separate file. Photographs if any are submitted as original file.
4. Conclusion - emphasize new and important outcomes of the study or observations.
5. References - APA format – complete and current, numbered consecutively in the order as they appeared in the text; should have been published within the past five years.

D. General instructions

Submission of the manuscripts should be in English not exceeding 12 pages including Tables, Figures and References. Footnotes should be given if needed and it should be numbered consecutively. All citations and footnotes in the text should be documented in the references and vice versa, in the sequential order.

All the title, author names and abstract must be in single-column format and must be centered. Author details must be given at the bottom of first column of the first page.

Every word in a title must be capitalized except for short minor words such as "a" "an" "and" "as" "at" "by" "for" "from" "if" "in" "into" "on" "or" "of" "the" "to" "with". Author details must not show any professional title (e.g. Managing Director), any academic title (e.g. Dr.) or any membership of any professional organization (e.g. Senior Member IEEE). Email address is compulsory for the corresponding author.

#1 First author affiliations; department, name of the organization, city, country. Email address
#2 Second affiliations; department, name of the organization, city, country. Email address
#3 Third affiliations; department, name of the organization, city, country. Email address

#4 Fourth affiliations; department, name of the organization, city, country. Email address
Corresponding author details:Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. Ensure that the e-mail address is given and that contactdetails are kept up to date by the corresponding author**.**

Page Layout

Page size corresponding to A4 which is 210mm (8.27") wide and 297mm (11.69") long. The margins must be set as follows

- Top = 1" (254mm)
- Bottom = 1" (254mm)
- Left = right = 1" (254mm)

Your paper must be in single column format with 1.5 line space. All paragraphs must be justified, i.e. both left–justified and right-justified.

Font Style and Size

S.No.	SECTION	FONT TYPE	FONT SIZE	FONT STYLE
1.	Title	Cambria	12	Capital, bold and regular
2.	Authors detail	Cambria	10	Uncapital, unbold, regular
3.	Authors affiliation details	Cambria	10	Uncapital, unbold, regular
4.	Abstract, introduction., - side headings	Cambria	10	capital, bold, regular
5.	Content of the abstract	Cambria	10	Uncapital, unbold, italic
6.	keywords	Cambria	10	Uncapital, unbold, italic
7.	Text part	Cambria	10	Uncapital, unbold, regular (italics wherever needed)
8.	Sub side headings	Cambria	10	Uncapital, bold, regular
9.	Sub sub side headings	Cambria	10	Uncapital, bold, italic.
10.	Table headings (refer model)	Cambria	10	Capital, bold, regular
11.	Figure headings (refer model)	Cambria	10	Uncapital, bold, regular
12.	References and Foot notes	Cambria	9	Uncapital, unbold, regular

Model Table

TABLE 1: HEADING

Footnote comprises of abbreviations, figure in parenthesis, alphabets in superscript of the value in the table.

Model Figure

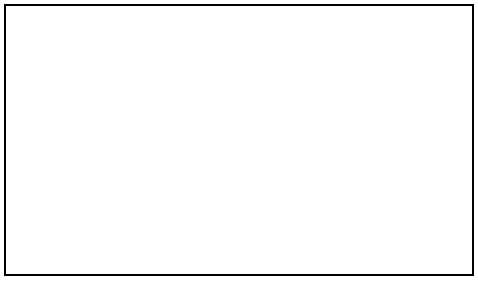


Fig.1: Heading

Mathematical Equations

Equations and formula should be readable, preferably written using equation editing software (E.g. Math Type or Microsoft equation editor).

Abbreviations

Whole abbreviations should be defined on first use in the text along with the abbreviation in parenthesis. E.g. Magnetic Resonance Imaging (MRI).

Page Numbers, Headers and Footers

Page numbers, headers and footers must not be used

Reference Style

Text*:* Citations in the text should follow the referencing style used by the American Psychological Association. It can be referred to the Publication Manual of the American Psychological Association, Sixth Edition, ISBN 978-1-4338-0561-5, copies of which may be ordered from http://books.apa.org/books.cfm?id=4200067 or APA Order Dept., P.O.B. 2710, Hyattsville, MD 20784, USA or APA, 3 Henrietta Street, London, WC3E 8LU, UK. In the text it refer to the author's name (without initials) and year of publication (e.g. "Steventon, Donald and Gladden (1994) studied the effects..." or "...similar to values reported by others (Anderson, Douglas, Morrison &Weiping, 1990)..."). For 2-3 authors all authors are to be listed at first citation. At subsequent citations use first author *et al*. When there are more than 3 authors, first author *et al*. should be used throughout the text.

List*:* references should be arranged first alphabetically and then further sorted chronologically if necessary. More than one reference from the same author(s) in the same year must be identified by the letters 'a', 'b', 'c', etc., placed after the year of publication. The manuscript should be carefully checked to ensure that the spelling of authors' names and dates are exactly the same in the text as in the reference list.

Examples:

Reference to a journal publication:

Van der Geer, J., Hanraads, J. A. J., & Lupton, R. A. (2010).The art of writing a scientific article.Journal of Scientific Communications, 163, 51–59.

Reference to a book:

Strunk, W., Jr., & White, E. B. (2000).*The elements of style.*(4th ed.). New York: Longman, (Chapter 4).

Reference to a chapter in an edited book:

Mettam, G. R., & Adams, L. B. (2009).How to prepare an electronic version of your article. In B. S. Jones, & R. Z. Smith (Eds.), *Introduction to the electronic age* (pp. 281–304). New York: E-Publishing Inc.

Reference to a website:

Cancer Research UK. Cancer statistics reports for the UK. (2003). http://www.cancerresearchuk.org/aboutcancer/statistics/cancerstatsreport/ Accessed 13.03.03.

(dataset) Oguro, M., Imahiro, S., Saito, S., Nakashizuka, T. (2015). Mortality data for Japanese oak wilt disease and surrounding forest composition. Mendeley data, v1.http://dx.doi.org/10.17632/xwj98nb39r.1.

Unpublished results and personal communications are not recommended in the reference list, but may be mentioned in the text. If these references are included in the reference list they should follow the standard reference style of the journal and should include a substitution of the publication date with either 'Unpublished results' or 'Personal communication'. Citation of a reference as 'in press' implies that the item has been accepted for publication.

E. Research Data

To facilitate reproducibility and data reuse, original data entered in excel sheet, software code models, algorithms, protocols, methods and other useful materials related to the project are to be shared through department email id pufoodscience@gamil.com.

F. Additional Information

Abbreviations for units should follow the suggestions of the British Standards publication BS 1991. The full stop should not be included in abbreviations, e.g. m (not m.), ppm (not p.p.m.), % and '/' should be used in preference to 'per cent' and 'per'. Where abbreviations are likely to cause ambiguity or may not be readily understood by an international readership, units should be put in full. Current recognized (IUPAC) chemical nomenclature should be used, although commonly accepted trivial names may be used where there is no risk of ambiguity. The use of proprietary names should be avoided. Papers essentially of an advertising nature will not be accepted.

G. Supplementary Material

Full articles quoted in the reference part should be enclosed along with manuscript.

Appendix II

Modules for the short term courses

Corel Draw and Adobe Photoshop – Nutritional Labeling (16FSNST01)

Objectives

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

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

Biostatistics using software (16FSNST02)

Objectives

1. To educate the students on application of statistics in food science and nutrition related research using Microsoft Excel functions and SPSS software.

Module	Sub Modules	L	T	P	Total hours
Microsoft Excel and SPSS	Statistical concepts	1	1	-	2
	Sampling and sample size calculation	1	1	2	4
	Hypothesis	1	1	1	3
	Parametric and Non Parametric tests	2	-	1	3
	Microsoft Excel function and SPSS data input	-	1	3	4
	Descriptive statistics	-	1	2	3
	Sorting, filtering and cross tabulation of data	-	1	3	4
	't' test	-	1	4	5
	ANOVA		1	4	5
	Correlation and Regression	-	1	4	5
	Non Parametric tests		2	2	4
	Total	5	11	26	42

Advanced Analytical Techniques in Food Quality Control (16FSNST03)

Objectives

1. To enhance the knowledge of the students on principle, techniques, operation and application of advanced analytical instruments in food science and nutrition.

Module	Sub Modules	L	T	P	Total hours
UV Visible	Principle and parts of the instrument	1	-	-	1

Spectrophotometer, High Performance Liquid Chromatography (HPLC), Rapid ViscoAnalyser (RVA), Differential Scanning Calorimeter (DSC), Atomic Absorption Spectrophotometer (AAS)	Standard Operating Procedures	1	1	-	2
	Sample preparation and techniques in analysis	1	-	3	4
	Demonstration of operation	-	3	-	3
	Experimentation	-	-	3	3
	Data analysis, storage and interpretation	1	1	2	4
	Pre and post analysis care of the instrument	1	-	3	4
	Any two instrument operation (21 x 2 = 42 hours)	5	5	11	21
	Total	10	10	22	42

In Vitro and *In Vivo* Techniques in Nutrition (16FSNST04)

Objectives

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

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

Semester I

PAPER I (CORE)

FOOD SCIENCE AND CHEMISTRY

SUB. CODE: 16FSNC01 **HOURS**: L+T+P=C

MARKS:100 3+1+0=4

Objectives

1. To learn about colloidal systems, properties and chemistry of food in raw form and on cooking.

UNIT I

Concept of food and nutrients.Colloidal system in foods –types and properties of colloids.Sols – types, properties.Gels- theory of gel formation and factors influencing gel formation.Emulsions – types and nature, types of surface films and activity, common food emulsifies, functions of emulsifying agents, emulsification capacity, factors affecting emulsion stability. Foams – theory of foam formation, factors affecting foam formation, foaming capacity and stability, factors affecting foaming stability. Hydrocolloids.

UNIT II

Cereals and Millets- classification, nutritional composition, structure, types of starch in cereals, principles of starch cookery – gelatinization, gelation, retro gradation, syneresis and dextrinisation, starch uses in food systems. Pulses, nuts and oil seeds- classification, nutritional composition, structure, toxic constituents in pulses, factors influencing cooking quality of pulses, complementary proteins.

UNIT III

Sugars- sources, properties, stages of sugar cookery, sugar substitutes, crystalline and non-crystalline candies. Vegetables and fruits –composition, classification, pigments, enzymes, tannins, pectin, acids and flavors, changes during cooking, effect of cooking on pigments, browning reaction, ripening of fruits.

UNIT IV

Egg- structure, composition, coagulation of egg protein, factors affecting coagulation of egg protein, egg quality. Meat – structure and composition, postmortem changes, tenderness of meat, changes during cooking. Poultry and fish – classification, composition and structure.

UNIT V

Milk – types, composition, physical and chemical properties, effect of heat, acids and enzymes, milk substitutes.

Fats and oils - sources, properties, kinds, effect of heating on fat, rancidity of fat and its prevention. Spices and condiments- types, uses and abuses.Coffee, Tea and Cocoa beans – types and composition.

References

1. Sri Lakshmi, B. Food Science, New Age International [p] Limited, New Delhi, Third Edition, 2003
2. Potter, N.W., Food Science, AVI Publishing Co. Cunneticut, 1960.
3. Shakuntalamanay, N&Shadakcheraswamy, M, Foods, facts and principles, Wiley Easterd Ltd. 2004.
4. Vaclavik, V & Christian, E.W. Essentials of Food Science, XXIV edition, WWW.Springer.com/978-1-4614-9137-8. 2014.
5. M.N. Ahmed, Food Science and Nutrition, 1st Edition Anmol Publications Pvt. Ltd, New Delhi. 2005.

PAPER II (CORE)
FOOD SCIENCE AND CHEMISTRY PRACTICALS

SUB CODE: 16FSNC02 **HOURS**: L+T+P = C
MARKS : 100 0+0+3 = 2

Objectives

1. To gain practical experience on chemistry and science of food and nutrients.

Quantitative

Colloidal properties

1. Determination of least gelation concentration of flour.
2. Determination of emulsification capacity of a natural emulsifier.
3. Determination of foaming capacity and foaming stability of egg white foam.

Carbohydrates

4. Microscopic examination of flour / starches
5. Determination of gelatinization and retrogradation properties of cereal / pulse flour using DSC (Demonstration)
6. Determination of pasting properties of flour using RVA (Demonstration)

Protein

7. Determination of gluten content in wheat flour
8. Determination of relative density and casein content in milk.
9. Effect of salt in meat

Fat

10. Determination of smoking point of oil
11. Determination of Iodine number of oil
12. Determination of saponification number of oil

Fiber

13. Determination of pectin content in fruits

References

1. MohiniSethi and Eram S. Rao (2005) Food Science Experiments and Applications, CBS Publishers & Distributors, New Delhi.
2. Pomeranz, Y.(Ed), (1991), Functional properties of food components, (2nd edition), Academic press, New Delhi
3. Bowers, J. (1992): Food theory and applications, (2nd edition), Macmillan Publishing co., New elhi.
4. Weaver, C. (1996). The food chemistry laboratory: a manual for experimental foods, dietetics, and food scientists. CRC Press, LLC.
5. Wrolstad, R.E. 2012. Food carbohydrate chemistry**.** John Wiley & Sons, Inc, and Institute of Food Technologists.
6. American Association of Cereal Chemists (AACC). 2000. Approved Methods of the AACC method 22-08.10th ed. St. Paul, MN.
7. Ranganna, S. (1986): Handbook of Analysis and Quality Control for Fruit and Vegetable Products, 2nd edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

PAPER III (CORE)
FOOD PROCESSING TECHNOLOGY

SUB CODE: 16FSNC03 **HOURS**: L+T+ P=C
MARK : 100 4+1+0= 5

Objectives

1. To disseminate the knowledge on processing of food in industry.

UNIT I

Cereal Processing- Rice- pre processing, parboiling, milling, by products of rice milling; Wheat- preprocessing, milling, by products of wheat milling; malting, manufacture of breakfast cereals, extruded products, puffed and flaked cereals. Processing of millets.

Pulse/legume Processing – milling and germination.

UNIT –II

Milk Processing –pre processing, Separation, standardization, pasteurization, homogenization, sterilization, evaporation, drying, condensation, membrane fractionation, milk products -butter, ghee, cream, paneer, yoghurt and cheese.

Egg Processing – manufacturing of egg powder.

UNIT-III

Fleshy food Processing – pre processing, canning, dehydro freezing, dehydration of meat, poultry and fish, smoking and curing of meat, fish oil extraction.

Oil Seeds Processing– pre processing, milling, extraction of oil and it's processing, production of meal concentrates and isolates, specialty fats from non-traditional oilseeds, modification of fat, fat substitutes and replacers and fat mimetics,

UNIT – IV

Fruits and vegetables Processing–pre processing, drying and dehydration, juices extraction, concentrates preparation, Minimal processing and Hurdle technology.

Production of mushroom and its processed products.

Processing of coffee, tea leaves and cocoa beans.

UNIT V

Sugar – Manufacturing of sugar from sugarcane and palm, sugar cubes and powdered sugar.

Starch – Starch isolation, modification of starch. Manufacturing of food Hydrocolloids – CMC and gaur gum.

Spices Technology - Extraction of essential oils - oleoresin and colors.

Practical Experience

1. Visit to food processing Industries- Rice, wheat, pulse, millets, fleshy foods, Egg, milk, and milk product and fruit and vegetable processing Industry.

References

1. Rick Parkar, Introduction to Food Science, Library of Congress Cataloging-in- Publication Data, First Edition, 2002.
2. SumanBhatti& Uma Varma, Fruit & Vegetable Processing Organizations and Institutions, CBS Publishers and Distributors, New Delhi, Reprint 2003.
3. Thoms Richardson and Johan W. Finley, Chemical Changes in Food during Processing, CBS Publishers and Distributors, New Delhi, 2003.
4. YeshajahuPomeranz Clifton E.Meloan, Food Analysis theory and Practice, CBS Publishers and Distributors, New Delhi Third Edition, 2004.
5. MiridulaMirajkar, Sreelatamenon, Food Science and Processing Technology, Volume-II Commercial Processing and Packaging, Kanishka Publishers & Distributors, New Delhi, 2005.

PAPER IV (CORE)
RESEARCH METHODOLOGY AND STATISTICS

SUB. CODE: 16FSNC04 **HOURS**: L + T+P=C
MARKS:100 3 + 1+0= 4

Objectives

1. To gain knowledge on methods of research and statistical techniques in food science and nutrition.

UNIT I

Meaning of research, purpose of research, types of research, steps of research process, selection and formulation of research problem, Review of literature, Research Objectives, Hypothesis, Types of Research design – Interventional and non interventional studies,cross sectional and longitudinal studies, Epidemiological methods. Census and sampling design, steps in sample design; criteria of selecting a sampling procedure; Characteristics of a good sampling design,Sampling methods - Random sampling methods and Non-Random sampling methods, size of sample, sampling and non-sampling errors.

UNIT II

Methods of collecting primary data – quantitative data - survey, experiments, observation and simulation; qualitative - focus group, key informant interviews, community health resource inventory and case studies. Method of collecting secondary data- Sources of secondary data, precautions while using secondary data. Ethical issues in data collection. Measurement in research and measurement scales, tests of sound measurement – test of validity, reliability and practicality.

UNIT III

Editing and coding the data, Organization of data- Classification, meaning and objectives, types of classification, Tabulation –parts of a table, general rules of tabulation, types of tables.Representation of data – Diagrammatic and graphical representation, Significance of diagrams and graphs, General rules for constructing diagrams, Types of diagrams and graphs.

UNIT IV

Application of statistics in research - Measures of central Tendency – Mean, Median, Mode. Measures of dispersion- Mean deviation, standard deviation, quartile deviation, co-efficient of variation, Range and Percentiles.Testing of Hypothesis – Basic concepts, procedure for hypothesis testing, parametric tests - z-tests, t-tests, chi-square tests, F- tests, post hoc tests in ANOVA.

UNIT V

Testing of Hypothesis – Non parametric tests, Correlation and Regression, Multivariate analysis techniques – types, characteristics of important multivariate techniques in Food Science and Nutrition research.Interpretation and Report writing- Format of research report, types, steps and stages, mechanism and style, essentials for good report.Mechanism of scientific writing.

Practical Experiences

1. Statistical packages- application of data analysis package in calculation of mean, SD,'t' test, ANOVA, Correlation, Regression etc. with suitable nutrition research examples.

References

1. Kothari, C.R , Research Methodology, 2002.
2. Gupta, S.P, Statistical Methods, Sultana Chand and Sons, 31st revised edition, 2002.
3. Devadas, R.P ,A Handbook on Methodology of Research, Sri Ramakrishna Vidhyalaya, Coimbatore, 1989.
4. Ramakrishnan, P , Biostatistics, Saras publication, 2001.
5. Donald, H.M.C. Burney , Research Methods, fifth edition, Thomson and Wadsworth Publications, 2002.
6. Shanthi,P., Sophia and Bharathi , Computer oriented statistical methods/ probability and Statistics, charulatha publications, second edition, 2000.
7. Pillai,R.S.N and Bagavathi,V , Statistics, Chand and company limited, 2001 .

PAPER V (ELECTIVE)
FOOD PACKAGING TECHNOLOGY

SUB. CODE : 16FSNE01 **HOURS**: L + T+P=C
MARKS :100 3 + 1+0=4

Objectives

1. To gain knowledge on packaging requisites of food and its products.

UNIT I

History, Packaging Functions and Requirements- Historical background, importance and scope of food packaging, functions of food packaging and requirements for effective food packaging. Graphics, Package Design, Printing and Labeling- Function of packaging graphics, main printing processes, printing inks, varnishes, adhesives and labels.

UNIT II

Paper and paper-based materials, corrugated fiber board (CFB). Injection molding, blow molding, types of plastics and their properties, co-extrusion, lamination, Biodegradable plastics, edible packaging and bio-composites. Environmental Concerns- recycling and disposal of packaging waste. Metal and Glass packaging- Metals: Tinplate, tinning process, components of tinplate, tin free can (TFC), types of can, metallic films, lacquers, Glass: composition, properties, methods of bottle making, types of closures.

UNIT-III

Package design for fresh horticultural produce and animal foods, dry and moisture sensitive foods, frozen foods, fats and oils, thermally processed foods and beverages**.**

UNIT IV

Testing Procedures for Packaging Materials- thickness, tensile strength, puncture resistance, bursting strength, seal strength, water vapor permeability, CO2 permeability, oxygen permeability, grease resistance.Testing Procedures for Packaged Foods - Compatibility and shelf life studies, evaluation of transport worthiness of filled packages.Food Packaging Laws and Regulations.

UNIT V

Bottling machines, cartoning systems, seal and shrink packaging machine. Form, fill and sealing machine (FFS). Vacuum, controlled and modified atmosphere packaging systems. Aseptic packaging systems. Retort packaging, Active and Intelligent packaging systems.

Practical experiences

1. Visit to food package and label manufacturing industry.

References

1. Robertson GL, Food Packaging – Principles and Practice, CRC Press Taylor and Francis Group, 2012.
2. Paine FA and Paine HY, A Handbook of Food Packaging, Blackie Academic and Professional, 1992.
   Coles R, McDowell D, Kirwan MJ Food Packaging Technology. Blackwell, 2003.

PAPER VI (ELECTIVE)
INSTRUMENTATION IN FOOD PROCESSING

SUB CODE :16FSNE02 **HOURS**: L + T+P=C
MARKS:100 3 + 1+0=4

Objectives

1. To acquaint with fundamentals of food engineering and its process.

UNIT – I

Unit operations in food processing - classifications; Design and selection of Food Processing equipments; Mechanical transport equipment- pumps, process piping and valves, conveyors; Food storage equipment – solid and liquid food storage equipments.

UNIT –II

Mechanical processing equipment- size reduction- slicers/ dicers, mincers, cutters, crushers and grinders; Size enlargement- Agglomerators , homogenizers and mixers; Mechanical separation equipment – Sorters, separators – solid /solid separators, solid / liquid separators.

UNIT – III

Heat transfer equipments – heat exchangers; Heat generation equipments- microwave oven, omhic heating system, infrared emitters; Food evaporation equipments- Evaporators ; Thermal processing equipments – Blanchers, sterilizers and pasteurizers.

UNIT –IV

Mass transfer equipments – distillers , extraction and leaching equipments, gas and liquid absorption equipments , adsorption and ion exchange equipments, crystallizers.

Food Dehydration equipment- dryers; Refrigeration and freezing equipment – refrigerators, freezers, thawers, freeze driers or lyophilizers

UNIT – V

Equipments for novel food processes – Membrane separation equipment, irradiation system, extruders, fementors, pulse electric field processing equipment, High pressure processing equipment, pulsed light processing equipment; Food packaging equipment- fillers, closures, sealers, wrappers, aseptic packaging equipment and palletizers.

Practical Experiences

1. Visit to Food Processing Industry.

References

1. Fellows, P.J. (2000), Food Processing technology: Principles and Practice, Second edition, CRC woodhead publishing ltd, Cambridge.
2. Peter Zeuthen and Leif Bogh – Sorensen, (2003), Food Preservation techniques, Woodhead publishing ltd.
3. George D. Saravacos and Athanasios E. Kostaropoulos (2002) Handbook of Food Processing Equipment, Kluwer Academic /Plenum publishers.

PAPER I (SUPPORTIVE)
FOOD PRESERVATION PRACTICAL

SUB. CODE: 16FSNS01 **HOURS**: L + T+P=C
MARKS **:** 100 1 + 1+ 2=4

Objectives

1. To introduce students to hands-on experience with food preservation methods

Practical Training on

1. Heat Processing and Preservation Techniques –blanching, roasting, frying and baking
2. Cold Processing and Preservation Techniques – chilling and freezing
3. Addition of Preservatives – jam, squash, juices, preserves, pickles
4. Minimally processed fruits and vegetables
5. Drying and dehydration – vadam, vatthal, dried raisins/amla/coconut
6. Fermentation – curd and yoghurt

SEMESTER II

PAPER I

FOOD MICROIOLOGY AND PRESERVATION

SUB. CODE: 16FSNC05 **HOURS**: L + T+P=C

MARKS : 100 3 + 1+ 0=4

Objectives

1. To integrate the knowledge on microorganisms and its identification in food; method of preservation of food to control the growth of microorganisms.

Unit I

Microbiology: Introduction, historical developments in food microbiology; prokaryotes andeukaryotes; classification of microorganisms- Sources of microorganisms infoods; microbial growth, growth curve; factors affecting growth-intrinsic and extrinsic factorscontrolling growth of microorganisms.

Unit II

Food spoilage and microbes of milk, meats, fish and various plant products, spoilage of cannedfoods; Microbiological criteria of foods and their significance; the HACCPsystem and food safety used in controlling microbiological hazards, applications of hurdletechnology for controlling microbial growth.

Unit III

Effect of food preservatives, heating process, irradiation, low temperature storage, chemical preservativesand Non destructive method of preservation – High pressure processing, pulse electric field, pulse light field, ultrasound, MAP, CAP and vaccum packaging on the microbiology of foods; control of water activity and microbialgrowth.

Unit IV

Foods microbiology and public health: food poisoning, types of food poisonings, importantfeatures etc; bacterial agents of food borne illness, food poisoning by clostridium, salmonella, E.coli, bacillus, staphylococcus etc.; non-bacterial agents of food borne illness: poisonous algae,and fungi - a brief account.

Unit V

Indicator microorganisms; methods of isolation and detection of microorganisms or their products in food - conventional methods; rapid methods (newer techniques) - immunological methods, fluorescent,antibody, radio immunoassay, ELISA, PCR (Polymerized chain reactions).

References:

1. James M. Jay (2000). Modern Food Microbiology, 5th Edition, CBS Publishers.
2. Banwart, G.J. (1997). Basic Food Microbiology, CBS Publishers.
3. Adam M.R. & Moss, M.O. (1995). Food Microbiology, New Age International Pvt. LtdPublishers.
4. Bibek Ray (1996). Fundamental Food Microbiology, CRC Press.
5. Stanier, R.Y. (1996). General Microbiology, Vth Edition, MacMillan

PAPER II

FOOD SAFETY AND QUALITY CONTROL

SUB. CODE: 16FSNC06 **HOURS**: L + T+P=C

MARKS **: 100** **3 +1+ 0=4**

Objective

1. To acquaint with food quality parameters and control systems, food standards, regulations, specifications.

UNIT I

Introduction to concepts of food quality, food safety, food quality assurance and food qualitymanagement; Quality Control vs Quality Assurance in a food industry, Current challenges to foodsafety.Food additives and adulteration, nature of adulterants, methods of evaluation of food adulterants, additives and toxicconstituents.

UNIT II

Quality attributes- physical, chemical, functional, nutritional, microbial and sensory; their measurement and evaluation; Sensory *vis-àvis*instrumental methods for testing quality.Shelf life evaluation.Statistical quality control in food industry.Quality Manuals – FSSAI, BIS and AGMARK.

UNIT III

Quality management systems in India- Quality Management System: ISO 9000, Food Safety Management System: ISO 22000, Environment Management System: ISO 14000, Laboratory Management System: ISO 17025; Retail Practices and Standards; Pest Control Program; IPR and Patent.

UNIT IV

International Food Regulatory Agencies - Introduction to WTOagreements: SPS and TBT agreements, FAO and Codex alimentarious commission; HALAL, Total Quality Management (TQM); GMP/GHP; GLP, GAP; Sanitary and hygienic practices; HACCP; Food Export and Import Policy.

UNIT V

Role of Bureau of Indian Standards (BIS),AGMARK, Food Safety and Standards Authority of India (FSSAI) – Food safety and standards bill, General Food Safety Regulations, Food Regulatory Enforcement and Compliance through Inspection, Licensing and Registration of Food Business regulations, Prohibition and Restriction on Sales regulations, Laboratory and Sample Analysis Regulations, Packaging and Labeling Regulations.PFA, Essential Commodities Act, Standard of Weights and Measures Act, Export Inspection Council (APEDA) and Consumer Protection Act.

References:

1. Early. R. (1995): Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London.
2. Gould, W.A and Gould, R.W. (1998). Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
3. Pomeraz, Y. and MeLoari, C.E. (1996): Food Analysis: Theory and Practice, CBS publishers and Distributor, New Delhi.
4. Bryan, F.L. (1992): Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. World Health Organization, Geneva
5. Kirk, R.S and Sawyer, R. (1991): Pearson's Composition and Analysis of Foods, Longman Scientific and Technical. 9th Edition, England.
6. Food and Agricultural Organization (1980): Manuals of Food Quality Control. 2 Additives Contaminants Techniques, Rome.
7. Furia, T.E. Ed. 1980. Regulatory Status of Direct Food Additives. CRC Press, Florida.
8. Krammer, A. and Twigg, B.A. (1970). Quality Control for the Food Industry. 3rd Edn. AVI, Westport.
9. Rekha S. Singhal ,Pushpa R. Kulkarni, Dananesh V. Rege, (1997). Hand Book of Indices of food Quality and Authenticity, wood head Publishing Ltd.
10. Hubbard, Merton R. (2003). Statistical Quality Control for the Food Industry, 3rd Edition, Springer.

PAPER III (CORE)

FOOD SAFETY AND QUALITY CONTROL PRACTICAL

SUB. CODE: 16FSNC07 **HOURS**: L + T +P=C
MARKS:100 0 + 0+3 = 2

Objectives

1. To develop skills related to safety and quality evaluation of foods.

Physical and Functional

2. Determination of physical dimensions of food.
3. Determination of bulk density, WAC and FAC of grain/flour

Chemical

4. Determination of pH, titrable acidity and total soluble solids of fruit pulp.

Microbial

5. Determination of total microbial count.
6. Determination of Antimicrobial and antifungal activity.

Sensory

7. Taste sensitivity tests.
8. Subjective evaluation of sensory profile.

Adulteration

9. Tests for adulterants.
10. Identification of additives.

Packaging Material

11. Identification of packaging material.
12. Identification of parts of a food label.

References

1. Venderzant, c. and D.F. SplittsToesser (1992): Compendium of methods of the microbiological examination of Doods, 3rd edition, American public health Association, Washington D. C.
2. Lawless, H.T. and Klein, B.P. (1991): Sensory science theory and applications in foods. Marcel Dekker Inc.
3. Ranganna, S. (2004), Handbook of analysis and quality control for fruit and vegetable products Tata McGraw Hill publishing co.Ltd., New Delhi
4. Journal of Food Science and Technology, AFSTI publications.
5. FSSAI Manuals for Quality testing (www.fssai.gov.in)

PAPER IV (CORE)
FOOD COMPOSITION ANALYSIS PRACTICAL

SUB. CODE: 16FSNC08 **HOURS**: L + T +P=C
MARKS:100 0 + 0+3 =2

Objectives

1. To educate the students on analytical techniques and accuracy in food composition analysis.

I. **Quantitative**

Macronutrients

1. Total sugar by phenol sulphuric acid method
2. Protein by Kjeldhal and Lowry's method
3. Fat by Soxhletmethod
4. Moisture by hot air oven method and moisture analyser
5. Ash content by AOAC method
6. Crude fiber by acid and alkali digestion method

Micronutrients

Vitamins

7. Total carotenoids
8. Ascorbic acid

Minerals

9. Calcium
10. Iron
11. Phosphorus
12. Sodium

Qualitative Tests

13. Qualitative Tests for sugars, aminoacids and phytochemicals

Demonstration

1. Energy value by bomb calorimeter
2. Analysis of sugar fractions by HPLC.
3. Analysis of mineral content by AAS.

References

1. Raghuramulu, N., Nair, K.M. and Kalyanasundaram, A. (1983), A Manual of laboratory Techniques, National Institute of Nutrition, Silver prints, Hyderabad.
2. Oser, B.L.(1954), Hawke's physiological chemistry, XIV edition, Tata MC Graw Hill Publishing company ltd, Mumbai.
3. Jayaram. J.(1996), Laboratory manual in Biochemistry, New Age International Ltd, publishers, New Delhi, fifth reprint.
4. Sadasivam, S and Manickam, A (1991), Biochemical methods, New Age International Pvt. Ltd, publishers, New Delhi, 2nd edition.
5. Pomeranz, Y. and Meloan, C. E (1996): Food Analysis: Theory and Practice, CBS Publishers and Distributor, New Delhi.

PAPER V (ELECTIVE)

FOOD INDUSTRIES WASTE MANAGEMENT

SUB. CODE: 16FSNE03 **HOURS**: L + T +P=C

MARKS:100 3 + 1+0 =4

Objectives

1. To educate the students on wastes, waste disposal and regulations and standards in the waste management in food industry

Unit I

Introduction: types of waste generated; non-degradable & biodegradable wastes; food industrialwastes from fruit and vegetable processing industry; beverage industry, fish, meat & poultryindustry, sugar industry and dairy industry.

Unit II

Storage & disposal of waste: solid waste storage and disposal methods- land-filling, burial,incineration, recycling; biological treatment of food industry wastes, storage and disposal of liquidand gaseous waste; legal aspects related to storage and disposal.

Unit III

Utilization of waste: methods of utilizing wastes to make value added products; pectin, foodcolorants, antioxidants from fruit peels (citrus, mango, pomegranate), lycopene from tomato peels,vegetable seed oils, biomolecules and enzymes from meat processing, single cell proteins.

Unit IV

Waste water treatment: standards for disposal of water, physical, chemical and biologicalcharacteristics of waste water; measurement of organic content in waste water; physical unitoperations in waste water treatment - screening; racks, mixing, flocculation, sedimentation,floatation, elutriation, vacuum filtration, incineration; chemical unit operations in waste watertreatment-chemical precipitation, aeration and gas transfer process, rate of gas transfer,adsorption, disinfection; biological unit operations - aerobic and anaerobic.

Unit V

Environment management systems (ISP 14000) and its application in food industry; legislationrelated to waste management; standards for emission or discharge of environmental pollutantsfrom food processing industries covered under PFA Act.

Recommended Books:

1. Robert R. Zall (2004), Managing Food Industry Waste: Common sense methods for Fod Processors, Blackwell Publishing.
2. Loannis S. and Arvanitoyannis (2008). Waste Management in Food Industry, Academic Press
3. VassoOreopoulou and Winfried Russ (2007). Utilization of by products and treatments of waste in Food Industry, Springer publication.
4. Lawrence K. Wang (2006). Waste Treatments in Food Industry, Taylor and Francis.
5. Waldron K. (2007). Handbook of waste Management and Co- product Recovery in Food Processing, Woodhead Publishing Company.

PAPER VI (ELECTIVE)
FOOD BIOTECHNOLOGY

SUB. CODE: 16FSNE04 **HOURS**: L + T +P=C
MARKS:100 3 + 1+0 =4

Unit I

Introduction to food biotechnology; basic principles of genetic engineering; improvement of thefood crops by genetic engineering; genetically modified plants and animals for enhanced foodproduction; safety of GM food crops, ethical issues concerning GM foods; trade related aspects of biotech foods; intellectual property rights (IPR) issues and biopiracy problems.

Unit II

Natural antimicrobials for food preservation: phytoalexins, essential oils and their components;bacteriocins: nisin, pediocinsetc; applications of bacteriocins in food systems as biopreservatives. Biotechnological routes to food colour and flavour production: microbial, enzymatic etc.

Unit III

Protein engineering in food technology: methods, applications of protein engineering to produceglucose isomerase, Lactobacillus beta-galactosidase and peptide antibiotic nisin. Biotechnology for protein security: prospects and problems.

Unit IV

Biotechnology and Food ingredients: biogums, fat substitutes, biocolors, organic acids andsweeteners.Transgenic plant foods: golden rice, Btbrinjal, maize, tomato, potato, soyabean etc.production of Food additives and supplements. Nanotechnology: Principles and applications in foods.Effect of biotech foods on the food business of developing and developed countries.

Unit V

Food Fermentation - Process in production of alcoholic beverages, cheese making, bread making, fermented soya based foods, meat fermentations and vinegar.Microbial products – Primary and secondary metabolites, Vit B_{12}, Citric Acid, Penicillin & alcohol.Microbial biomass production-baker's yeast, single cell protein and mushroom.Probiotics and Prebiotics.

References:

1. Lee, B.H. (1996). Fundamentals of Food Biotechnology, VCH Publishers.
2. Tombs, M.P. (1991). Biotechnology in Food Industry, Open University Press, Milton Keyness.
3. Knorr, D. (1987). Food Biotechnology, Marcel Dekker , INC , new yark.
4. Schwartzberg, A &Rao (1990). Biotechnology & Food Process Engineering, Marcel Dekker , INC , New York.
5. Goldberg, I & Williams, R. (1991). Biotechnology and food Ingredients, Van Nostrand Reinhold, New York.
6. King , R . D. and Cheetham , P.S.J. (1986)). Food Biotechnology, Elsevier Applied Science, London.

SEMESTER III

PAPER I (CORE)

NUTRITIONAL BIOCHEMISTRY

SUB CODE: 16FSNC09 **HOURS**: L + T+P=C

MARKS : 100 3 + 1+ 0=4

Objectives

1. To provide an understanding of biochemistry, digestion, absorption and utilization of macronutrients and micronutrients.

UNIT I

Water: Body water and distribution in the body; functions of water in the body; water requirement by the human body and water balance.

Energy: Energyvalue of food and its determination; energy expenditure-components-basal metabolism, physical activity, SDA of food, factors affecting BMR; energy utilization in cells; energy balance; energy requirement and energy system in the body.

UNIT- II

Carbohydrates: Dietary types of carbohydrate; functions of carbohydrates, amino sugars, proteoglycans and glycoproteins; digestion and absorption of carbohydrates;metabolism – glycolysis,kreb's cycle, pyruvate decorboxylation, oxidative pathway, pentose phosphate pathway, glycogensis, glycogenolysis and gluconeogenesis; energetics of carbohydrate metabolism and regulation of blood glucose level.

Complex carbohydrates and dietary fiber: classification; role of dietary fiber and resistant starch; requirement and safe intake; effect of overconsumption of fiber.

UNIT III

Protein: Nutritional classification of proteins; functions of proteins; digestion and absorption of proteins; protein metabolism-transformation, decarboxylation, ammonia formation and transport, urea cycle; nutritional classification of amino acids; biologically active peptides and sequencing of protein; protein requirements; amino acid balance in the diet.

UNIT IV

Fats: classification of lipids and fatty acids; digestion and absorption of fats; functions of lipids; lipid metabolism-hydrolysis of triacylglycerols, α, β and ω- oxidation of fatty acids, lipid and fatty acid biosynthesis; metabolism of cholesterol and its regulation; ketosis; lipoproteins in the blood and its functions; fat requirements and energetic of fatty acid cycle.

UNIT V

Vitamins and minerals: Vitamins - water and fat soluble vitamins, biochemical functions, requirements, digestion, absorption and metabolism of vitamins, interrelationship between vitamins; Minerals- Macro, micro and trace minerals, biochemical functions, requirements, digestion, absorption and metabolism of minerals; interrelationship between vitamins, interrelationship between minerals and interrelationship between vitamins and minerals.

Practical Experiences

1. Energy balance analysis of an individual
2. Determination of PER using animal model – Demonstration
3. Vitamins and Minerals supplements available in the market and its analysis

References

1. Voet, D and Voet, G., "Biochemistry", Second Edition, John Wiley and Sons, New York, 1994.

2. Belitz, H.D., Grosch, W., Schieberle, P. “Food Chemistry”, Third Edition, Springer-Verley, Berlin, 2004.
3. Stryer, L. (1998): 4th Ed. Biochemistry, WH Freeman and Co.
4. J.L. Jain(2004).Fundamentals Of Biochemistry (Multi Colour Ed), S Chand publisher, 6th Edition.
5. Murray, R K., Granner, D K., Mayes, P A and Rodwell, V W (2012) : 29th Ed Harper’s illustrated Bio-Chemistry. Lange Medical book.
6. Nutritional Biochemistry and Metabolism: With Clinical Applications 2 Sub Edition by Maria C. Linder (Editor)
7. Nutritional biochemistry Nutrition and Dietary Habits, DrAlka Mohan Chutani Senior Dietician, AIIMS New Delhi – 110 049 (Revised Mar-2008)
8. Robert K.Murray, Daryl K. Granner, Peter A.Mayes and Victor W. Rodwell. Harper’s Illustrated Biochemistry, Lange Medical Books/McGraw-HillMedical Publishing Division New York Chicago San Francisco Lisbon London.(Twenty sixth edition 2003).
9. Lehninger, A.L, Biochemistry, worth publishers INC, New York, 2000.
10. RanganathaRao, K. Text book of Biochemistry, Prentice Hall of india, New Delhi, 2000.

PAPER II
NUTRITION IN LIFE CYCLE

SUB. CODE: 16FSNC10 **HOURS**: L + T+P=C
MARKS : 100 3 + 1+ 0=4

Objectives

1. To highlight the growth, development and nutritional requirements in different stages of life cycle.

UNIT I

Concept of different food groups, portion size of food groups and balanced diet (ICMR); Dietary guidelines for Indians; RDA – Basis, components required to derive RDA, Basis for energy, protein, Fat, fiber, vitamins and minerals, RDA by ICMR requirement, computation of allowances.

UNIT II

Nutrition in pregnancy-stages of gestation, maternal physiological adjustments, weight gain during pregnancy, nutritional requirements –preconception nutrition and during pregnancy, storage of nutrients, physiological cost of pregnancy and health concerns of pregnancy.
Nutrition in lactation- hormonal controls & reflex action, physiology of milk production, special food during lactation, nutritional requirements during lactation.

UNIT III

Nutrition in infants – Growth and development, weight as the indicator, breast vs bottle feeding, nutritional allowances, feeding premature and low birth weight infants, supplementary feeding,nutritional components of colostrum and mature milk and weaning foods.
Nutrition in preschool children – growth and development, food habits, nutritional requirements and supplementary foods.

UNIT IV

Nutrition in School age - Early and middle childhood, growth and development, food habits, nutritional needs and feeding – packed lunch.
Nutrition during adolescence – physical growth, pubertal changes, nutritional needs, eating disorders - anorexia nervosa and bulimia, adolescent pregnancy and its complications.

UNIT V

Nutrition in adulthood – Type of work and nutritional requirements.
Nutrition in old adulthood - Process of aging, physiological and psychological changes during old age, nutritional requirements, factors affecting food intake, common nutritional problems in old age.

Practical Experience

1. Visit to anganwadicentres, lactation units, school in-built cafeteria, institutional menu plan analysis, old age homes.

References

1. Swaminathan,M. Advanced text book on Food and Nutrition, , An mol Publication Pvt,Ltd, Second Edition.2004.
2. VenkataiahS.D.,Nutrition Education, Anmol Publication Pvt. Ltd, Revised 2004.

3. MahtabS.Bamji, Prasad Rao, N.Vinodini Reddy. Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt .Ltd, Second Edition, 2003.
4. Srilakshmi, B. Nutrition Science, New Age International [p] ltd, New Delhi, 2002.
5. Gopal,C.Kamalakrishnaswamy, Nutrition in Major Metabolic Disease, Oxford India Paper backs Publisher First Edition 2000.
6. H.P.S. Sachdev, Anna choudhry., Nutrition in children- Developing country concerns N.I. Publications Pvt. Ltd, New Delhi, 2004.
7. Bahasahe and B. Dosa, Hand book of nutrition and diet.
8. Sumati. R. Mudambi, M.V Rajagopal., Fundamentals of Foods & Nutrition, 4th Edition New age International publishers New Delhi, 2006.
9. Judith E. Brown., Nutrition Now, 2nd edition, West / Wadswroth west / Wadsworth, An International Thomson publishing company, 1998.
10. Melvin H. Willams., Nutrition for health fitness & Sport. 5th edition Mcgraw –Hill, publishing Co., 1999.
11. Gordon M. Wardlaw, Anne M. Smith Contemporary Nutrition, McGraw – Hill International Edition -2006.
12. Nutrient Requirement and Recommend Dietary Allowances for Indians by Indian council of Medical research, National Institute of nutrition, Hyderabad, 2004.
13. Dietary Guidelines for Indians, National Institute of Nutrition, Hyderabad, 2004.

PAPER III
PUBLIC HEALTH NUTRITION

SUB. CODE: 16FSNC11 **HOURS**: L + T+P=C
MARKS:100 3 + 1+0=4

Objectives

1. To study the insights of nutritional parameters, public health challenges and strategies.

UNIT I

Definition of community, public health nutrition, public health nutrition cycle, Nutritional status assessment- Direct parameters – anthropometry, Dietary survey, Clinical and Biochemical methods, Growth monitoring methods and Body composition studies

UNIT II

Nutritional status assessment – Indirect parameters – Vital statistics - Health indicators, population tests and indicators, socio- economic indices, KAP surveys, nutrition indicators. Assessment and surveillance of nutritional status in emergency affected populations, nutritional Epidemiology.

UNIT III

Public health challenges – Nutrition transition in developing countries; Food security – definition, factors affecting food security system, food security status assessment, national and international approaches to improve food security; Dietary diversity and its assessment; per capita availability and adult consumption unit; distorted food markets; environmental impacts – climate change, web of threats to water, land use, forest cover, soil fertility and biodiversity; insecure employment and energy reliance; political, economical and social processes influencing food and nutrition policies and legislation.

UNIT IV

Public health nutrition strategies - Policies and programs address food insecurity, hunger and nutrition interventions in diverse population – objectives and approaches;Nutrition Program - elements of nutrition program, types of nutrition programs, methodologies for nutrition intervention among individual, community, program and policy level, school health and nutrition programmes and public health approaches to ensure safe food supply;primary, secondary and tertiary prevention of public health and nutrition problems, strategies for a health promotion campaign, preventive programmes of nutritional problems in India - PEM, vitamin A deficiency, Anaemia, Iodine deficiency disorder and Flurosis.

UNIT V

Nutrition Education- Types and Methods of education, principles of planning, executing and evaluating nutrition education programmes, problems of nutrition education.Roles and responsibilities of public health nutritionist and careers in public health nutrition.

Practical Experiences

1. Application of nutritional assessment parameters and nutrition education kit in a nutrition camp organized by the departments' Nutrition and Health Club.
2. Development of audience specific nutrition education messages

References

1. Rayner G, Lang T. Public health and nutrition. Our vision: Where do we go? [Commentary]. *World Nutrition* April 2012, **3,** 4, 92-118

2. *World Nutrition*. Journal of the World Public Health Nutrition Association. www.wphna.org Volume **3**, Number 4, April 2012
3. Natellie Stein, MS, 2014. Introduction to public health nutrition. Pp 4-12
4. http://www.jblearning.com/samples/0763747602/47602_ch01_5165.pdf

5. http://sydney.edu.au/science/molecular_bioscience/cphn/pdfs/human_nutrition_study_guide.pdf
6. *K. Vijayaraghavan.2011.* Food and nutrition situation in India. Pp -878-889
7. Jacqueline Edington. 1999. Problems of nutritional assessment in the community. Proceedings of the Nutrition Society (1999), 58,47-51
8. Judith L. Buttriss, Ailsa A. Welch, John M. Kearney, Susan A. Lanham-New, Public Health Nutrition, Wiley Blackwell. 2017.
9. Sheila ChanderVir. Public Health and Nutrition in Developing Countries (Part I and II). Wood head publishing India PVT Ltd, 2015, New Delhi
10. Michigan Natalie Stein. Public Health Nutrition, 2014
11. Michael J. Gibney, Barrie M. Margetts, John M. Kearney, Lenore Arab, Public Health Nutrition, Wiley Blackwell, 2013

PAPER IV
COMPUTER AIDED DIET PLANNING PRACTICAL

SUB. CODE: 16FSNC12 **HOURS**: L + T+P=C
MARKS:100 3 + 1+0=4

Objectives

- To impart learning on menu planning strategy, nutrient intake analysis using software and analysis on sufficiency of food intake.

Exercises

1. Weights and Measures
2. Food Exchange list
3. Menu plan for pregnancy
4. Menu plan for lactation
5. Menu plan for infants
6. Menu plan for preschool children
7. Menu plan for school children
8. Menu plan for adolescent boys and girls
9. Menu plan for an adult
10. Menu plan for Nutritional Deficiencies
    a. Protein Calorie Malnutrition
    b. Anaemia
    c. Iodine Deficiency
    d. Flourosis
    e. Vitamin A Deficiency
    f. Scurvy
    g. Angular stomatitis
    h. Calcium Deficiency

The above mentioned exercises will provide learning on planning a menu, collection of basic information of a person, portion size, amount of nutrients required, food plan, meal distribution, menu plan, nutrient calculation using the software and matching with requirement.

References

1. Amy E. Galena, Msh Rd. 2013. Eat to Your Good Health: Exchange Lists and Meal Planning for Eating Disorders. USA
2. Peggy S. Stanfield, Peggy Stanfield, Y. H. Hui. 2010. Nutrition and Diet Therapy: Self-Instructional Approaches. 5th edition. Jones and Bartlett publishers. Canada.
3. B Srilakshmi. 2014. Dietetics. New Age International publishers.

PAPER V (ELECTIVE)
SPECIALIZED NUTRITION

SUB. CODE: 16FSNE05 **HOURS**: L + T+P=C
MARKS : 100 3 + 1+ 0=4

Objectives

1. To understand the differences between providing food to individual leading normal life on earth and those in space, submarine, defence, sports and doing yoga and exercise.

UNIT I

Nutrition in Space – Understanding space flight – Mercury, Germini, Apollo, Skylab, Apollo – Soyuz, Space shuttle- Mir program, International Space Station, adapting to space flight, space food systems, physiological adaptation to weightlessness, Nutrition requirements and dietary intake during space flight, bone demineralization, Research and limitations on spacecraft.

UNIT II

Nutrition in military operations – Types of military operations, nutrient requirement and recommendations for military personnel, Nutrition and optimum physical performance of military personnel, Body composition measurement and its relation to health and physical performance of military personnel, Alimentation of military causalities, nutrition for combat, Dietary approach for high mileage warrior and long term warrior, nutrition education and implementation of dietary goals of military personnel.

Navy Nutrition – History of navy nutrition, nutritional requirements of Navy personnel, Nutrition Guidelines for Navy personnel, performance nutrition fundamentals-fueling series, rules to live by, the big three, eat the rainbow, fuel up, hydrate, recovery nutrition and virtual meal builder, NOFFS – Operational Series, Navy operational Fitness and Fueling System, Food service in navy and submarines Galley Go Green nutrition program for navy personnel.

UNIT III

Nutrition in Cold and in High-Altitude Environments -physiology of cold exposure- military schedules vs. biological clocks- influence of cold stress on human fluid balance, muscle metabolism and shivering during cold stress, macronutrient requirements for work in cold environments, Cold Exposure, Appetite and Energy Balance, Micronutrient Deficiency States and Thermoregulation, Drug-Induced Delay of Hypothermia.

Nutrition in the High-Terrestrial Environment -Physiology of High-Altitude Exposure, Physical Performance at High Altitudes, Fluid Metabolism at High Altitudes, Maintenance of Body Weight at High Altitudes, Energy and Macronutrient Requirements for Work at High Altitudes, Oxidative Stress at High Altitudes and Effects of Vitamin E, performance and Food Components, Treatments that may enhance mental Performance at High Altitudes and in the Cold.

UNIT IV

Nutrition in Emergency – Disaster, earthquake, flood, famine, Major nutritional deficiencies – nutritional surveillance- general feeding programmes, selective feeding programmes, prevention, treatment and control of communicable diseases, health extension activities, immunization, environmental health management, household food security and livelihoods.

UNIT V

Sports Nutrition – Energy balance, body mass and composition, fuel needs for training and recovery, protein needs for training and bulking up, vitamins, minerals and antioxidants for training and staying well, preparation for competition, fluid, carbohydrate and salt needs during and after exercise, Hydration process, supplements and sports foods; nutritional concern of athletes in specific groups - young athlete, female athlete, power and sprint sports, endurance sports, team sports, weight conscious sports, travelling athlete, Olympic and elite athletes, vegetarian athletes, physically disabled athletes, athletes with chronic medical conditions, athletes with eating disorder. Environ mental challenges for athletes, cultural and regional issues Nutritional and performance implications of use of addictive substances; Nutritional concern and knowledge of coaches and athletic trainers.

References

1. The management of nutrition in emergencies, World Health Organisation, 2000
2. A toolkit for addressing nutrition in emergency situations, IASC Nutrition Cluster, 2008
3. Lieutenant Commander Sean D. Mollahan, USN, B.S., United States Naval Academy, Annapolis, Maryland, 2002, United States Navy Nutrition Culture And How Best to Select Food While Underway / THESIS
4. All-Navy Sports: Cross-Country , Patti Sue Plummer,2010 /Book.
5. Patrica A. Deuster, Ph.D, MPH, CNS, Teresa Kemmer, Ph.D, RD, Lori Tubbs, M.S, RD, Stacey Zeno, MS, Christiane minnick, MAC. /Book
6. Asker E. Jeukendrup, School of Sport and Exercise Sciences, University of Birmingham, Birmingham, UK, (Accepted 1 August 2011), Nutrition for endurance sports: Marathon, triathlon, and road cycling, Journal of Sports Sciences, 2011; 29(S1): S91–S99.
7. Nutrition Resource Guide 2011, Navy Physical Readiness programme.
8. All-Navy Sports: Hydration / Book
9. Atul Singh President, Coca-Cola India/ Tan Sri Dr M Jegathesan Honorary Medical Advisor, Commonwealth Games Federation Nutrition for Athletes/ Revised and updated February 2010
10. All-Navy Sports: Making Weight / Book.

PAPER VI (ELECTIVE)
NUTRITIONAL POLICIES AND PROGRAMMES

SUB. CODE: 16FSNE06 **HOURS**: L + T+P=C
MARKS : 100 3 + 1+0= 4

Objectives

1. To update the students' knowledge on nutrition policies, schemes, programmes and organisations

Unit I

Nutrition Policies and Schemes – History of Nutritional Policies and Programmes, Millennium Development Goals, Nutritional Policies in India - National Nutritional Goals, National Nutritional Policy, National Food Security Mission, National Food Security Bill, Public Distribution System, National Plan of Action on Nutrition; Nutrition Schemes in India – Ministry of Agriculture – GraminBhandranYojana; Ministry of Women and Child Development - SABALA or Rajiv Gandhi Scheme for Empowerment of Adolescent Girls; Ministry of Tribal Affairs – Village Grain Bank Scheme; Ministry of Rural Development – Annapurna Scheme; Ministry of Consumer Affairs – SC/ST/OBC Hostels; Nutrition in India: Targeting the First 1,000 Days of a Child's Life; Schemes for supply of food grains to welfare institutions; AkshayaPatra and Private Sector Participation in Mid-Day Meals; SampoornaGrameenRozgarYojana; SarvaShikshaAbhiyan; RashtriyaKrishiVikasYojana.

Unit II

Nutritional Programmes – Ministry of Rural Development – Applied Nutrition Programme; Ministry of Social Welfare – Integrated Child Development Services Scheme, Balwadi Nutrition Programme, Special Nutrition Programme; Ministry of Health and Family Welfare – National Nutritional Anemia Prophylaxis Programme, National Prophylaxis Programme for Prevention of Blindness due to Vitamin A Deficiency, National Iodine Deficiency Disorder Control Programme; Ministry of Education – Mid Day Meal Programme; Programmes for Communicable and Non Communicable Diseases; Wheat Based Supplementary Nutrition Programme; World Food Programme Project; CARE assisted Nutrition Programmes; Tamil Nadu Integrated Nutrition Project; UNICEF Assistance for Women and Children; Emergency Feeding Programme; National Programme for Nutrition Support to Primary Education; National Food for Work Programme;

Unit III

National Organizations - ICMR, NIN, NNMB, CFTRI, DFRL, ICAR, NIPCCD, NSI, NFI and IDA

Unit IV

International Organizations - FAO, WHO, UNICEF, UNESCO, UNDP and World Bank Data

Unit V

International Voluntary services - CARE, CRS, IDRC, Micronutrient Initiative (MI), IFPRI, WFS, WFP, AUSAID, CIDA, SIDA, DANIDA, USAID.

Practical Experience

1. Assessing the impact of any one policy, programme and organization in community nutrition in one village.

Reference

1. WalRuchi Mishra, S, Encyclopedia of Health Nutrition and Family welfare, Sarup and Sons, New Delhi 2000
2. Srilakshmi, B. Nutrition Science, New Age International (p) ltd, New Delhi, 2002
3. Swaminathan, M. Handbook of Food and Nutrition, the Bangalore Printing and Publishing Co.Ltd, 5th Edition, 2003
4. Padmini Gupta, Ruchithakkar, Nutritional Disorders and Community Health, Pointer Ltd Publishers, Jaipur.
5. Nancy Milio, ElisabetHelsing, European Food and Nutrition Policies in Action, WHO Regional Publications, 1998
6. Mishra, Health and Nutrition Education, A.P.H. Publications, New Delhi 2005
7. S. L. Goel, Sumer LalGoel Health Care System and Hospital Administration: Health policy and programmes, Deep and Deep Publication PVT, LTD. New Delhi, 2009

PAPER VII (SUPPORTIVE)
NUTRITION AND FITNESS PRACTICAL

SUB. CODE: 16FSNES02 **HOURS**: L + T+P=C
MARKS : 100 1 + 1+ 2=4

Objectives

1. To learn about the means of determining the body composition, nutritional status and fitness of an individual

Exercises

1. Anthropometric measurements
2. Body fat measurements
3. Respiratory fitness assessment by respirometry
4. Blood pressure measurement by BP apparatus
5. Muscular endurance – Male 1. Push up test 2. Pull up test
   Female – Flexed arm
6. Skin Fold Caliper Test
7. Flexibility assessment
8. Goniometry Test
9. Dietary intake assessment
10. Meal supplements for athletes
11. Yogic exercises

SEMESTER IV

PAPER I (CORE)

CLINICAL NUTRITION I

SUB CODE: 16FSNC13 **HOURS**: L + T+P=C

MARKS : 100 3 + 1+ 0=4

Objectives

- To enable the students to understand the importance of diet in disease management
- To equip the students, gain skills on planning and providing nutritional care for prevention and treatment of various diseases

UNIT –I

Dietitian – types of dietitian and role of dietitian, delivery of nutritional care and diet counseling techniques, Factors to be considered in diet planning, Recent trends in dieting, Global purview on dieting, Types of diet at international trend.

Therapeutic diets – Nutritional screening and assessment of nutritional status of hospitalized and outdoor patients, Principles & objectives of diet therapy, Review of hospital diets- Regular diet, liquid diet, light diet, soft diet, pre and postoperative diet, Types of feeding – TPN and EN, Routes of administration.

UNIT –II

Gastrointestinal disorders – etiopathophysiology, clinical and metabolic aberrations and nutritional management of diarrohea, constipation, peptic ulcer, malabsorption syndrome and ulcerative colitis.

Disorders of liver and gall bladder - etiopathophysiology, clinical and metabolic aberrations and nutritional management of jaundice, hepatitis, cirrhosis, hepatic coma, cholecystitis and cholelithiasis.Role of fat in liver and gall bladder diseases.Nutrition and alcoholism.

UNIT –III

Etiopathophysiology, clinical and metabolic aberrations and nutritional management of

a. Fever- malaria, typhoid and tuberculosis
b. Allergy
c. Dental Diseases – dental caries & peritonitis.

UNIT – IV

Diseases of kidney – etiopathophysiology, clinical and metabolic aberrations and nutritional management of glomerulo nephritis, nephrosis, renal failure, nephroscelerosis, nephrolithiasis, dialysis – types and transplantation. Fluid and electrolyte balance in renal patients. Risks in feeding renal patients with other metabolic disorder.

UNIT –V

Diseases of the heart & circulatory system- etiopathophysiology, clinical and metabolic aberrations and nutritional management of hypertension, atheroscelerosis, congestive heart failure, hyperlipoproteinemia, dyslipidemia, role of antioxidants in the prevention and treatment.

References

1. The Management of Nutrition in Major Emergencies, A.I.T.D.S. Publishers and Distributors Delhi, First Edition 2002.
2. LoryA. Smolin and Mary B.Grosvenor, Nutrition Science and Application, Saunders College Publishing New York, Third Edition, 2000.
3. MahtabS.Bamji, Prasad Rao, N.Vinodini Reddy. Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt .Ltd, Second Edition, 2003.
4. Gopal, C. Kamalakrishnaswamy, Nutrition in Major Metabolic Disease, Oxford India Paper backs Publisher, First Edition, 2000.
5. Mahan, L.K., Stump, S.E and Krause, S, Food Nutrition & Diet therapy, 11th edition, W.B. saunders Co, 2004
6. Passmore, D.P and Break, J.P, Human Nutrition& Dietetics, English language Book Society, Livingeston, 1986.

Shills, E.M and Olson, S.J and SMC, Modern nutrition in Health and Diseases, Volume II, 8th edition, Lea &Febringes, philadelphia1994.

PAPER II (CORE)
CLINICAL NUTRITION II

SUB CODE: 16FSNC14 **HOURS**: L + T+P=C
MARKS : 100 3 + 1+ 0= 4

Objectives

- To enable the students to understand the metabolism and special nutritional requirements of the critically ill and diseased subjects
- To equip the students, gain skills on planning and providing nutritional care for prevention and treatment of various diseases

UNIT – I

Endocrine disorders - etiopathophysiology, clinical and metabolic aberrations and nutritional management of hypo and hyperthyroidism, obesity, PCOS, Grave's disease, aldosteroidism.

Disorders of pancreas - Pancreatitis and Diabetes mellitus – classification, etiology symptoms, metabolic changes, long term & short term complications, types of insulin, dietary modifications for diabetes mellitus, Glycemic index of foods, nutritive and non nutritive sweeteners.

UNIT –II

Metabolic disorders – etiopathophysiology, clinical and metabolic aberrations and nutritional management of Maple syrup disease, Galactosemia, glycogen storage disease, alcaptonuria, Lesch–Nyhan syndrome, nieman- pick disease

HIV infection and AIDS- Epidemiology, transmission of HIV, Clinical manifestations, HIV infection and other disease, immunity and AIDS virus, dietary management, prevention and control.

UNIT –III

Nutrition in cancer - Reproduction of the normal cells and cancer cells, classification of neoplasms, principles of cancer pathogenesis, causes of cancer cell development, metabolic and nutritional alterations in malignancy, bodies' defense system, cancer therapy & nutrition, eating problems in cancer, feeding and blend preparation for cancer.

UNIT – IV

Nutrition in critical care - Injury- types, causes and dietary management. Burns – source and types of burns, palliation treatment, grading of burns and dietary regimen, wound management-types, dietary management for various wounds, Nutrition in stress and trauma, role of immune enhancers, immunosuppressants and nutritional support system and special diets in critical care.

UNIT –V

Management of nervous disorders -etiopathophysiology, clinical and metabolic aberrations and nutritional management of Epilepsy, Alzheimer disease, Parkinsons disease, Autism, neuropathies, migraine, stroke.

Management of musculoskeletal system disorders - etiopathophysiology, clinical and metabolic aberrations and nutritional management of osteoporosis, osteomalasia, osteoarthritis and rheumatoid arthritis and systemic lupus erythematosis.

References

1. The Management of Nutrition in Major Emergencies, A.I.T.D.S. Publishers and Distributors Delhi, FirstEdition,2002.
2. LoryA.Smolin and Mary B.Grosvenor, Nutrition Science and Application, Saunders College Publishing New York, Third Edition, 2000.
3. MahtabS.Bamji, Prasad Rao, N.Vinodini Reddy. Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt .Ltd, Second Edition, 2003.
4. Gopal, C. Kamalakrishnaswamy, Nutrition in Major Metabolic Disease, Oxford India Paper backs Publisher, First Edition, 2000.
5. Mahan, L.K., Stump, S.E and Krause, S, Food Nutrition & Diet therapy, 11th edition, W.B. saunders Co, 2004
6. Passmore, D.P and Break, J.P, Human Nutrition& Dietetics, English Language Book Society, Livingeston, 1986.
7. Cataldo, C.B., Rolfes, S.R and whitney, E.N, Understanding clinical nutrition, west publishing Co. New york, 1991.
8. Shills, E.M and Olson, S.J and SMC, Modern nutrition in Health and Diseases, Volume II, 8th edition, Lea &Febringes, philadelphia1994.

PAPER III (CORE)
BIOCHEMICAL ANALYSIS PRACTICAL

SUB CODE: 16FSNC15 **HOURS**: L + T+P=C
MARKS : 100 0 + 0+ 3= 2

Objectives

- Understand the significance of biochemical parameters and disease relationship
- To gain skill on analyzing and interpreting the biomarkers in urine and blood

Exercises

1. Qualitative tests of urine
    - Test for sugar
    - Test for ketone bodies
    - Test for albumin
    - Test for blood
    - Test for Bile salt and pigment
    - Test for bilirubin
2. Quantitative tests of urine
    - Estimation of sugar in urine
    - Estimation of urea in urine
    - Estimation of creatinine in urine
3. Qualitative analysis of blood
    - Blood grouping
    - Bleeding time
    - Clotting time
4. Quantitative tests of blood
    - Estimation of blood urea by DAM method
    - Estimation of Cholesterol in serum by ZAK method
    - Estimation of blood sugar by Ortho Tolidine method
    - Estimation of protein by biuret method

References

1. Jelalu Kemal , Laboratory Manual and Review on Clinical Pathology, Published by OMICS Group eBooks**,** 731 Gull Ave, Foster City. CA 94404.
2. Mark Brandt, biochemistry Laboratory manual, USA
3. Sadhasivam and manickam, Biochemical methods, New Age International publications, 2008**.**

PAPER IV (CORE)
COMPUTER AIDED CLINICAL NUTRITION PRACTICAL

SUB. CODE: 16FSNC16 **HOURS**: L + T+P=C
MARKS:100 0 + 0+3=2

Objectives

- To impart learning nutrition support techniques and feeding formulations to meet nutritional needs of various diseases.

Exercises

1. Plan for hospital diets – liquid diet, semisolid diet, soft diet and bland diet
2. Diet plan for post operative care
3. Diet plan for GI disorders – diarrohea, constipation, peptic ulcer, malabsorption syndrome, ulcerative colitis
4. Diet plan for disorders of liver and gall bladder – jaundice, hepatitis, cirrhosis, hepatic coma, cholecystitis and cholelithiasis
5. Diet plan for different types of fever
6. Diet plan for kidney disorders – nephritis, nephrosis, renal failure and patients in dialysis
7. Diet plan for diseases of heart and circulatory system – hypertension, atherosclerosis, congestive heart failure, hyperlipoproteinemia and dyslipidemia
8. Diet plan for different grades of obesity
9. Diet plan for different types of diabetes
10. Diet plan for cancer
11. Diet plan in critical care – burns, injuries and trauma
12. Diet plan for osteoporosis and rheumatoid arthritis
13. Diet plan for autism
14. Diet plan for HIV infected individuals

The above mentioned exercises will provide learning on planning a menu, collection of basic information of a person, portion size, amount of nutrients required, food plan, meal distribution, menu plan, nutrient calculation using the software and matching with requirement.

References

4. Amy E. Galena, Msh Rd. 2013. Eat to Your Good Health: Exchange Lists and Meal Planning for Eating Disorders. USA
5. Peggy S. Stanfield, Peggy Stanfield, Y. H. Hui. 2010. Nutrition and Diet Therapy: Self-Instructional Approaches. 5th edition. Jones and Bartlett publishers. Canada.
6. B Srilakshmi. 2014. Dietetics. New Age International publishers.

PAPER V (ELECTIVE)
PHYSIOLOGICAL ASPECTS OF NUTRITION

SUB. CODE: 16FSNE07 **HOURS**: L + T+P=C
MARKS:100 0 + 0+3=2

Objectives

- To learn the physiological conditions related to nutrition.
- To get insight into immune system and learn food and drug interaction.

UNIT I
Blood- composition, cellular elements of blood and hemopoiesis, Hemoglobin- structure, synthesis and function, plasma proteins- functions and changes in various disorders, secretion of gastrointestinal tract, physiology and clinical significance of enzymes and hormones of the gastrointestinal tract,Hunger, Appetite and Satiety, circadian rhythm of salivary, gastric, pancreatic and glucocorticoid secretions.

UNIT II
Types of immunity, cells of the immune system, Immune response – humoral immunity, cell mediated immunity, Immune changes in malnutrition, vitamin deficiency, Iron deficiency and zinc modulation, Neuroendocrine control of stress and immunity, Immune mechanisms in infections, Autoimmunity and Hypersensitivity.

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

UNIT IV
Water and electrolyte balance- Total body water, intake versus output of water, body fluid compartments, composition of body fluid, measurement of body fluid volumes, forces controlling the water and electrolyte balance between cells and extra cellular fluid, metabolism of water and electrolytes, Regulation of acid base balance, Effect of diet on water, electrolyte and acid-base balance.
Function tests- Gastric function test, liver function test, renal function test and endocrine function test.

UNIT V
Drugs- Introduction, absorption, biotransformation and excretion of drugs, routes of drug administration, physiological action, clinical significance of drug, food and drug interaction, drug induced malnutrition – luminal factors, mucosal factors, antibacterial agents including antibiotics, hypolipidemic agents, anti-inflammatory agents, oral hypoglycemic drugs.

Practical Experience

1. Attending the special lecture by doctors and biochemists relevant to the unit contents.

References

1. Chatterjee, C.C, Human Physiology, Vol I & II, Medical Allied Agency.
2. Sukkar, M.Y.,EI- Munshid, H.A and Ardawi, M.S.M ,Concise human physiology , Blackwell scientific publications, 1993.
3. Daniel, P., Stites., Abba, I. Terr., Tristram, G. Parslow., Basic and clinical Immunology Prentice – Hall International InC, 8th edition, 1994.
4. DulsyFatima.,Arumugam, Immunology, Saras publication.
5. Chakrabarti.,Ghosh and Sahana., Human physiology, the New Book stall, second Edition, 1984.
6. Maurice, E. Shils and Vemon, R. Young , Modern Nutrition in Health and Disease, Indian Edition, seventh Edition.
7. Guyton, J.E, Textbook of Medical physiology, Saunders Publication, seventh edition, 1997.
8. Murugesh, N, A concise textbook of pharmacology, fifth edition, Prabhu offset printers, 2000.
9. Anne Waugh, Allison grant, Anatomy and physiology in Health and illness, 9th edition Elsevier church livingstone Edinburgh, London, 2001.
10. Gary A. Thibodeau, Kevin T. Patton, Anatomy & Physiology, Reed Elseviee India Pvt. Ltd, New Delhi 17th edition, 2003.
11. K.Sembulingam and PremaSembulingam (2007), Essentials of Medical Physiology, Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi, 3rd Edition.