SNDT Women's University, Mumbai

Master of Science

(Home Science- Food Science and Nutrition)

M.Sc. (FSN)

As per NEP 2020

Syllabus

(w.e.f. Academic Year 2023-24)

M.Sc. (Food Science and Nutrition)

Semester I						
SN	*Courses*	*Type of Course*	*Credits*	*Marks*	*Int*	*Ext*
114311	Physiological Biochemistry (Th.)	Major (Core)	4	100	50	50
114312	Food Chemistry (Th.)	Major (Core)	4	100	50	50
114313	Human Nutrition I (Macro nutrients & water) (Th.)	Major (Core)	4	100	50	50
114324	Methods of Investigations in Foods & Nutrition (Pr.)	Major (Core)	2	50	50	-
124321 124312	Food Science & Chemistry (Pr.) OR Public Nutrition & Health (Th.)	Major (Elective)	4	100	50	50
134311	Methods of Research (Th.)	Minor Stream (RM)	4	100	50	50
End of Semester I			**22**	**550**	**300**	**250**
Semester II						
214311	Food Microbiology I (Th. & Pr.)	Major (Core)	4 (2 + 2)	100	50	50
214312	Human Nutrition II (Micro nutrients) (Th.)	Major (Core)	4	100	50	50
214313	Food Safety & Quality Control (Th. & Pr.)	Major (Core)	4 (1 + 3)	100	50	50
214324	Food Product Development, Modification & Sensory Evaluation (Pr.)	Major (Core)	2	50	50	-
224321 224312 224313 224314	Food Processing & Technology (Pr.) OR Food Quality Standards & Regulations (Th.) OR	Major (Elective)	4	100	50	50

	Functional Foods, Biodynamic Principles, Nutraceuticals OR Food Entrepreneurship					
244341	Internship *	OJT	4	100	50	50
Exit with PG Diploma in Food Science Nutrition (FSN)			**22**	**550**	**300**	**250**

(* Internship at Research & Development Laboratory/Food Analysis Laboratory/ Nutrition Research)

SECOND YEAR

M.Sc. (Food Science & Nutrition)

Semester III						
Code	*Courses*	*Type of Course*	*Credits*	*Marks*	*Int*	*Ext*
314311	Statistical Application in Research	Major (Core)	4	100	50	50
314312	Maternal & Child Nutrition (Th.)	Major (Core)	4	100	50	50
314313	Food Microbiology II (Th. & Pr.)	Major (Core)	4 (2 +2)	100	50	50
314324	Assessment of Nutritional Status (Pr.)	Major (Core)	2	50	50	-
324321 324312 324313 324314 324315 324316	Food Product Development (Pr.) OR Genetics OR Research from Molecular Level to Human OR Recent Methods in Food Processing, Preservation and Packaging OR Understanding Metabolic and Cardiovascular Health OR Advances in Food Microbiology and Safety	Major (Elective)	4	100	50	50
354331	Research Project	RP	4	100	50	50
End of Semester III			**22**	**550**	**300**	**250**
Semester IV						
414311	Nutrigenetics & Nutrigenomics (Th.)	Major (Core)	4	100	50	50
414312	Nutrition Human Microbiome & Health (Th.)	Major (Core)	4	100	50	50
414323	Nutrition in Society (Pr.)	Major (Core)	4	100	50	50
424311 424312 424313	Environment Sustainability, Food and Nutrition Security for Health OR Integrated Lifestyle Health Management OR Integrated Diet and	Major (Elective)	4	100	50	50

424314 424315 424316 424317	Musculoskeletal Health OR Food Product Development for Special population OR Indian Knowledge Systems in Diet, Food & Health OR Nutritional Epidemiology					
454331	Dissertation	RP	6	150	50	100
End of Semester IV			**22**	**550**	**250**	**300**

Course Syllabus

Semester III

3.1 Major (Core):

Course Title **Subject Code**	**Statistical Application in Research** **314411**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Identify parametric and non-parametric tests
	2. Apply statistical tests for data analysis for both large and small samples
	3. Interpret the results of statistical analysis of data
	4. Summarize data and present it using tables and graphs
Module 1 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Analyze parametric and non-parametric test
	2. Apply the statistical programs for data management
Content Outline	**Introduction to Statistics** Definition, conceptual understanding of statistical measures, popular concepts and misuse of statistics **Normal Distribution and its Properties** a. Normal distribution b. Binomial distribution c. Probability, use of normal probability tables, area under normal distribution curve d. Parametric and non-parametric tests **Data Management** Planning for data analysis – coding of responses, preparation of code book Coding of data Use of statistical programs - MS Excel – SPSS
Module 2 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to

	1. Describe quantitative analysis, descriptive & inferential statistics.
	2. Apply large and small sample tests and interpret the results.
Content Outline	**Data Analysis** a. Quantitative analysis, descriptive statistics, inferential statistics : Uses and limitations, Summation sign and its properties b. Proportions, percentages, ratios c. Measures of central tendency-mean, median, mode-arithmetic mean and its uses, mid – range, geometric mean, weighted mean d. Measures of dispersion /variability- range, variance, standard deviation, standard error, coefficient of variation, Kurtosis, skewness Grouped data-frequency distribution, histogram, frequency polygons, percentiles, quartiles, tertiles, ogive e. Large and Small Sample tests and interpretation -. Z-test for single proportions and difference between proportions -. Large sample test for single mean and difference between means -. Small sample tests- 't'-test, paired 't'-test, 'F' Test
Module 3 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Interpret chi square test, correlation & regression
	2. Distinguish between experiment designs
Content Outline	**Chi square test and its interpretation** a. General features, goodness of fit b. Independence of Attributes **Correlation and Regression and its interpretation** a. Basic concepts b Linear regression and correlation coefficient Regression and prediction c. Rank correlation, Product-moment method **Analysis of Variance and its interpretation** a. One-factor analysis of variance b. Two-factor analysis of variance **Design of Experiments** a. Completely randomized design b. Randomized block design c. Latin square design d. Factorial design
Module 4 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to

	1. Discuss the presentation of Data
	2. Prepare research proposal
Content Outline	**Presentation of Data** a. Tabulation and Organization of data- frequency distributions, cumulative frequency distribution, contingency tables b. Graphical presentation of data- histogram, frequency polygon, ogive, stem and leaf plot, box and whiskers plot, Graphs for nominal and ordinal data- pie diagram, bar graphs of different types, graphs for relation between two variables, line diagram. Use of illustrations Cautions in visual display of data **The Research Report** Basic components of a research report- prefatory material, introduction and Review of Related Literature, Methodology, Results, Discussion, Conclusion, Summary, Abstract, Bibliography and Appendices Students to design a research study on a topic- - specify type of research - sample selection - protocol/operationalization - tools - tests for statistical analysis **Preparation of a Research Proposal**
Assignments / Activities towards Comprehensive Continuous Evaluation (CCE) • Assignment on a standard normal curve • Assignment on calculation of descriptive statistics • Assignment to test the hypothesis • Assignment on sample size calculation	

Bibliography

- Banerje, B. (2018): Mahajan's Methods in Biostatistics for Medical Students and Research Workers, 9th edition, Jaypee Brothers
- Chowdhary, N. and Hussain, S. (2021): Handbook of Research and Publication Ethics, 1st edition, Bharti Publications
- Jain, R.K. (2021): Research Methodology: Methods & Techniques, 5th edition, Vayu Education of India VEI Publishers
- Kothari, C.R. and Gang, G. (2019): Research Methodology: Methods & Techniques, 4th edition, New Age International Publishers
- Nelson, M. (2020): Statistics in Nutrition & Dietetics, 1st edition, Wiley-Blackwell
- Ramalingam, A.T. and Kumar, SN. (2018): Essentials of Research Methodology, 1st edition, Jaypee Brothers

3.2 Major (Core):

Course Title **Subject Code**	**Maternal & Child Nutrition** **314312**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Discuss the physiological changes in pregnancy and lactation
	2. Describe the growth and developmental changes from conception till adolescence.
	3. Identify the inter-relationship between nutrition and growth and development during life cycle
	4. Apply their knowledge in community and public nutrition/health programmes
Module 1 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1.Determine the physiological changes during pregnancy and discuss the stages of embryonic development
	2. Discuss the nutritional requirements during pregnancy
	3. Determine the various complications that occur during pregnancy and their management
Content Outline	**Changing concepts and controversies in Maternal and Child Nutrition** **Importance of Maternal Nutrition during Pregnancy :** Unit 1. Importance of nutrition prior to and during pregnancy Unit 2. Pre-requisites for successful outcome. Effect of undernutrition on mother-child dyad including pregnancy outcome and Maternal and Child Health – Short term and Long term Unit 3. Physiology and endocrinology of pregnancy and embryonic and fetal growth and development Unit 4. Nutritional requirements during pregnancy Unit 5. Adolescent Pregnancy Unit 6. Pregnancy and AIDS, Pregnancy and TB Unit 7. Intra-uterine growth retardation critical windows of development and programming concepts

	Unit 8. Complications of pregnancy and management and importance of antenatal care Unit 9. Congenital malformations, fetal alcohol syndrome and gestational diabetes mellitus
Module 2 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe the physiology and endocrinology of lactation
	2. Discuss the nutritional composition of breastmilk
	3. Describe key nutritional strategies for infant feeding and importance of exclusive breastfeeding
	4. Identify problems faced by lactating mothers and their management
Content Outline	**Lactation and Infant feeding** Unit 1. Development of mammary tissue and role of hormones Unit 2. Physiology and endocrinology of lactation – Synthesis of milk components, let down reflex, role of hormones, lactational amenorrhea, effect of breast feeding on maternal health Unit 3. Human milk composition and factors affecting breastfeeding and fertility, maternal nutritional status and milk composition Unit 4. Management of lactation – Prenatal breastfeeding skills Education. Rooming in, problems – sore ripples, engorged breast, inverted nipples Unit 5. Exclusive breastfeeding Baby friendly Hospitals Initiative Unit 6. Breast feeding in the age of AIDS **Feeding of infants and children and dietary management, key issues in infant Feeding**
Module 3 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Discuss nutritional management strategies adopted for preterm and LBW infants
	2. Describe the growth and development patterns in various stages of childhood
	3. Apply the knowledge of using growth charts into practise by conducting growth monitoring of infants, children and adolescents

Content Outline	**Infant physiology and the preterm and LBW infants: Implications for feeding and management** **Growth and development during infancy, childhood and adolescence** a. Normal pattern of growth and development b. Norms/standards for growth c. Growth monitoring and promotion, growth faltering, Failure to thrive
Module 4 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Determine the intergenerational impact of maternal and child malnutrition
	2. Discuss public health policies and programmes in realm of maternal and child care in India
Content Outline	Malnutrition in mothers and children: etiology and management (in brief) Consequences of malnutrition on physical development, mental development, cognitive development. Effect of deficiencies of specific nutrients Current Nutrition and Health Status of Women and Children in India. Policies and programmes for promoting maternal and child nutrition & health. International, national and state level Concept of small family, methods of family planning, merits and demerits.
Assignments / Activities towards Comprehensive Continuous Evaluation (CCE) • Assignment on clinical assessment of malnutrition amongst children. • Case study of low birth weight babies. • Nutritional assessment of mothers. • Workshop on SAM and MAM children. • Visit to ICDS Centres.	

Bibliography

- ACC/SCN Reports
- Alderman,H.; Behrman,J.; Lavy,V.; Menon,R. (1997) Child Nutrition, Child Health and School Enrollment. Policy Research Working Paper 1700. Washington DC. World Bank
- Barker, D.J.P. (1998). Mothers, Babies and Health in Later Life. Edinburgh, Churchill Livingstone
- Haggerty, PA; Rustein SO (1999) Breastfeeding and Complementary Infant Feeding and the Postpartum Effects of Breastfeeding. Demographic and Health Surveys Comparative Studies Calverton, MA., Macro International

- Huffman, S.L.; Baker, J.; Schumann, J.; Zehner, E.R. (1998) The Case for Promoting Multiple Vitamin/Mineral Supplements for Women of Reproductive Age in Developing Countries. LINKAGES Project. Washington DE. AED
- International Child Health: A Digest of Current Information
- International Food Policy Research Institute (1997). Care and Nutrition: Concepts and Measurement. International Food Policy Research Institute Washington DC., USA
- King, F.S. (1992). Helping Mothers to Breastfeed. Association for Consumers Action on Safety and Health, Mumbai
- Koletzo, B.; Hernell, O.; Michaelson, K. (2000) Short and Long Term Effects of Breastfeeding on Infant Health. Plenum Press, New York
- Luke, B. Johnson, T.R.B.; Petrie, R.H. (1993). Clinical Maternal-Fetal Nutrition. Little Brown and Co, Boston
- Sachdev, H.P.S. and Choudhary, P. (1995). Nutrition in Children-Developing Country Concerns. Cambridge Press, New Delhi
- UNICEF (1997). The Care Initiative: Assessment, Analysis and Action to improve care for Nutrition. New York, UNICEF
- Ward, R.H.T; Smith, S.K.; Donnai, D. (eds) (1994) Early Fetal Growth and Development. London, RCOG Press
- WHO (1999) Management of severe malnutrition. A manual for physicians and other senior health workers. Geneva, WHO
- WHO (1999) Nutrition for Health and Development: Progress and Prospects on the Eve of the 21st century. WHO/NHD/99.9. Geneva
- WHO/ University of California, Davis (1998) Complementary Feeding of Young Children in Developing Countries. Review of Current Scientific Knowledge. Geneva, WHO

3.3 Major (Core):

Course Title **Subject Code**	**Food Microbiology II** **314313**
Course Credits	**4 (2 Th+2 Pr)**
Course Outcomes	After going through the course, learners will be able to
	1. Discuss the hazards of food- borne disorders and identify the recent procedures adopted in various food operations to prevent them
	2. Conduct bacteriological examination of food samples
	3. Apply the concepts of food safety and microbiological testing into practice
Theory **Module 1 (Credit 1)**	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe the common pathogens implicated in food-borne disorders
	2. Discuss the risk factors and impact of food-borne disorders
Content Outline	**Food borne infections and diseases:** Significance to public health Food hazards and risk factors Bacterial, and viral food-borne disorders, Food-borne important animal parasites, Mycotoxins. *Bacillus, Campylobacter, Brucella, Staphylococcus, Clostridium, E.coli, Aeromonas, Vibrio cholerae, Listeria, Mycobacterium, Salmonella, Shigella*
Module 2 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Determine the legal rules and regulations concerning food safety
	2. Apply the principles of HACCP in conducting food safety analysis

Content Outline	**Quality Control/Quality Assurance** Legislation for food safety – national and international Criteria, sampling schemes, records, risk analysis QC- microbial source, code Indicators of food safety and quality: Microbiological criteria of foods and their significance The HACCP system and food safety used in controlling microbiological hazards
Practical **Module 1 (Credit 1)**	
Learning Outcomes	After learning the module, learners will be able to
	1. Conduct tests for identification of bacterial contamination of food samples
Content Outline	**Various biochemical tests used in identification of commonly found bacteria in foods:** IMVIC urease, H2S, Catalase, coagulase, gelatin and fermentation (Acid/gas) Demonstration of available rapid methods and diagnostic kits used In identification of microorganisms or their products. HACCP
Module 2 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	1. Summarize latest techniques in food microbiology
Content Outline	Visits (at least two) to food processing unit or any other organization dealing with advanced methods in food microbiology Project
Assignments / Activities towards Comprehensive Continuous Evaluation (CCE) 1. Discuss the latest approaches in detection of pathogens in food. 2. What is NABL accreditation in food testing laboratories 3. Discuss the importance of having a HACc-P system in a food manufacturing unit.	

Bibliography

- Adams, M.R and M.O. Moss (2007): Food Microbiology, 3rd Edition, New Age International (P) Ltd.
- Atlas, M. Ronald (1996) Principles of Microbiology, 2nd Edition, Mosby-Year Book, Inc, Missouri, U.S.A.
- Banwart, G. (2004) Basic Food Microbiology, 2nd Edition. CBS Publisher.

- Bensaon, H.J. (1990) Microbiological applications, 5th Edition C. Brown Publishers U.S.A.
- Frazier, W.C. (2017) Food Microbiology, Mc Graw Hill Inc. 5th Edition.
- Garbutt, J. (1997) Essentials of Food Microbiology, 1st Edition, Arnold International Students Edition. (2nd edition)
- Jacquelyn G. Black, Laura J. Black. (2018) Microbiology: Principles and Explorations, 10th Edition John Wiley and Sons Inc.
- Jay, James, M. (2006) Modern Food Microbiology, 7th Edition. Springer-Verlag New York Inc.
- Michael P. Doyle, Francisco Diez-Gonzalez, Colin Hill (2019): Food Microbiology, Fundamentals and Frontiers, ASM Press, Washington DC. (5th edition)
- Roday, S. (2011) Food Hygiene and sanitation, 2nd Edition. Tata McGraw Hill, New Delhi.
- Salfinger Y. and Tortorello M.L. (2015): Compendium of Methods for the Microbiological Examination of Foods 5th Edition. American Public Health Association, Washington D.C.
- Topley and Wilson's (1990) Principles of Bacteriology, Virology and Immunity, Edited by S.G. Wilson, A. Miles, and M.T. Parkar, Vol. I: General Microbiology and Immunity, II: Systematic Bacteriology, III: Bacterial diseases, IV: Virology 8th Edition. Edward Arnold Publisher.
- Willey J., Sandman K., and Wood D. (2022) Prescott's Microbiology McGraw Hill Book Company, New York, 12th Edition.

Journals:

- Food Technology published by the Institute of Food Technologists, Chicago, U.S.A.
- Journal of Food Science and Technology published by Association of Food Scientists and Technologists (India) CFTRI – MYSORE.
- Journal of Food Science Published by the Institute of Food Technologists, Chicago, U.S.A.

1.4 Major (Core):

Course Title **Subject Code**	**Assessment of Nutritional Status** **314324**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Analyze and various methods for assessment of nutritional status, body composition analysis.
	2. Carry out and interpret the assessment of dietary/nutrient intakes
	3. Conduct assessment of physical activity and energy expenditure
Practical **Module 1 (Credit 1)**	
Learning Outcomes	After learning the module, learners will be able to
	1. Evaluate the different body composition analysis techniques for nutritional assessment
	2. Apply the correct methods for anthropometric measurements
Content Outline	**Assessment of Nutritional Status** a) Reliability b) Validity c) Accuracy d) Precision **Measurement of weight and height** a) Assessment of nutritional status for adults, young and older children b) Calculation of BMI c)Interpretation Use of WHO reference standards Wasting, stunting, underweight, severe and moderate malnutrition d) Calculation of z-scores and use of software Circumference Measurements – chest, head, mid arm. Waist, hip and ratios wherever applicable to children and adults

	Body Composition a) Use of skinfold b) Bioelectric impedance c) Dual X-ray Absorptiometry (DEXA) d) Calculation of body fat WHO Software for Z Scores, IAP Growth charts.
Module 2 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	2. Determine the legal rules and regulations concerning food safety
	2. Apply the principles of HACCP in conducting food safety analysis
Content Outline	**Dietary intake assessment** a) Food frequency questionnaire b) A 24 hour diet recall and record - Weighment method **Assessment of energy expenditure** a) Indirect calorimetry - use of ergometer, treadmill, heart rate monitoring b) Recording physical activities c) Factorial estimation of energy expenditure: MET, PAL Study of food labels- calculation of DV d) Study of food labels- calculation of DV e) In vitro starch digestibility
Assignments / Activities towards Comprehensive Continuous Evaluation (CCE) • Executing WHO Software for Z Scores. • Plotting IAP Growth charts. • Using BIA machine to analyze body composition of adults. • Project on dietary assessment using dietary recall techniques.	

Bibliography

- Consultation, F. E. (2011). Dietary protein quality evaluation in human nutrition. FAO Food Nutr. Pap, 92, 1-66.
- Escott-Stump, S. (2008): Nutrition and Diagnosis Related Care, Williams and Wilkins

- Frisancho, A. R. (2008). Anthropometric standards: an interactive nutritional reference of body size and body composition for children and adults (p. 335). Ann Arbor: University of Michigan Press.
- Gibson R. Principles of Nutritional Assessment, Oxford University Press
- Khadikar, V., Khadilkar, A. V., Lohiya, N. N., & Karguppikar, M. B. (2021). Extended growth charts for Indian children. Journal of Pediatric Endocrinology and Metabolism, 34(3), 357-362
- Lohman, T., Wang, Z., & Going, S. B. (2005). Human body composition (Vol. 918). Human Kinetics.
- Longvah, T., Anantan, I., Bhaskarachary, K., Venkaiah, K., & Longvah, T. (2017). Indian food composition tables (pp. 2-58). Hyderabad: National Institute of Nutrition, Indian Council of Medical Research.
- Ramachandran, P. (2015). The assessment of nutritional status in India during the dual nutrition burden era. Undernutrition and Public Policy in India, 19-48.
- World Health Organization. (2011). Waist circumference and waist-hip ratio: report of a WHO expert consultation, Geneva, 8-11 December 2008.

3.5.1 Major (Elective):

Course Title **Subject Code**	**Food Product Development (Practical)** **324321**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Apply various aspects of food product development including Food Science and Technology, Marketing and Consumer research, finance and communication
	2. Develop products which meet consumer needs, and are nutritionally and commercially viable
	3. Acquire skills in the various aspects including shelf life assessment, testing of quality parameters and acceptability, packaging and labelling of a product
Module 1 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Prepare food product and conduct its nutritional evaluation
Content Outline	**Nutritional evaluation (estimation of relevant parameters)** **Packaging and Labelling of the product - Packaging design, graphics and labeling**
Module 2 (Credit 2)	
Learning Outcomes	After learning the module, learners will be able to
	1. Undertake bulk preparation of the proposed food product and conduct its shelf life testing
Content Outline	**Bulk preparation of product** **Shelf life testing of the product** (testing for appropriate quality parameters- chemical, microbiological and nutrient content, acceptability studies) Product integrity and conformance to standard
Module 3 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Undertake costing, marketing, advertising and sales of the developed product

Content Outline	Costing the product and determining the sales price Advertising and test marketing the product
Module 4 : **Report preparation**	
Assignments / Activities towards Comprehensive Continuous Evaluation (CCE) • Market survey of recent/ innovative food products. • Assignment on packaging material. • Test marketing, costing and sensory evaluation. • Development of food product and quantity food production.	

Bibliography:

- Askar, A. and Treptow (1993): Quality Assurance in Tropical Fruit Processing. SpringerVerlag, New York.
- ASTM (1968 to 1981): Special Technical Publications, American Society for Testing and Materials, Philadelphia.
- Ball, A.D. and Buckwell, G.D. (1995): Work Out Statistics: 'A' level. Edition: revised MacMillan, London.
- BIS 6273 (2003) Guide for Sensory Evaluation of foods. Optimum Requirement. Part I. Bureau, Of Indian Standards, Manate Bhavan, New Delhi.
- BSI (1975 to 1989) BS 5098 & BS 5929: Publications of British Standards Institution, London.
- Fuller, G.W.(1994) New Food Product Development : From Concept to Market place CRC Press, New York.
- Graf, E. and Saguy, I. S. (1991). Food Product Development : From concept to the Market place, Van Nostrand Reinhold New York.
- Lawless, H.T. and Klein, B.P. (1991): Sensory Science Theory and Applications in Foods. Marcel Dekker Inc.
- Lyon, D.H.; Francombe, M.A.; Hasdell, T.A.; Lawson, K. (eds) (1992): Guidelines for Sensory Analysis in Food Product Development and Quality Control. Chapman and Hall, London.
- Man, C.M.D. and Jomes A.A. (1994) Shelf-life Evaluation of Foods. Blackie Academic and Professional, London.
- Meilgaard, M.; Civille, G.V.; Carr, B.T. (1987): Sensory Evaluation Techniques, Vols. I and II, CRC Press, Florida.
- Moskowitz, H.R. (eBook) (2017): Food Texture: Instrumental and Sensory Measurement. Marcel Dekker Inc. New York.
- O'Mahony, M. (1986): Sensory Evaluation Practices. Academic Press, London.
- Oickle, J.G. (1990) New Product Development and Value Added. Food Development Division Agriculture, Canada.
- Piggott, J.R. (ed) (1988): Sensory Analysis of Foods. Elsevier Applied Science, London.
- Proc. Food Processors Institute: A key to Sharpening your Competitive Edge. Food Processors Institute, Washington, DC.
- Resurrecion, A.V.A. (1998). Consumer Sensory Testing for Product Development. Aspen Publishers Inc., Guthersburg, Maryland USA.

- Shipton, D.A. and Shapton, N.F.(1991) Principles and Practices for the Safe Processing of Foods. Butterworth Heinemann Ltd , Oxford.
- Thomson, D.M.H. (1988): Food Acceptability. Elsevier Applied Science, London.
- Watts, B.M., Ylimaki, G.L., Jeffery, L.E. and Elias, L.G. (1989): Basic Sensory Methods for Food Evaluation. The International Development Research Centre, Ottawa, Canada.

Journals:

- Critical Reviews in Food Science and Nutrition
- Food Technology
- International Journal of Food Science and Technology
- Journal of Food Technology
- Trends in Food Science and Technology

3.5 RP

Course Title **Subject Code**	**Research Project** **354331**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Demonstrate mastery of parametric and non-parametric statistical tests through application in data analysis.
	2. Evaluate and critique quantitative analysis methods, demonstrating proficiency in interpreting large and small sample tests for inferential statistics.
	3. Synthesize advanced statistical techniques such as chi-square tests, correlation, and regression to analyze complex datasets and draw meaningful conclusions.
	4. Construct comprehensive research proposals, integrating data presentation techniques and discussing experimental designs with clarity and precision
Module 1 (Credit 1) Formulation of problem	
Learning Outcomes	After learning the module, learners will be able to
	1. Recognize and undertake research problem.
Content Outline	• Identifying research gaps and formulating research questions. • Sources of research problems (literature, real-world issues, academic curiosity). • Techniques for developing research questions. • Writing clear and measurable research objectives.

<table>
<tr><td colspan="2">Module 2 (Credit 2) Review of Literature</td></tr>
<tr><td>Learning Outcomes</td><td>After learning the module, learners will be able to
1. Review the existing literature</td></tr>
<tr><td>Content Outline</td><td>• Conducting comprehensive literature searches using databases and other resources.
• Evaluating and selecting relevant literature.
• Organizing literature into themes and developing a theoretical framework.
• Writing a coherent and critical literature review.</td></tr>
<tr><td colspan="2">Module 3 (Credit 1) Designing Research proposal</td></tr>
<tr><td>Learning Outcomes</td><td>After learning the module, learners will be able to
1. Apply critical thinking to the problem selected for research</td></tr>
<tr><td>Content Outline</td><td>• Components of a research proposal (title, abstract, introduction, etc.).
• Selecting appropriate research design (exploratory, descriptive, experimental).
• Methodology: data collection methods and sampling techniques.
• Writing and structuring the research proposal.</td></tr>
<tr><td colspan="2">Module 4 (Credit 1) Planning tools & techniques for data collection</td></tr>
<tr><td>Learning Outcomes</td><td>After learning the module, learners will be able to
1. Able to design the research work and plan the execution.</td></tr>
<tr><td>Content Outline</td><td>• Use Gantt charts, timelines, and milestones for project planning and resource allocation.
• Address ethical considerations, including obtaining informed consent.
• Conduct data collection through surveys, interviews, and observations, ensuring ethical guidelines.
•</td></tr>
<tr><td colspan="2">Assignments / Activities towards Comprehensive Continuous Evaluation (CCE)

• Module 1: Continuous assessment involves monitoring students' ability to identify research gaps, formulate clear research questions, and articulate measurable research objectives.
• Module 2: Assess students' proficiency in conducting comprehensive literature searches, evaluating and synthesizing relevant literature, and developing a coherent theoretical framework for their research.
• Module 3: Evaluate students' application of critical thinking in selecting appropriate research designs, developing methodologies for data collection, and structuring a research proposal effectively.
• Module 4: Assess students' competence in using planning tools like Gantt charts for project management, addressing ethical considerations in data collection, and applying qualitative and quantitative analysis methods to interpret research findings.</td></tr>
</table>