MAHARAJA GANGA SINGH UNIVERSITY

SCHEME OF EXAMINATION FOR

THE DEGREE OF MASTER OF SCIENCE IN FOOD & NUTRITION

M. SC. (FOOD & NUTRITION)

Applicable for students seeking admission to the Two year M. Sc. Course in Food & Nutrition for theAcademic Year 2024-2025

PROGRAMME BROCHURE

Syllabus Prepared and Checked by:

S.No.	NAME	DESIGNATION	DEPARTMENT	INSTITUTION/ AFFILIATION
1	Dr. Abhilasha Alha	Professor, Convener, BOS	Home Science	Govt. M S College for Women, Bikaner
2	Dr. Nidhi Agarwal	Professor Member, BOS	Home Science	Govt. M S College for Women, Bikaner
3	Dr. Kamal Jeet Kaur	Professor Member, BOS	Home Science	Govt. BRG Girls College, Sriganganagar
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7	Dr. Neena Sareen	Professor External Member	Extension & Communication	College of Community Sc., SKRAU, Bikaner

PROGRAM OUTCOMES FOR THE DEGREE OF M. SC. (FOOD & NUTRITION)

Program Objective:

To equip students with advanced knowledge and skills in areas such as food service, dietetics, food safety, prepare globally competitive foe research, teaching and technology with human values.

Program Outcomes (PO)

On completing Master in Faculty of Science (Food & Nutrition), the students shall be able to realize the following outcomes:

PO	Description
PO1	Foster ethical, moral, and social values to cultivate individuals who contribute positively to society.
PO2	Encourage problem-solving thinking rooted in scientific knowledge.
PO3	Promote the application of scientific thought to various aspects of social life.
PO4	Enhance various communication skills, including reading, listening, and speaking, to express ideas and views clearly and effectively.
PO5	Exemplify the highest standards of ethical conduct and professional behavior, while honing critical, interpersonal, and communication skills, and maintaining a commitment to lifelong learning.
PO6	Develop entrepreneurship skill.

Program Specific Outcomes (PSO)

On completing M.Sc. in Food & Nutrition, the students shall be able to realize the following outcomes:

PSO	Description
PSO1	Advanced knowledge of food science, nutrition principles, and their applications in promoting human health and well-being.
PSO2	Be equipped with research skills and the ability to conduct independent research related to food & nutrition.
PSO3	Nutritional assessment- comprehensive studies to evaluate dietary intake, provide evidence based recommendations for individuals and communities to improve the nutritional status.
PSO4	Understand principles of food safety and quality assurance, including food processing techniques, food preservation methods, and regulatory standards to ensure safe and nutritious food supply chains.
PSO5	Dietary management for individuals with specific nutritional needs or medical conditions such as diabetes, obesity, and cardiovascular diseases.
PSO6	Public health promotion- contribute to public health initiatives by designing and implementing nutrition education programs, advocating healthy policies, addressing nutrition related challenges at the population level.
PSO7	Develop critical thinking and problem-solving skills, allowing them to analyze complex issues related to food and nutrition and develop innovative solutions to address them.
PSO8	Be competent to succeed in various competitive state and national level exams such as NET, JRF,SET, AP, dietitian , counselors etc.
PSO9	Communication and collaboration- to become effective communicators who can disseminate scientific information to diverse audience and collaborate with multidisciplinary to address complex nutrition-related challenges.
PSO10	Prepare students with various career opportunities in fields such as clinical nutrition, community nutrition, research, food industry and public health worker.

SYLLABUS STRUCTURE FOR I-IV SEMESTER M. SC. COURSE IN FOOD & NUTRITION

M.Sc. program is a two-year course divided into four-semesters. To complete the course and award of degree, a student is required to complete 100 credits for the completion of course.

- Each theory course is of 4 credits for which there will be 6 hours of lecture/tutorial per week.
- Each practical course is of 4 credits for which there will be 8 hours of laboratory work per batch per week. A minimum of 240 hours are required as per UGC norms for the completion of laboratory work and conduct of practical examination.

The maximum marks for each course will be 50. For theory course, 50 marks will be allocated for end- semester examination of 3 hours duration. For the laboratory course, 50 marks shall be allocated for end-semester examination of 5 hours to be conducted by an external examiner.

Guidelines for the award of Internal Assessment Marks

- Continuous Comprehensive Evaluation will be adopted to find out each course level learning outcome, i.e. assignment, test, quiz, seminars.
- Individual Assignments i.e. Case Study, Practical Record, Dissertation.
- Seminar Presentation, Project Report writing.

Proper record of the Internal Assessment evaluation along with the attendance of students is required by the University for each course adopted by the institution.

Guidelines for Setting Theory Question Paper

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

Pass Marks and Promotion Criteria

A candidate has to pass in internal assessment as well as theory paper and practical individually to pass each semester. The promotion criterion shall be decided by the University.

Attendance Requirement

As per the University rules.

M.Sc. Programme (Semester-Wise)

Semester I									
CourseCode	**Course Title**	**Code**	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Max. Mark**		**Min. Marks**
							Internal	**External**	
MFN6.5DCCT101	**Research Methodology**	**DCC**	**3**	**1**		**4**	**10**	**40**	**13(25%)**
MFN6.5DCCT102	**Food Science**	**DCC**	**3**	**1**		**4**	**10**	**40**	**13(25%)**
MFN6.5DCCT103	**Macro-Nutrients in Human Nutrition**	**DCC**	**3**	**1**		**4**	**10**	**40**	**13(25%)**
MFN6.5DCCT104	**Advanced Nutritional Biochemistry**	**DCC**	**3**	**1**		**4**	**10**	**40**	**13(25%)**
MFN6.5DCCP105	**Practical Lab I**	DCC			**4**	**4**	**10**	**40**	**18(36%)**
MFN6.5DCCP106	**Practical Lab II**	DCC			**4**	**4**	**10**	**40**	**18(36%)**
	TOTAL					**24**	**300**		

Semester II									
CourseCode	**Course Title**	**Code**	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Max. Mark**		**Min. Marks**
							Internal	**External**	
MFN6.5DCCT201	**Statistical Methods and Application**	**DCC**	**3**	**1**		**4**	**10**	**40**	**13(25%)**
MFN6.5DCCT202	**Micro-Nutrients in Human Nutrition**	**DCC**	**3**	**1**		**4**	**10**	**40**	**13(25%)**
MFN6.5DCCT203	**Public Health and Nutrition**	**DCC**	**3**	**1**		**4**	**10**	**40**	**13(25%)**
MFN6.5DCCT1204	**Nutritional Challenges in Life-cycle**	**DCC**	**3**	**1**		**4**	**10**	**40**	**13(25%)**
MFN6.5DCCP205	**Practical Lab III**	DCC			**4**	**4**	**10**	**40**	**18(36%)**
MFN6.5DCCP206	**Practical Lab IV**	DCC			**4**	**4**	**10**	**40**	**18(36%)**
	TOTAL					**24**	**300**		

Semester III									
CourseCode	Course Title	Code	Lecture	Tutorial	Practical	Credits	Max. Mark		Min. Marks
							Internal	External	
MFN6.5DCCT301	Institutional Food Service Management	DCC	3	1		4	10	40	13(25%)
MFN6.5DCCT302	Clinical & Therapeutic Nutrition	DCC	3	1		4	10	40	13(25%)
MFN6.5DSCT303	A. Food Microbiology OR B.Food Toxicology	DSE	3	1		4	10	40	13(25%)
MFN6.5DSCT1304	A. Food Safety & Standards OR B.Food Economics & Food Security	DSE	3	1		4	10	40	13(25%)
MFN6.5DCCP305	Practical Lab V	DCC			4	4	10	40	18(36%)
MFN6.5DCCP306	Practical Lab VI	DCC			4	4	10	40	18(36%)
	TOTAL					24	300		

Semester IV									
CourseCode	Course Title	Code	Lecture	Tutorial	Practical	Credits	Max. Mark		Min. Marks
							Internal	External	
MFN6.5DCCT401	Nutrition for Health & Fitness	DCC	3	1		4	10	40	13(25%)
MFN6.5DCCT402	Food Chemistry & Food Analysis	DCE	3	1		4	10	40	13(25%)
MFN6.5DSCT403	A.Food Processing Technology OR B.Food Product Development & Quality Evaluation	DSC	3	1		4	10	40	13(25%)
MFN6.5DCCP404	Practical Lab VII	DCC			4	4	10	40	18(36%)
MFN6.5DSCP405	Practical Lab VIII	DCC			4	4	10	40	18(36%)
MFN6.5DCCT406	Dissertation/ OJI/RCC	DCC				6	10	40	18(36%)
	TOTAL					26	300		

SEMESTER I

Course Code: MFN6.5DCCT101

RESEARCH METHODOLOGY

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. i. Research: Definition, Scientific Methods, Scientific Approach. Objectives of Research.
   ii. An overview of research process.
   iii. Criteria of good research.
   iv. Common problems faced during research study.
   v. Qualities of a good researcher.
   vi. Types of research: Historical, Descriptive, Experimental, Case study, Social research and Participatory research.
2. i. Definition and identification of research problem.
   ii. Selection of research problem.
   iii. Justification.
   iv. Hypothesis, basic assumptions, limitations and delimitations of the problem.

UNIT II

3. i. Variables: Types of variables- Dependent and independent; qualitative and quantitative; discrete and continuous.
   ii. Error producing variables, intervening, extraneous, and attribute variables.
   iii. Methods of controlling variables.
4. i. Theory of probability.
   ii. Population and sample.
   iii. Probability sampling, simple random, systematic random sampling, two stage and multistage sampling, cluster sampling.
   iv. Non-probability sampling, purposive, quota and volunteer sampling, snowball sampling.

UNIT III

5. i. Research design: Basic principles.
   ii. Purposes of research design: fundamental, applied and action, exploratory and descriptive, experimental, survey and case study, Ex-post facto.
   iii. Longitudinal and cross-sectional, correational.
6. i. Qualitative research methods.
   ii. Theory and design in qualitative research.
   iii. Definition and types of qualitative research.
   iv. Methods and techniques of data collection.
   v. Data gathering instruments: Observation, questionnaire, interview, sealing methods, case study; reliability and validity of measuring instruments.

UNIT IV

7. i. Quantitative research.
   ii. Design strategies in research: Descriptive studies. A brief over view of types of descriptive studies.
   iii. Co-relational studies (Populations/Individuals).
   iv. Case reports and case studies.
   v. Cross sectional surveys.
8. i. Use of descriptive studies in research.
   ii. Hypothesis formulation.
   iii. Issues in the design and conduct of descriptive studies.

UNIT V

9. Selecting a problem and writing a research proposal.
   i. Selection of problem area, topic and defining the problem.

ii. Literature search- reviewing related literature, referencing, abstracting, bibliography.

iii. Developing the research proposal- title, statement of the problem and its scope, defining concepts, objectives, basic Assumption.

10. i. Delimitations and limitations of the research problem.

ii. Statement of Hypotheses- Types of Hypotheses.

iii. Data collection procedures- Designing study, treatment of data.

REFERENCES:

1. Good C.V. and Carter, D.E., Methods of Research, Educational, Psychological, Sociological Applications, Century Crafts, New York, 1954.
2. Best, J.W. Research in Education, Prentice. Hall, New Delhi, 1983.
3. Kerlinger Foundations of Behavioral research New York, Holt, Rinehart and Winson Inc., 1966.
4. Doby, J.T. An Introduction to Social Research , Appleton Centuary Crafts, 1967.
5. Philips, B.S. Social Research Strategy and tactics, MacMillan , 1977.
6. Young ,P.V. and Schmid, C.F. Scientific Social Survey and Research, Prentice Hall, New Delhi, 1968.
7. Devdas, R.P. and Kulandaivel, K. Hand book & Research Methodology, Sri Ramakrisna Mission Vidhyalaya, 1971.

Course Code: MFN6.5DCCT102

FOOD SCIENCE

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for Section B and C are 150 and 400 words respectively.

UNIT I

1. Introduction to Food Science: Evaluation of the food industry. Emergence of Food Science as a discipline.
2. Basic physio-chemical concepts of importance in food system-Hydrogenion concentration (pH), Osmotic pressure, Isoelectric points of proteins, Solutions, Colloidal Systems - Properties of Colloidal Systems, Types of Colloidal dispersion existing in food system - Soles, gels, foams and emulsions, browning reactions in food - enzymatic and non - enzymatic.

UNIT II

3. Functional properties of food constituents in terms of their chemical and physiochemical properties-
(a) Polysaccharides. Sugars and Sweeteners -
(i) Starch: Structure, Functional properties of Starch - Gelatinization, Gelatin, Retrogradation, Dextrinization, modified food starches.
(ii) Non-starch polysaccharides: Cellulose, Hemi-cellulose, Pectic substances. Gums and Lignins.
(iii) Sugars and Sweeteners Functional properties of Sugars -
Sweeteners. Hygroscopicity, Solubility, Hydrolysis, Degradation, Caramelization, the Maillard reaction. Crystallization. Fermentation, Food applications - Crystalline candies, Amorphous candies, Types of sweetener.

UNIT III

4. Functional properties of proteins in different foods during processing-
(a) Cereals and Cereal products - Flours and flour quality, Gluten, Factors affecting hydration of gluten. Roles of ingredients in baking process. Cereal produces - Extruded foods, breakfast cereals, wheat germ, bulgar, puffed and flaked cereals.
(b) Milk and Milk Products - Milk proteins, effect of heat, enzymes, acid and salt on milk protein. Processing of milk (pasteurization, Homogenization, Evaporation, Drying and Fermentation). Milk products - milk, butter, cream, cheese, whey and ice cream.
(c) Eggs and Egg Products - Egg proteins, Processing of egg - Drying, Freezing, Functional properties of egg - Coloring, Emulsification, Denaturation and Coagulation, Foaming.
(d) Meat and Poultry - Meat proteins, Factors affecting quality - Maturity postmortem changes, Effect of cookery - Heat, pH, Salt, Tenderizers.
5. Fats and Oils - identification of Natural fats and oils, Flavour changes in fats and oils, the Technology of Edible oils and fats, Functional roles of fat Colour, Flavour, Texture, Tenderness, Emulsifier, Cooking medium.

UNIT IV

6. Additional Food Constituent - Their role in improving functional properties.
(i) Enzymes - Enzymes in food Processing, Carbohydrates, Proteases, Lipases, Oxidoreducatase, Immobilized enzymes.
(ii) Pigments - Pigments in food processing - Chlorophylls, Myoglobin, Anthocyanins, Flavonoids, Tannins, Betalins, Quinones, and Xanthones, Carotenoids.
(iii) Flavour Compounds - Terpenoids, Flavonoids, Sulphur compounds, Volatile flavour compounds.
(iv) Minerals - Role minerals in food processing.
(v) Water - Water contents of food, significance of water, bound water, water activity.

UNIT V

7. Chemical, Physical and Nutritional alterations occurring in food products during.
(a) Freezing - Changes in food during refrigerated storage, Immersion freezing with cryogenic liquids.
(b) Thermal processing.
(c) Dehydration - Effect of food properties on dehydration.
(d) Irradiation - Food irradiation, direct and indirect effect, safety and wholesomeness of irradiated food.
(e) Microwave heating - Properties of microwaves, microwave food application.

REFERENCE:

1. Bower, Jane, Food theory and applications. Mac Millan publishing company. 1992
2. Potter, N.N. & Hotchkiss, J.H., Food Science, CBS publishers & Distributors New Delhi. 1986
3. Pomerange, Y., Functional properties of food components, Academic press. INC. 1991

4. Early, R. The technology of dairy products. VCH publishers, INC.
5. Belitz, H.D. and Grosch, W. (1999) Food Chemistry. Springer-Verlag, Berlin Heidelberg
6. Damodaran, S. and Parot. A (1997) Food Proteins and their Applications. Marcel Dekker Inc.
7. Davis, M.B. Austin, J. and Partridge, D.A. (1991) Vitamin C : Its Chemistry and Biochemistry. The Royal Society of Chemistry T.G. House, Science Park, Cambridge CB4 4WF
8. Diehl, J.F. (1995) Safety of Irradiated Foods Marcel Dekker Inc, New York
9. Friberg, S.E. and Larsson, K. (editors) (1997) Food Emulsions. Marcel Dekker, New York
10. Golderg, I. (ed) (1994) Functional Foods Chapman and Hall, Inc.
11. Gunasekaram, S. (ed) (2001) Nondestructive Food Evaluation Marcel Dekker, Inc. New York.
12. Tombs, M.P. (1991) Biotechnology in the Food Industry Prentice-Hall Inc. India
13. Risch, S.J. and Hotchkiss, J.H. (ed) (1991) Food Packaing Interactions II. ACS Symposium Series 473, American Chemical Society, Washington D.C.
14. Marhawa. S.S. and Arora, J.K. (2000) Food Processing: Biotechnological Applications Asiatech Publishers Inc. New Delhi.
15. Mahindru. S.N. (2000) Food Safety - A Techno-legal Analysis Tata McGraw Hill Publishing Co. Ltd., New Delhi.
16. Mathindru. S.N. (2000) Food Additives - Characteristics - Detection and Estimation Tata McGraw Hill Publishing Co. Ltd.
17. Borwanker, R.P. and Shoemaker, C.E. (1992) Rheology of Foods. Elsevier Science Publishers Ltd. England.
18. Charalambour. G. (1990) Flavours and off-Flavours 89, Elesiver Science Publishers Ltd., P.O. Box 211, 1000 AE Amsterdam, The Netherlands.
19. Salunke, D.K. and Kodam. S.S. (2001) : Handbook of vegetable Science and Technology, Marcel Dekker. Inc. 270, Madisom Avenue. New York N.Y. 10016
20. FAO food and Nutrition Paper: Manual of Food Quality Control - Parts 141 (1979) to (1986), FAO of the United Nations Rome.

Course Code: MFN6.5DCCT103

MACRO NUTRIENTS IN HUMAN NUTRITION

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Carbohydrates: Classification, composition, functions, sources and dietary requirements. R.D.A.
2. Physiological significance of carbohydrates and deficiency. Digestion and absorption of Carbohydrates. Regulation of blood glucose concentration.

UNIT II

3. Dietary Fibre: meaning, composition, classification, physiological role and health benefits of dietary fibre. Recommended level of dietary fibre consumption.
4. Resistant starch and fructo-oligosaccharides: meaning and its physiological importance, requirement and food sources. glycemic index and glycemic response to carbohydrates.

UNIT III

5. Proteins: Classification, functions and food sources. Dietary requirement and deficiency. PEM.
6. Digestion, absorption and transport of proteins. Synthesis of non-essential amino acids in the body. Protein quality and factors influencing it.

UNIT IV

7. Urea Cycle: Relationship between energy and protein requirements. Evaluation of protein quality and methods.
8. Regulation of food intake. Nutrient adaptation to low intake of energy and protein.

UNIT V

9. Lipids: classification of lipids and fatty acids functions and sources. Dietary requirements. Digestion and absorption. Excessive fat intake.
10. Deficiency disorders of lipids and essential fatty acids. Role of Omega – 3 and Omega-6 fatty acids in physiological disorders.

REFERENCES:

1. Raheena Begum Textbook of Food, Nutrition and Dietetics, Sterling Pub., New Delhi, 1989.
2. Swaminathan, M. Essentials of Foods and Nutrition Vol. I and II, Ganesh and Co., 1985.
3. Prevention of Food Adulteration Act, 1994, Govt. of India.
4. Gopalan, C. Recent trends in Nutrition, Oxford Univ. Press, 1993.
5. Jelliffe, D.B. Assessment of nutritional status of the community, WHO, 1996.
6. Gopalan, C. Nutrition of health care, Nutrition Foundation Of India, Special Pub. Series.
7. Many, N.S. and Sadaksharaswamy, M. Food Facts and Principles, New Age International Pvt. Ltd., New Delhi, 1987.
8. Channey, M.S. and Ross, M.L. Nutrition, Haughton Millian Co., New York, 1979.
9. Gopaldas, T. and Seshadri, S. Nutrition Monitoring and Assessment, Oxford Univ. Press, New Delhi, 1987.

Course Code: MFN6.5DCCT104

ADVANCED NUTRITIONAL BIOCHEMISTRY

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Carbohydrates and types of polysaccharides. Important reactions of monosaccharides. Hormonal control of carbohydrates, Homeostasis.
2. Lipids: chemical properties of lipids – hydrolysis, saponification, hydrogenation and acetylation, saponification number, acid number, Reichert–Meissel number, UV absorption.

UNIT II

3. Protein – classification of amino acids, reactions, methods of separation of amino acids – chromatography, micro-biological, electrophoretic methods. Structure of proteins, denaturation of proteins. Plasma proteins – properties and functions.
4. Nucleic Acids – synthesis and breakdown of purines and pyrimidines. Structure of DNA and RNA. DNA replication and transcription. Genetic code. Genetic mutation. Protein biosynthesis.

UNIT III

5. Vitamins – structure, metabolism and bio-chemical role (fat soluble and water-soluble vitamins).
6. Minerals – biochemical role of all essential minerals – Macro elements and trace elements.
7. Hormone's – biochemical role of adrenocorticotropic hormone, FSH, leutinising hormone, gonadotropin, growth hormone, thyroxine, thyroid stimulating hormone insulin, male and female sex hormone.

UNIT IV

8. Enzymes – Classification, general properties. Intra cellular distribution of enzymes, allosteric enzymes, isoenzymes Enzyme kinetics. Importance in clinical diagnosis.
9. Biological oxidation – concept of free energy, redox potential, oxido-reductases, oxidases, dehydrogenases and hydroperoxidases.

UNIT V

10. Intermediary Metabolism
    a. Overview
    b. Carbohydrates – glycolysis, glycogenolysis and glycogenesis, gluconeogenesis, citric acid cycle.
    c. Lipids: oxidation of odd and even numbered saturated fatty acids. Biosynthesis of cholesterol, formation and metabolism of ketone bodies, Ketosis.
    d. Protein – Urea cycle, creatine and creatinine synthesis.
11. Inborn errors of metabolism – incidence, clinical changes and treatment of phenylketonuria, maple syrup urine disease homocystinuria, galactosemia, Wilson disease.

REFERENCES:

1. Principles of Biochemistry by Lehninger
2. Textbook of Biochemistry by U. Satyanarayana & U. Chakrapani

Course Code: MFN6.5DCCP105

PRACTICAL LAB I

Hours of Instruction/Week: 2 Max **Max. Marks: 40**

1. Starch cookery -
(a) Study the microscopic structure of different starches before & after cooking.
(b) Study the gelatinization properties of food starches and various factors affecting the gelatinization properties & setting quality of food starches.
2. Sugar cookery -
(a) Study the effect of temperature on solubility of sugar and determine the concentrations at which solutions become saturated.
(b) Study the effect of sugar on the boiling point of water.
(c) Determine the effect of heat on sugar solutions and observe their behaviour corresponding to thread & cold water test.
(d) Demonstrate the process of sugar recrystallization through preparation of fondant, fudge and shakarpara.
(e) Study the process of inversion, melting and caramelization in sucrose.
3. Milk cookery - determine the relative density of milk at different temperatures. Effect of heat and acid on the proteins of milk.
4. Egg cookery - study the effect of cooking time on the colour. Texture & acceptability of whole egg. Observe the effect of method of cooking, coagulation property of eggs.
5. Visits to commercial food manufacturing packaging units where food products are developed and tested.

Course Code: MFN6.5DCCP106

PRACTICAL LAB II

Hours of Instruction/week: 2 Max. **Max. Marks: 40**

1. Qualitative analysis of carbohydrates.
2. Qualitative analysis of amino acids.
3. Qualitative analysis of proteins.
4. Determination of acid value, saponification value and iodine number.
5. Demonstration on estimation of nitrogen by kjeldhal method.
6. Demonstration on estimation of soxhelet method.
7. Determination of P H
8. Demonstration of chromatography and electrophoresis techniques.

SEMESTER II

Course Code: MFN6.5DCCT201

STATISTICAL METHODS AND APPLICATION

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Statistics
   - i. Definition, meaning and scope.
   - ii. Role of statistics in research.
   - ii. Limitations of statistics.
2. i. Conceptual understanding of statistical measures.
   - ii. Classification and tabulation of data.
   - iii. Measurement of central tendency- Mean, Mode, and Median.

UNIT II

3. i. Measures of variation.
   - ii. Frequency distribution-, Histogram, Frequency polygons.
   - iii Student's t-test.
4. i. Correlation, Coefficient of Correlation, Rank Correlation.
   - ii. Regression and Prediction.

UNIT III

5. i. Analysis of Variance- One-way and Two-way classification.
   - ii. Experimental Designs:
     - a. Completely randomized design
     - b. Randomized block design
     - c. Latin square design
     - d. Factorial design
     - e. Trend analysis
6. i. Computers- Role in Research.
   - ii. Word processing.
   - iii. Use of computers in data processing, analysis and presentation.

UNIT IV

7. Analysis / Presentation and reporting of Data.
   - i. Data processing and analysis: Categorization, Editing, Coding, Tabulation and Statistical testing.
   - ii. Presentation of data- General guidelines for presenting data.
8. i. Use of tables, graphs diagrams in presentation.
   - ii. Types and characteristics of good tables, graphs, diagrams and other illustrations.
   - iii. Interpretation of findings.

UNIT V

9. Scientific writing as a means of Communication
   - i. Different forms of scientific writing.
   - ii. Articles in Journals. Research notes and Reports, Review Articles, Monographs, Dissertations, Bibliographies.
10. Writing Dissertation/ Research Report/ Article
    - i. Preliminaries- Title page, Acknowledgement, Index, List of tables, List of figures, Plates, Photographs etc.
    - ii. Text, Footnotes, Quotations
    - iii. Spacing, Margins, Pagination, Indentation.
    - iv. Writing; Introduction, Scope, Objectives, Hypothesis, Review of related Literature, Methodology, Results and Discussions, Summary, Conclusions and Recommendations, Bibliography, Abstract.
    - v. Checking Content, Continuity, Clarity, Validity, Internal consistency and Objectivity during writing each of the above parts.

REFERENCES:

1. Shukla, M.C. and Gulshan, S.S. Statistics, Theory and Practice, Sultanchand Co., New Delhi, 1970.
2. Gupta , S. P. Statistical Methods , Sultan Chand & Co., New Delhi, 1970.
3. Bhandarkar, P.L. and Willkinson, T.S. Methodology and Techniques of Social Research, Himalaya Pub. House, Mumbai, 2000.
4. Bhatnagar, G.L. Research methods and measurement in behavioural and social science, Agri. Cole Publishing Academy, New Delhi, 1990.

Course Code: MFN6.5DCCT202

MICRO NUTRIENTS IN HUMAN NUTRITION

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Functions, absorption, requirement, sources, deficiency and toxicity of fat-soluble Vitamins – A, D, E and K.
2. Functions, absorption, requirement, sources, deficiency and toxicity of water-soluble Vitamins – Thiamine, Riboflavin and Niacin.

UNIT II

3. Functions, absorption, requirement, sources, deficiency and toxicity of water-soluble Vitamins – Pyridoxine, Folate, B12.
4. Functions, absorption, requirement, sources, deficiency and toxicity of water-soluble Vitamins – Ascorbic acid, Pantothenic acid and Biotin.

UNIT III

5. Functions, absorption, requirement, sources, deficiency and toxicity of macrominerals – Calcium and Phosphorus.
6. Functions, absorptions, requirement, sources, deficiency and toxicity of microminerals – Iron, Zinc, Sodium.

UNIT IV

7. Functions, absorptions, requirement, sources, deficiency and toxicity – Copper, Cobalt, Selenium and Chromium.
8. Functions, absorption, requirement, sources, deficiency and toxicity of Iodine and Fluorine.

UNIT V

9. Water: Body composition. Physiological functions and distribution of water in the body.
10. Water and Electrolyte Balance, Electrolyte composition of body fluids.

REFERENCES:

1. Raheena Begum Textbook of Food, Nutrition and Dietetics, Sterling Pub., New Delhi, 1989.
2. Swaminathan, M. Essentials of Foods and Nutrition Vol. I and II, Ganesh and Co., 1985.
3. Prevention of Food Adulteration Act, 1994, Govt. of India.
4. Gopalan, C. Recent trends in Nutrition, Oxford Univ. Press, 1993.
5. Jelliffe, D.B. Assessment of nutritional status of the community, WHO, 1996.
6. Gopalan, C. Nutrition of health care, Nutrition Foundation Of India, Special Pub. Series.
7. Many, N.S. and Sadaksharaswamy, M. Food Facts and Principles, New Age International Pvt. Ltd., New Delhi, 1987.
8. Channey, M.S. and Ross, M.L. Nutrition, Haughton Millian Co., New York, 1979.

Course Code: MFN6.5DCCT203

PUBLIC HEALTH & NUTRITION

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Definition and key concepts - community, nutritional anthropology, community health & community nutrition. Role of public nutritionists the health care delivery. Ecology of Health & amp; Specific determinants of food behavior

2. Population Dynamics Demographic transition, population structure, fertility behaviour, population policy, fertility, nutritional and quality life - interrelationship.

UNIT II

3. Health Economics and Economics of malnutrition Social and behaviour consequences, economic losses - reduced physical and mental efficiency, loss due to premature deaths, underutilization of potential women and the ultimate cost of under nutrition. Impact on national development. Cost-benefit, cost effectiveness and cost efficiency.

4. Sectors and public policies relevant to nutrition & Primary health care of the community - National health care delivery system, determinants of health status, indicators of health.

5. Magnitude and background of the problem of malnutrition in India-Prevalence, etiology biochemical and metabolic changes in protein energy malnutrition Vitamin-A deficiency, iron deficiency, anemia, Iodine deficiency disorder and other life style disorders.

UNIT III

6. Nutritional status -
(a) Nutrition and non-nutritional indicators.
(b) Planning and conducting a nutritional status assessment survey.
    i. Defining scope and objectives of survey, defining population and selecting samples.
    ii. Selecting and standardizing parameters.
    iii. Executing the survey-organizing team, materials, training and field testing of methodology, verification and cross checking of data. Interpretation of data and reporting.
(c) Monitoring and evaluation.
7. Food and Nutrition Security

UNIT IV

8. Approaches and Strategies for improving nutritional status & health:
(a) Programmatic options - their advantages and demerits. Feasibility, available resources (human, financial & infrastructural) and support. Case studies of selected strategies and programmes: their rationale and context, selection of interventions from a range of possible options.
(b) Health based intervention (primary health care & family welfare program)
(c) Food based interventions including fortifications, genetic improvements of food and supplementary feedings.
(d) Nutrition education for behaviour changes. Participatory training.

UNIT V

9. Community Nutrition Programme Management –
(a) Planning - identification of problem, analysis of causes, resources, constraints, selection of intervention, setting a strategy.
(b) Implementation and supervision
(c) Operations monitoring, surveillance and evaluation (process &impact evaluation).
10. National Food and Nutrition Policy, Plan of Action and Programmes

REFERENCES:

1. Sheila Chander Vir (2012) Public health nutrition in developing countries. Vol I&II. Woodhead Publishing India Pvt. Ltd.New Delhi.
2. Park K (2011). Park's Textbook of Preventive and Social Medicine, 21st Edition. M/s Banarasidas Bhanot Publishers, Jabalpur, India
3. Bamji MS, Krishnaswamy K and Brahmam GNV (Eds) (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi
4. Kaufman and Mildred (2006). Nutrition in promoting the public's health. Jones and BartlettPublishers. USA.
5. Edelstein and Sari (2006). Nutrition in public health, 2nd edition. Jones and Bartlett Publishers.USA.
6. Michael J. Gibney , Barrie M. Margetts, John M. Kearney and Lenore Arab (2005). Public Health Nutrition. Blackwell Publishing company. USA.
7. Schneider and Mary-jane. Introduction to public health (2006). Jones & Bartlett Publishers. USA.
8. Spark and Arlene (2007). Nutrition in public health. CRC Press. USA
9. Frank and Gail C (2008). Community nutrition,2nd edition. Jones & Bartlett Publishers. USA.
10. Edelstein, sari and Sharlin (2009). Life cycle nutrition. Jones and Bartlett Publishers. USA.
11. Wadhwa A and Sharma S (2003). Nutrition in the Community - A Textbook. Elite Publishing House Pvt. Ltd. New Delhi.

Course Code: MFN6.5DCCT204

NUTRITIONAL CHALLENGES IN LIFE CYCLE

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I: Importance of maternal nutrition

1. Nutritional needs during first 1000 days.
2. Influence of maternal nutritional status on outcome of pregnancy: birth Weight of infant and lactation performance.

UNIT II: Human milk

1. Psycho-physiology of lactation; Milk synthesis and secretion;
2. Maternal needs during lactation; Composition of colostrum and mature human milk;
3. Milk of mothers of preterm babies;
4. Milk of animal and formula feeds; Non-nutritional Factors of human milk-immunological factors, Enzymes and hormones;
5. Human milk banking.

UNIT III: Nutrition during childhood

1. Nutritional needs of the children and adolescents;

2. Common childhood ailments and dietary considerations; Growth spurt and nutrition

UNIT IV: Nutrition during Adolescence and adulthood

1. Adolescent fads influencing nutrition, food preferences and nutritional problems;
2. Nutritional requirements in Adulthood; Malnutrition, mental Development, learning abilities and behavior.

UNIT V: Geriatric nutrition

1. Overview of ageing process; Nutritional variables related to the ageing process;
2. Physiology of aging; Biological markers of aging; Sociology of aging;
3. Nutritional requirements and deficiencies in elderly;
4. Medications and psychiatric problems in elderly; Immuno pathological diseases and aging; Parkinson and Alzheimer syndrome;
5. Care of the elderly; Care-givers and community services.

REFERENCES:

1. Raheena Begum Textbook of Food, Nutrition and Dietetics, Sterling Pub., New Delhi, 1989.
2. Swaminathan, M. Essentials of Foods and Nutrition Vol. I and II, Ganesh and Co., 1985.
3. Prevention of Food Adulteration Act, 1994, Govt. of India.
4. Gopalan, C. Recent trends in Nutrition, Oxford Univ. Press, 1993.
5. Jelliffe, D.B. Assessment of nutritional status of the community, WHO, 1996.
6. Gopalan, C. Nutrition of health care, Nutrition Foundation Of India, Special Pub. Series.
7. Many, N.S. and Sadaksharaswamy, M. Food Facts and Principles, New Age International Pvt. Ltd., New Delhi, 1987.
8. Channey, M.S. and Ross, M.L. Nutrition, Haughton Millian Co., New York, 1979.

Course Code: MFN6.5DCCP205

PRACTICAL LAB III

Hours of Instruction/week: 2 Max. **Max. Marks: 40**

1. Planning and preparation of nutrient rich dishes.
2. Preparation of preserved items. Display and Sale.
3. Napkin folding and table setting.
4. Study of common adulterants.
5. Labeling and pricing of food items.
6. Identification of nutritional problems prevalent in community using method of nutritional assessment.
7. Preparation of teaching aid.

Course Code: MFN6.5DCCP206

PRACTICAL LAB IV

Hours of Instruction/week: 2 Max. **Max. Marks: 40**

1. Techniques of assessment of nutritional status
2. Use of Screening Tools
3. Visit to the ongoing public health nutrition programme and report writing.
4. Study of existing diet and nutrition practices
5. Planning and conducting survey, analysing data and report writing
6. Development, implementation and evaluation of community nutrition and health programmes

SEMESTER III

Course Code: MFN6.5DCCT301

INSTITUTIONAL FOOD SERVICE MANAGEMENT

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Food Service Institutions: An overview
2. Types of Food Service Institutions
3. Principles of Management
4. Functions and Tools of Management in Food Service Institutions

UNIT II

1. Personnel Management, Selection and Training, Desirable qualities, Grooming
2. Financial Management, terms used, Budgeting
3. Account keeping and record keeping
4. Cost control- Calculation of food cost and methods of controlling food cost, Use of left-over food

UNIT III

1. Meal Service Management, Quantity food production
2. Menu Planning, Types and writing of Menu
3. Standardization of Recipes
4. Principle involved in development of recipes

UNIT IV

1. Planning and Layout for Food Service Institutions
2. Types of kitchen
3. Selection and care of equipment
4. Food Service, Styles of Service

UNIT V

1. Quality control - Sanitation and hygiene in food handling, Food Laws and Standards
2. FSSAI and CODEX guidelines
3. Preventive measures to control common accidents
4. Challenges faced by Food Service Institutions

REFERENCES:

1. Marzia, M. Cathy, M. and Brighton, R. Introduction to catering, Blackwell Scientific Pub. , London.
2. Sethi, M. and Malhan, S. Catering Management: An integrated approach, Willey Eastern Ltd., New Delhi, 1993.
3. Treat, N. and Richards, N. Quantity cooking, Little Brown and Co., Boston, 1996.
4. West, B.B. Wood, L. Herger, V.F. and Shugart, G.S. Food service in Institutions, John Wiley and Sons, New York, 1997.

Course Code: MFN6.5DCCT302

CLINICAL AND THERAPEUTIC NUTRITION

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Concept of Diet Therapy- Dietetics, Purpose and principles of therapeutic diet. Modification of normal diet. Classification of therapeutic diet.
2. Role of Dietitian- Definition & nutritional care, Assessment of Patient needs based on interrelation of patient data clinical, biochemical, bio-physical and Personal.
3. Hospital Diets- feeding methods.
4. RDA for Indians by ICMR, Protein, energy malnutrition.

UNIT II

5. Diet in fever & infection – types of fever, metabolism in fever, Diet in influenza, typhoid, malaria, tuberculosis
6. Diet in disturbances of GIT- gastritis, small intestine and colon- peptic ulcer, Diarrhea, Constipation, Etiology- Symptom, clinical finding, treatment, dietary modification.

UNIT III

7. Cardiovascular diseases- acute & chronic diseases of heart, atherosclerosis, plaque formation, hyperlipidemia, Hyperproteinemia, treatment, dietary management.
8. Diet in diseases of liver, gall bladder & pancreas basic hepatic function, etiology, symptoms and dietary management, hepatitis A & B, cirrhosis, of liver & hepaticcoma.

UNIT IV

9. Diabetes- etiology, classification, sign & symptoms, Insulin,, dietary treatment, oral hypoglycemic drugs short & long term complications of diabetes.
10. Diet in Renal diseases- basic renal function, symptoms & dietary treatment, glomerulonephritis, renal failure, dialysis, transplantation.
11. Diet for hypertension- primary & secondary Role of rennin in hypertension, dietary management, low sodium diet.

UNIT V

12. Nutrition in cancer- Role of diet in cause of cancer metabolic effects of cancer. Cancer cachexia, Impact of radiations and chemotherapies, Nutritional effect of cancer therapy.
13. Diet and drug interaction- effect of drugs on food and nutrient intake ingestion, digestion, absorption, metabolism and requirement. Interaction between nutrient, infections and drugs.

REFERENCES:

1. Joshi, S.A. Nutrition of Dietetics, Tata McCirad Pub., New Delhi, 1992.
2. Raheena Begum Textbook of Food, Nutrition and Dietetics, Sterling Pub., New Delhi, 1989.
3. Swaminathan, M. Essentials of Foods and Nutrition Vol. I and II, Ganesh and Co., 1985.
4. Robinson, C.H.; Lawler, M.R.; Chenoweth and Garwick, A.B. Normal and Therapeutic Nutrition 17edition, Macmillan Pub. Co.,1986.
5. Ghosh, S. The feeding and care of infants and young children, VHAI 6th edition, New Delhi, 1992.
6. Gopalan et.al. Nutritive value of Indian Foods, NIN, ICMR, Hyderabad, India, 1989.
7. Krause, M.V. and Mahen, L.K. Food, Nutrition and Diet Therapy, W.B. Saunders Co., Philadelphia, 1990.
8. Gopalan, C. Recent trends in Nutrition, Oxford Univ. Press, 1993.
9. Swaminathan, M. Advance Textbook on Food and Nutrition, BAPPCO Ltd., Bangalore.
10. Shukla, P.K. Nutritional problems of India, Prentice Hall Of India, New Delhi, 1982.
11. Gopalan, C. Nutritional problems and programmes in South east Asia.
12. Davidson, S. and Passmore Human Nutrition and Dietetics.

Course Code: MFN6.5DSCT303A

FOOD MICROBIOLOGY

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Food Microbiology- Introduction, Definition, Overview
2. Importance of Food Microbiology
3. Factors affecting growth of Micro-organisms-intrinsic and extrinsic factors like pH, water activity, oxidation reduction potential, nutritional requirements, temperature, relative humidity, gaseous environment, biological structure of food and inhibitory substances

UNIT II

1. Methods of isolation or detection of micro-organisms or their products in food
   a. Conventional methods
   b. Rapid method (Newer techniques)
   c. Immunological methods- Fluorescent, Antibody, Radio-immune assay, ELISA etc.
   d. Chemical methods- Thermo stable, Nuclear, ATP measurement, PCR (Polymer Chain Reactions)- only principles in brief

UNIT III

1. Sources of contamination of food- water, air soil, sewage, animals, during handling and processing
2. General principles underlying spoilage
   a. Chemical changes due to microbial spoilage
   b. Spoilage of different groups of food- cereal and cereal products, vegetables and fruits, meat and meat products, egg and poultry, fish and other sea foods, sugar, milk and milk products, canned foods.

UNIT IV

1. Role of microbes in fermented food and genetically modified foods, malt, bread, beverages, vinegar, fermented vegetables, fermented dairy products, tea and coffee. Single cell protein, fats, amino acids, and enzymes from micro-organisms.
2. Food preservation- Physical methods. Chemical preservatives and natural anti-microbial compounds. Food borne diseases-infections and intoxications. Bacterial and viral food borne disorders. Mycotoxins.

UNIT V

1. Food sanitation- Microbiology in food plant sanitation, bacteriology of water, sewage and waste treatment and disposal.
2. Indicators of food safety and quality- microbiological criteria of food and their significance
3. HACCP system and food safety used in controlling microbiological hazards. Food control and enforcement agencies. Microbioligical standards of food and water.

REFERENCES:

1. Prescott LM Harley JP and Klein DA (2006). Microbiology (7th edition) McGraw Hill,Newyork.
2. Frazier, W.C. (1988) Food Microbiology, Mc Graw Hill Inc. 4th Edition.
3. Vijaya Ramesh,K. (2007) Food Microbiology. MJP publishers, 2007
4. Yasmine Motarjemi and Martin Adams. (2006) Emerging Food borne pathogen- Wood Head Publishing England.
5. Arun, K Bhunia. (2008) Food borne microbial pathogens: Mechanisms and pathogenesis. Springer.
6. Thomas J. Montville, Karl R. Matthews, Kalmia E. Kniel (2012). Food Microbiology: An Introduction, American Society for Microbiology.
7. Dubey, R.C. and Maheswari, D.K. (2008) Text book of Microbiology. S Chand Publishing.

Course Code: MFN6.5DSCT303B

FOOD TOXICOLOGY

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Principles of Toxicology: Classification of toxic agents, characteristics and effects.
2. Evaluation of toxicity: Risk v/s benefit.
3. Experimental design and evaluation: prospective and retrospective studies.

UNIT II

4. Natural toxins in food: natural toxins of importance in food.
5. Toxins of plant and animal origin: microbial toxins (bacterial, fungal and algal toxins), occurrence, toxicity and significance.
6. Determination of toxicants in foods and their management.

UNIT III

7. Food allergies and sensitivities: natural sources and chemistry of food allergens..
8. True/untrue food allergies, handling of food allergies.
9. Genetically modified food: toxicity and safety; safety of children consumables.

UNIT IV

10. Environmental contaminants and drug residues in food: fungicide and pesticide residues.
11. Heavy metals and their impact on health.
12. Radioactive contamination of food.
13. Food adulteration and potential toxicity of food adulterants.

UNIT V

14. Food additives and toxicants added or formed during food processing.
15. Toxicants generated during food processing.
16. Common dietary supplements and possible toxic effects.

REFERENCES:

1. Klaassen, Curtis; Watkins III, John B. (2015), Casarett & Doull's Essentials of Toxicology, Third Edition, McGraw Hill Medical, ISBN 10: 0071847081.ISBN 10: 0071847081.
2. S.S. Deshpande Ed (2013), Handbook of Food Toxicology, CRC Press, ISBN 9780824707606.
3. Helferich, W., and Winter, C.K. (2001) Food Toxicology, CRC Press, LLC. Boca Raton, FL
4. Shibamoto, T. and Bjeldanes, L. (2009) Introduction to Food Toxicology, 2nd Ed. Elsevier Inc., Burlington, MA.
5. Watson, D.H. (1998) Natural Toxicants in Food, CRC Press, LLC. Boca Raton, FL.
6. Stine, K.E., and Brown T. M. (2006) Principles of Toxicology, 2nd Ed. CRC Press.

Course Code: MFN6.5DSCT304A

FOOD SAFETY AND STANDARDS

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Food quality assurance- Introduction to quality assurance. Current concept of quality control, Principles of Quality assurance, Raw material quality assurance, in process quality assurance, finished product quality.
2. Food safety and toxicology- Introduction, Hazards- Microbiological, Nutritional, Environmental, physical, Biological, Chemical, HACCP- as a method to prevent food borne diseases.

UNIT II

3. Naturally occurring toxicants and food contaminants, Toxicants in natural spices and flavours, Carcinogens, Goitrogens, Radioactive materials.
4. Food Poisoning – Types, causative factors, signs and symptoms and preventive measures.

UNIT III

5. Food Additives- Introduction, Role of different additives in controlling the quality of food product, Antioxidants, Chelating agents, Colouring agents Curing agents, Emulsifiers, Flavour and Flavour enhancers, Flour improvers, Humectants; Anticaking agent, Leavening agents, Nutrient supplement, Non nutritive Sweeteners. PH Control agents, Stabilizers & Thickeners, Preservatives, Additives and Food safety.
6. Food packaging-Functions of food packaging, requirement for effective food packaging, food packaging materials and forms, safety of food packaging.

UNIT IV

7. Government regulation of food and nutrition labeling- Introduction, food and nutrition law and acts, food labeling, nutrition labeling.
8. Evaluation of food quality
   (a) Sensory evaluation
   (b) Objective evaluation Advantages, disadvantage, basic guidelines.

UNIT V

9. Food product development- Defining new food product, classification; characterization of new food product, food product development tool.
10. Food safety Laws and Standards – FSSAI, FPO, ISI, Agmark, Codex Alimentarius, ISO mark for vegetarian and non-vegetarian foods, eco-friendly products.

REFERENCES:

1. Food Safety and standards Act 2006, Rules 2011, Regulations, 2011, 10th Edition, ILBCO India, Indian Law Book Company, 2013.
2. Early, R. (1995): Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London.
3. Gould, W.A and Gould, R.W. (1998). Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
4. Pomeraz, Y. and MeLoari, C.E. (1996): Food Analyasis: Theory and Practice, CBS publishers and Distributor, New Delhi.
5. 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 Organisation, Geneva.
6. Kirk, R.S and Sawyer, R. (1991): Pearson's Composition and Analysis of Foods, Longman Scientific and Technical. 9th Edition, England.
7. FAO (1980): Manuals of Food Quality Control. 2-Additives Contaminants Techniques, Rome.
8. FSSAI, FSIS, EU and FAO website for updates

Course Code: MFN6.5DSCT304B
FOOD ECONOMICS AND FOOD SECURITY

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Statistical profile of the world food economy.
2. Early human food systems and subsistence agriculture.
3. Semi-subsistence food systems and commercial, market-oriented food systems.
4. Global supply-demand balance and projections.

UNIT II

5. Statistical profile of the Indian economy, Agricultural production and the supply of food.
6. Food policies in India: Food and Agricultural policies, Agricultural research and development, Infrastructure and production policies, Demand side policies.
7. Income support and redistribution, Food assistance program.

UNIT III

8. Global Institutions and the WTO.
9. World food systems: the economics of agriculture.
10. Global sustainability: environmental impacts of the world food system.
11. Globalization of the food system.

UNIT IV

12. Food security: Hunger and malnutrition, Definition and measurement.
13. Food security model, Food availability. Foreign aid, food aid and development.
14. Hunger, conflict, government failure and international intervention.

UNIT V

15. Factors affecting food security.
16. Food security, nutrition and sustainability.
17. Food availability, food access, food utilization and stability of food supply: relation with livelihood security.

REFERENCES:

1. Leathers, H.D. and Fosters, P., The World Food Problem: Tackling the cause of Under-nutrition in the Third World, 3rd Edition. Lynne Rienner Publishers, 2004.
2. Southgate, D., Graham, D.H. and Tweeten, L., The World Food Economy, Blackwell Publishing, 2007.
3. Fogel, R. W. 2004. Health, nutrition, and economic growth. Economic Development and Cultural Change, 52(3): 643-658.

Course Code: MFN6.5DCCP305

PRACTICAL LAB V

Hours of Instruction/week: 2 Max. **Max. Marks : 40**

1. Standardization of recipes.
2. Planning, preparation and modification in basic recipes.
3. Quantity food production and cost calculations.
4. Preparation of menu cards of various types.
5. Menu planning and table setting.
6. Maintenance of account and record keeping.
7. Visit to different types of food service, institutions and study the following:
   Organization, physical plan and layout, menu cards, serving style, table setting, personnel work schedule, hygiene and sanitation, safety measures.
8. Practical experience in organization and management of a college cafeteria/ hostel/ hotels. Record keeping and cost calculation.
9. Planning and preparations for special occasions birthday, festivals, packed lunches.

Course Code: MFN6.5DCCP306

PRACTICAL LAB VI

Hours of Instruction/week: 2 Max. **Max. Marks: 40**

1. Planning and preparation of diets with modifications in:
   a) Consistency:
   b) Fibre and Residue.
   c) Diarrhoea
   d) Peptic Ulcer
   e) Liver diseases.
   f) Obesity
   g) Fevers and infections
   h) Insulin and non-insulin dependent diabetes.
   i) Cardiovascular diseases.
   j) Kidney diseases.
   k) Trauma (burns)
   l). Surgery
2. Market survey of commercial nutritional supplements and nutritional support substrates.
3. Preparation of Diet Counseling aids for common disorders.
4. Case studies: Selection of 3 to 5 admitted patients from a unit of a Hospital. Study of cliical. Nutritional, biochemical profile of the patient on admission, during hospital stay and at discharge. Therapeutic Modification of the diet for that condition. Dietary counseling of the Patients. Study of accept ability and compliance of diet planning, maintenance diets on discharge. Report writing.

SEMESTER IV

Course Code: MFN6.5DCCT401

NUTRITION FOR HEALTH AND FITNESS

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Definition, Components and assessment criteria of age: Specific fitness and health status.
2. Holistic approach to the management of fitness and health: Energy input and output. Diet and Exercise. Effect of specific nutrients on work performance and physical fitness, Nutrition, exercise, physical fitness and health interrelationship.

UNIT II

3. Review of different energy systems for endurance and power activity: Fuels and nutrients to support physical activity. Shifts in carbohydrate and fat metabolism. Mobilization of fat stores during exercise.
4. Nutrition in Sports : Sports specific requirements. Diet manipulation. Pre-gameand post-game meals. Assessment of different nutragenic aids and commercial supplements.

UNIT III

5. Diets for persons with high energy requirements, stress, fracture and injury.
6. Water and electrolyte balance: Losses and their replenishment during exercise and sport events, effect of dehydration, sports drinks.

UNIT IV

7 (a) Significance of physical fitness and nutrition in the prevention and management of weight control, obesity, diabetes mellitus, CV disorders, bone health and cancer.

(b) Nutritional and exercise regimes for management of obesity, Critical review of various dietary regimes for weight and fat reduction. Plateau effect and weight cycling.

8. Defining nutritional goals/guidelines appropriate to health, fitness prevention and management of the above chromic degenerative disorders.

UNIT V

9. Nutrition and exercise regimes for pre and post-natal fitness.
10. Alternative systems for health and fitness like ayurveda, yoga meditation.Vegetarianism and traditional diets.

REFERENCES:

1. Mahan. L.K. and Econ-Stump. S. (2000) : Krause's Food. Nutrition and Diet Therapy, 10 th Edition, W.B. Saunders Ltd.
2. Sizer, F. and Whitney, E. (2000) Nutrition-concepts and Controversies, 8th Edition, Wadsworth Thomson Learning.
3. Whitney, E.N. and Rolfes. S.R. (1999) : Understanding Nutrition, 8th Edition, West/Wadsworth. An International Thomson Publishing Co.

Course Code: MFN6.5DCCT402

FOOD CHEMISTRY AND FOOD ANALYSIS

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. Introduction to food chemistry: Definition, Scope and Composition of Food.
2. Water: Types of water, Sorption phenomenon, Role in packaging and Shelf life.

UNIT II

3. Carbohydrate: Classification, Structure, Modified cellulose and Starches. Chemical reactions of carbohydrates- Oxidation, Reduction, Acid and Alkali.
4. Lipids: Classification and Physico-chemical properties of food, Hydrogenation, Vegetable and Animal fat, Frying and Shortening, flavor changes in fats and oils, Lipid oxidation, factors affecting lipid oxidation.

UNIT III

5. Proteins: Classification, Properties of protein (electrophoresis, sedimentation, denaturation), Functional properties of protein (solubility, viscosity, gelation, emulsification and foaming).
6. Vitamins and Minerals: Role of Vitamins and Minerals in food industry, Effect of various processing treatments and fortification of foods.

UNIT IV

7. Food Enzymes: Nature, Classification, Properties, Enzyme activity in different food systems, Utilization in food industry, Browning reaction in foods.
8. Principles of proximate analysis: Moisture, Ash, Crude fat, Crude fibre, Crude protein.

UNIT V

9. Principles and Methods of Food Analysis.
10. Determination of Starch, Unsaturation of Fat and Rancidity of Fat, Quantitative analysis of Protein (Biuret method, Ninhydrin method), colorimetric analysis of fat and water soluble vitamins, Titrimetric method for estimation of minerals.
11. Methods of determining physical and rheological properties of food.

REFERENCES:

1. Damodaran S, Parkin, KL and Fennema OR (2007), Fennema's Food Chemistry, Fourth Ed., Publisher CRC Press.
2. Meyer LH (2003), Food Chemistry, Reinhold Pub. Corp.
3. Nielsen SS (2003), Food Analysis, Third Ed., Kluwer Academic/Plenum Publishers, New York.

Course Code: MFN6.5DSCT403A

FOOD PROCESSING TECHNOLOGY

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I: Food processing techniques

1. Principles underlying food processing operations including thermal, radiation, refrigeration freezing and dehydration.
2. Effect of processing on physiochemical characteristics.
3. Principles under lying pressure modified processing (high hydrostatic pressure, hyper baric processing, vacuum cooling, hypo-baric storage).

UNIT II: Processing technologies for plant foods

1. Processing technology for preservation and production of variety food products during storage, handling and processing of cereals/millets and legumes, oil seeds, fruits and vegetables;
2. Food preservation by Hurdle technology and canning technology.

UNIT III: Processing technologies for animal foods

1. Processing technology for milk and milk products, egg, meat, poultry and fish, convenience foods and processed foods;
2. Technologies underlying mutual supplementation, enrichment and fortification, fermentation, malting and germination;
3. Food additives commonly used in food industries for colour, flavour and as preservatives; Nano materials as food additives.

UNIT IV: Quality control in food processing

1. Quality control in food industry - raw materials and finished products;
2. Waste management and sanitation in food industries;

UNIT V: PACKAGING FOR QUALITY CONTROL

1. Packaging - self-cooling self-heating packaging,
2. micro packaging,
3. antimicrobial packaging
4. water-soluble packaging.

REFERENCES:

1) Rao, Chandra Gopala (2006). Essentials of food process engineering. B.S. Publications.
2) Khatkar, Bhupendra Singh ed (2007). Food science and technology. Daya Publishing House
3) Singh, N.P (2007). Fruit and vegetable preservation. Oxford Book Company.
4) Ahlluwalia, Vikas (2007). Food processing. Paragon International Publishers.
5) Sivasankar,B (2005). Food processing and preservation. Prentice - Hall of India
6) Paul, Meenakshi (2007). Effects of food processing on bioactive compounds. Gene-TechBooks.
7) Rahman, Shafiur : (2007). 2nd Edn Handbook of food preservation. CRC press.
8) Arthey, David . (2005). 2nd ed Fruit processing. Springer,
9) Fellows.P (2005). 2nd edn Food processing technology. woodhead publishing company.
10) Lewis Michael (2000). Continuous Thermal Processing Of Foods. Aspen.
11) Koutchma, Tatiana (2007). Ultraviolet light in food technology , CRC Press.
12) Sun, Da-Wen (2005). Emerging technologies for food processing. Elesevier Academic Press.
13) Zeuthen, Peter (2005). Food preservation techniques. Woodhead publishing ltd,

Course Code: MFN6.5DSCT403B

FOOD PRODUCT DEVELOPMENT AND QUALITY EVALUATION

Duration of Examination: 3 hrs. **Max. Marks: 40**

The question paper shall consist of 3 sections.

Section-A will consist of 10 questions of 1 mark each (2 questions from each unit). Question 1-5 will be of MCQ type and 6-10 will consist of fill in the blanks.

Section-B will consist of 10 questions of 3 marks each (2 questions from each unit with internal choice).

Section-C will consist of 5 questions of 5 marks each (1 question from each unit of which 3 questions are to be attempted).

The word limit for **Section B and C** are 150 and 400 words respectively.

UNIT I

1. New food products: concept, definition, classification, importance.
2. Factors shaping new product development.
3. Reasons for new food product development.

UNIT II

4. Business idea generation.
5. Sources of idea.
6. Phases in new food product development.

UNIT III

7. Principles of food product development.
8. Recipe development and evaluation.
9. Food safety and food spoilage.

UNIT IV

10. Basic concept of shelf life.
11. Sensory evaluation.
12. Methods of preservation of foods.

UNIT V

13. Food packaging.
14. Product labeling.
15. Entrepreneurship: Essentials in preparing a business plan. Investment and finance.

REFERENCES:

1. Fuller, 2004. New Food Product Development- from concept to market place, CRC.
2. Earle and Earle, 2001. Creating new Foods. Chadwick House Group.
3. Desai V, 2012. Fundamentals of entrepreneurship and small business management, Himalaya Publishing House Pvt. Ltd Mumbai.

Course Code: MFN6.5DCCP404

PRACTICAL LAB VII

Hours of Instruction/Week: 2 Max **Max. Marks: 40**

1. Determination of proximate analysis of given samples: Moisture, Ash, Crude fat, Crude fibre, Crude protein and carbohydrate.
2. Estimation of starch content in cereals.
3. Determination of iodine value and saponification number of fats.
4. Estimation of minerals: Iron and Calcium.
5. Estimation of vitamins: Ascorbic acid and Thiamine.

Course Code: MFN6.5DSCP405A

PRACTICAL LAB VIIIA

Hours of Instruction/Week: 2 Max **Max. Marks: 40**

1. Preparation of fruit preserves- jam, jelly, marmalades.
2. Preparation of vegetable preserves- pickle, sauces.
3. Preparation of dehydrated products- dried vegetables, seasonal products.
4. Baking: bread making and cookies.
5. Fruit pulping/ juice/ beverage preparation.

Course Code: MFN6.5DSCP405B

PRACTICAL LAB VIIIB

Hours of Instruction/Week: 2 Max **Max. Marks: 40**

1. Survey on types of convenience foods.
2. Survey of consumer behaviour with reference to food liking.
3. Analysis of food labelling.
4. Product development: Identification, planning and development of a product, documentation and preparation of report.

Course Code: MFN6.5DCCT406
DISSERTATION/OJI/RCC

Marks: 50

This course will be based on **preliminary research oriented topics either in theory or experiment**. The faculty members who will act as supervisors for the projects will float projects and any one of them will be allocated to the student. After the allotment, the student shall present synopsis in the department regarding aim, objective and method(s) to carry out the research project. The department shall keep a record of the progress of the project undertaken by the students. At the completion of the project by the semester end, the student will submit Project Report which will be examined by an external examiner. The examination shall consist of (a) Presentation and (b) Comprehensive viva-voce.