Rayat Shikshan Sanstha's

SADGURU GADAGE MAHARAJ COLLEGE, KARAD

(An Autonomous)

Accredited By NAAC with 'A^{+} (3.63 CGPA)' Grade

ISO- 9001-2015 Certified

Affiliated to Shivaji University, Kolhapur

Bachelor of Science (B. Sc.)

DEPARTMENT OF FOOD SCIENCE (ENTIRE)

Under the Faculty of Science and Technology

Choice Based Credit System (CBCS)

Regulations in accordance with **National Education Policy**
to be implemented from Academic Year 2024-25

Syllabus For

B. Sc. Part – II (Food Science-Entire)

SEMESTER III & IV

(Syllabus to be implemented from June 2024)

Rayat Shikshan Sanstha's

SADGURU GADAGE MAHARAJ COLLEGE, KARAD.

(An Autonomous College)

Regulations and Guidelines

Choice Based Credit System (CBCS)

Syllabus for Bachelor of Science Part- II (Food Science-Entire)

- ❖ Guidelines shall be as per B.Sc. Regular Program.
- ❖ Rules and Regulations shall be as per B.Sc. Regular Program.
- ❖ Structure of Program and List of Courses.

1. Title: B.Sc. II Food Science (Entire)

2. Year of Implementation: 2024-2025

3. Duration: One Year

4. Pattern: Semester wise CBCS

5. Medium of Instruction: English

6. Structure of Course:

a. Semester III:

Theory: 07 Papers

b. Semester IV:

Theory: 07 Papers

c. Practical (Semester III & IV): 06 Papers

7. Examination Pattern:

- ❖ Internal Evaluation for Theory Paper – Each theory paper having **10 Marks**
- ❖ Home Assignments /Unit test/ Project Work/Viva / Online /Offline Test
- ❖ There shall be 08 theory papers each having **40 Marks**
- ❖ Practical Examination will be Conducted Semester Wise – **50 Marks** for per subject.

8. Preamble:

This syllabus is framed to accommodate the widening horizons of the discipline of food Science and reflect the current changing needs of the students. Students learn Food Science as a separate subject from B.Sc. I, which increase the employability of students in food Industry. The exposureof students to the subject, will enable them of independent handling of food processing and packaging unit. The syllabus is based on basic and applied approach with vigor and depth. At the same time precaution is taken to make the syllabus comparable to the syllabi of other universities and the needs of industries and research. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

9. Program Outcomes:

1. The students will graduate with proficiency in subject of their choice.
2. The students will be eligible to continue higher studies and abroad in their subject.
3. The students will be eligible to appear for the examination for jobs in government organization.
4. The students will be eligible to apply for jobs with a minimum B.Sc. Food Science program.

10. General Objectives:

a. Enrichment of basic knowledge in areas of Food Science.

b. Reconstruction and redesigning of the courses to suite local needs.

c. To develop aptitude of students in the field of research.

d. More emphasis on applied aspects of Food Science.

Second Year Bachelor of Science (Level-6) Program Structure (NEP-2022Pattern) Structure of B. Sc. Program Semester – III & IV

Rayat Shikshan Sanstha's

SADGURU GADAGE MAHARAJ COLLEGE, KARAD.

COURSE STRUCTURE UNDER AN AUTONOMY

B. Sc. Food Science (ENTIRE)

B. Sc. II SEMESTER– III (Duration – 6 Months)

Sr. No.	COURSE CODE	TEACHING SCHEME							EXAMINATION SCHEME							
		THEOY			COURSE CODE	PRACTICAL			THEORY					PRACTICAL		
		Credit	No. of lectures	Hours		Credits	No. of lectures	Hours	Hours	Theory	Intern.	Total Marks (Min.)	Total Marks		Max Marks	Min Marks
1	N-MJT-BFS-301	2	3	2.4	N-MJP - BFS- 303	4	6.4	8	2	40	10	16+4=20	50	As per BOS Guid-lines	50	20
2	N-MJT-BFS-302	2	3	2.4					2	40	10	16+4=20	50			
4	N-MNT-BFS-309	2	3	2.4	N-MNP-BFS- 310	2	2.4	8	2	40	10	16+4=20	50		50	20
									2	40	10	16+4=20	50			
6	VAC N-VAC-I	2	3	2.4	-	-	-	-	2	50	-	20	50			
7	VAC N-VAC-II	2	3	2.4					2	50	-	20	50			
8	SEC N-SEC-II	2	3	2.4	SEC N-SECP	2	2.4	8	2		---	---	---		50	20
9	SEC N-SEC-III	2	3	2.4					2	40	10	16+4=20	50			
Total of SEM III		**14**	**24**	**19.2**		**08**	**19.2**	**24**	**16**	**350**				**150**		
									Total = 350+150 = 500							

TOTAL NO OF CREDITS FOR SEMESTER – III : 22

B. Sc. I SEMESTER– IV (Duration – 6 Months)

Sr. No.	COURSE CODE	TEACHING SCHEME							EXAMINATION SCHEME								
		THEORY			COURSE CODE	PRACTICAL			THEORY					PRACTICAL			
		Credit	No. of lecture	Hours		Credit	No. of lecture s	Hours	Hours	Theory	Intern.	Total Marks (Min.)	Total Marks		Max Marks	Min Marks
1	**N-MJT - BFS-401-**	2	3	2.4	**N-MJP - BFS- 403**	4	6.4	8	2	40	10	16+4=20	50	**As per BOS Guid - lines**	50	20
2	**N-MJT BFS-402-**	2	3	2.4					2	40	10	16+4=20	50			
3	**N-MNT BFS-409-**	2	3	2.4	**N-MNP - BFS- 410**	2	6.4	8	2	40	10	16+4=20	50		50	20
4	**VAC N-VAC-III**	2	3	2.4					2	50	-	20	50			
5	**SEC N-SEC IV**	2	3	2.4	**SEC N-SECP**	2	6.4	8	2	40	10	16+4=20	50		50	20
6	**SEC N-SEC-V**	2	3	2.4					2	40	10	16+4=20	50			
7	**CC NCC**	2	3	2.4					2	50	-	40	50			
Total of SEM IV		**14**	**24**	**19.2**		**08**	**19.2**	**24**	**16**	**350**					**150**	
Grand Total		**32**	**48**	**38.4**		**22**	**38.4**	**48**	**--**	**350 + 150 = 500**						

TOTAL NO OF CREDITS FOR SEMESTER - IV: 22

TOTAL NO. OF CREDITS FOR SEMESTER - III + IV : (22+22) = 44

- Student contact hours per week : 28.8 Hours (Min.)
- Total Marks for B.Sc.-II (Including AECC & SEC) : **1000**
- Theory lectures and practical : 48 Minutes Each
- Total Credits for B.Sc.-I (Semester III & IV) : **44**

- **BFS – N-MJT Bachelor in Food Science Major Entire Theory:** for Semester- III (BFS – 301MJT to BFS-302 MJT) and for Semester- IV (BFS-401-MJT to BFS-402-MJT)
- **BFS – MNT Bachelor in Food Science -Minor Entire Theory** : for Semester – III (BFS – 309 MNT) and for Semester – IV (BFS – 409 – MNT)

- **N-VAC**- Theory: for Value Added Course (N-VAC-I and (N-VAC-II)- (Theory – 50)

- **BFS – MJP, MNP & NSECP Food Science (Entire) Practical:** for (BFS – 303.BFS -310,403&410)
- Practical Examination will be conducted Semester wise for 50 Marks per course (subject).
- There shall be separate passing for theory and practical courses.

• The examination of each course will be of 50 marks. Minimum 20 marks (40%) out of 50 are required for passing. Separate passing for SEE and CCE (Theory and Internal examination having separate passing).
• Students can exit after Level 5 with Certificate Course in Science (with the completion of courses equal to minimum of 52 credits).
• Students can exit after Level 6 with Diploma in Science (with the completion of courses equal to minimum of 104 credits).
• Students can exit after Level 7 with Bachelor of Science (with the completion of courses equal to minimum of 140 credits).
• SEC: Skill Based Courses (4 credits). Students have to select one for each semester from the pool of courses available at their respective colleges.

Note for SEC courses:

- SEC courses are of Self Study mode. The study material of all above courses will be made available on College website.
- The examination of each of the course will be of 50 marks having 25 MCQ questions. Minimum 20 marks (40%) out of 50 are required for passing.
- The duration of examination shall be conducted at the college level.
- The list of candidates along with marks is to be submitted to the College.
- The degree will be awarded only after successful completion of these courses.

Stucture of the course: B.Sc.II Food Science

Level	Year	Sem.	Course Type	Course code	Course Tittle	Credit	No.of Lecture/Practical
4.5	II	Sem III	Major	N-MJT-BFS-301	Human Nutrition-I	2	30
			Major	N-MJT-BFS-302	Fruit and Vegetable Technology	2	30
			Major	N-MJP-BFS-303	Laboratory Exercise in Human Nutrition-I & Fruit and Vegetable Technology	4	30
			Minor	N-MNT-BFS-309	Food Microbiology : Food Biotechnology	2	30
			Minor	N-MNP-BFS-310	Laboratory Exercise in Food Biotechnology	2	15
			VAC	N-VAC-I	Democracy	2	30
			VAC	N-VAC-II	Environmental Science-I	2	30
			SEC	N-SEC-II	Food Auditing -II	2	30
			SEC	N-SEC-III	Food Product Tech-I	2	30
			SEC	NSECP	Laboratory Exercise in Food Auditing -II & Food Product Tech-I	2	15
		Sem.IV	Major	N-MJT-BFS-401	Human Nutrition-II	2	30
			Major	N-MJT-BFS-402	Fish & Egg Technology	2	30
			Major	N-MJP-BFS-403	Laboratory Exercise in Human Nutrition-II & Fish & Egg Technology	4	30
			Minor	N-MNT-BFS-409	Food Microbiology: Food Safety Management	2	30
			Minor	N-MNP-BFS-410	Laboratory Exercise in Food Safety Management	2	15
			VAC	N-VAC-III	Environmental Science-II	2	30
			SEC	N-SEC-IV	Food Product Tech-II	2	30
			SEC	N-SEC-V	Food Adulteration-I	2	30

			SEC	N-SECP	Laboratory Exercise in Food Product Tech-II & Food Adulteration-I	2	15
			CC	NCC	Yoga	2	30

B.Sc. Food Science Semester III

Course Code and title: N-MJT-BFS-301 Human Nutrition – I

Credits: 02 **Total Lectures: 30**

Course Objectives:

- To learn about the Human diet.
- To know the Calculations.
- To understand the effects on health.

Topic No.		Lectures
1.	**Unit I Nutrition** Definition of the term Nutrients, Dietetics, Balance Diet, Health, Energy, Adequate Nutrition, Optimal Nutrition, Malnutrition, Under Nutrition, Over Nutrition, Balance diet. Food as a source of macro (Carbohydrate, fat & protein) and micronutrients (Vitamins &Minerals). Interrelationship between nutrition & health, visible symptoms of good health.	7
2.	**Unit II Energy in Human Nutrition** Idea of Energy and its unit, Energy Balance, Assessment of Energy, Requirements deficiency and excess, Determination of Energy in food, B.M.R. and its regulation, S.D.A	8
3.	**Unit III Supplementary foods** Introduction. Historical perspectives. Supplementary foods In India. Indian multipurpose food. Malt food, Bal Aahaar, Novel foods.	7
4.	**Unit IV Recent concepts in food science** Introduction. Organic food, Food Fortification, Genetically Modified food, Bio fortification, Space food.	8

Course Outcomes:

After completing the credits students should gain knowledge about:

i. Students will get the importance of human dietary sources.
ii. Different steps to modify nutritious food.
iii. Genetically modification, fortification

Books

1. Gaile Moe, Danita Kelley, Jacqueline Berning and Carol Byrd-Bredbenner. 2013. Wardlaw's Perspectives in Nutrition: A Functional Approach. McGraw-Hill, Inc., NY, USA.
2. Carolyn D. Berdanier, Elaine B. Feldman and Johanna Dwyer. 2008. Handbook ofNutrition and Food, 2nd Ed. CRC Press, Boca Raton, FL, USA.
3. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer and Gregory J. Gatto, Jr. 2002.Biochemistry, 7th Ed. W.H. Freeman and Company, NY, USA.

Course Code and title: N-MJT-BFS-302 Fruit and Vegetable Technology

Credits: 02 **Total Lectures: 30**

Course Objectives:

- To provide fruits processing procedures.
- To learn about the production of different fruit based product varieties.
- To study the preservation methods.

Topic No.		Lectures
1.	**Unit I:** Production and processing scenario of fruits and vegetables in India and World. Scope of fruit and vegetable preservation industry in India. Present status, constraints and prospects. Overview of principles and Preservation methods of fruits and vegetables.	07
2.	**Unit II:** Commercial processing technology of fruits and vegetables. Primary processing and pack house handling of fruits and vegetables; Peeling, slicing, cubing, cutting and other size reduction operations for fruits And vegetables. Minimal processing of fruits and vegetables.	08
3.	**Unit III:** Blanching operations and equipment. Canning: Definition, processing steps, and equipment, cans and containers, quality assurance and defects in canned products. Preparation and preservation of juices, squashes, syrups, sherbets, nectars, cordials, etc.; problems in squash and RTS; processing and equipment for above products and FSSAI Specification. Preparation, preservation and machines for manufacture of crystallized fruits and preserves, jam, jelly and marmalades.	07
4.	**Unit IV:** Preparation, preservation and machines for manufacture of preserve, concentrate, fruit wine, sauerkraut, chutney, pickles, sauce, puree, paste, ketchup; toffee, cheese, lather, dehydrated, wafers and papads, soup powders; FSSAI specification. Production of pectin and vinegar; Commercial processing technology of selected fruits and vegetables for production of various value added processed products.	08

Course Outcomes:

After successful completion of the course the students will be able to:

i. Understand the importance of methods of preparation of fruit products.

ii. Understand the fermented vegetables.

iii. Understand the production working principles of pectin in jelly making.

Books:

1. A Handbook on Post-harvest Management of Fruits and Vegetables P. Jacob John. Daya Publishing House, Delhi ISBN: 9788170355328.
2. Postharvest: An introduction to the physiology and handling of fruit and vegetables. 6th edition Wills R. and Golding J. UNSW Press ISBN: 9781742247854.
3. Post-harvest Technology of Fruits and Vegetables – Vol. 1 Verma L. R. and Joshi V. K.Indus Publishing Company, Delhi ISBN: 8173871086.
4. Handbook of Analysis and Quality Control for Fruits and Vegetable Products Ranganna S. 2nd Edition, Tata-McGraw Hill, 2001.

Laboratory Exercise in Human Nutrition – I and Fruit and Vegetable Technology

Code: N-MJP-BFS-303

Human Nutrition – I

1. Role of various national and international agencies in field of human nutrition.
2. Calculation of Basal Metabolic Rate (BMR).
3. Diet plans for Athletes, Wrestler, Badminton Player, Cricketer and Chess Player
4. Diet plan to weight loss and weight gain.
5. Formulation and preparation of low cost and medium cost nutritious /supplementary recipe.
6. Formulation and demonstration of nutrition education tools such as charts related to health and nutrition education

Fruit and Vegetable Technology

1. Primary processing of selected fruits and vegetables.
2. Preparation of jam/ jelly/ marmalade from selected fruit.
3. Canning of mango/guava/ papaya.
4. Preparation of RTS beverage.
5. Preparation of squash.
6. Preparation of pickle.

Course Code and title: N-MJT-BFS-309 Food Biotechnology

Credits: 02 **Total Lectures: 30**

Course Objectives:

- This course is providing the students with basic knowledge about the applications of Biotechnology in the food industry and in food-related sectors.
- The fundamentals of the production of fermented foods, and the new biotechnological strategies for obtaining and transforming food products.

Topic No.		Lectures
1.	**Unit I: INTRODUCTION**. Food biotechnology: definition, history, current situation, social perception. General aspects of food technology and food industry. Quality attributes in food: sensory, nutritional and safety properties. Food spoilage: physical, chemical and microbiological agents. Strategies for the control of spoilage agents.	07
2.	**Unit II: FOOD FERMENTATIONS**. Starter cultures: classification, applications, market trends, legal aspects. Fermented dairy products: classification, characteristics, industrial production, microorganisms involved and targets for starter improvement. Cheese: types, improvement of starters. Products obtained by alcoholic fermentation: alcoholic drinks, bread, doughs. Other foods obtained by fermentation: vinegar, foods from soy fermentation, meat substitutes. Production of ingredients and additives.	08
3.	**Unit III: ENZYMES OF INTEREST IN FOOD INDUSTRY.** Enzymes in food science: friend and/or enemy. Properties of enzymes of special interest for food technologists. Use of enzymes in food processing: filtration aids, meat tenderization, protein texturization, production of sweeteners, fat interesterification, milk curdling. Biotechnological modification of enzymes involved in food processing: general strategies and examples.	07

4.	**Unit IV: GENETICALLY MODIFIED ORGANISMS FOR THE PRODUCTION OF FOODS WITH IMPROVED PROPERTIES.** Biotechnological modification of nutritional value of foods. Fundamentals of food flavour and its biotechnological modification. Food texture and structure and its biotechnological modification. Chemical basis of food colour: modification through biotechnological Strategies.	08

Course Outcomes:

After successful completion of the course the students will be able to:

i. Understand the importance of methods of preparation of technical products.

ii. Understand the genetically modified food. .

Books:

1. Food Biotechnology. “Introduction to Food Biotechnology” by Sinosh Skariyachan / Abhilash M.
2. Biotechnology in Food fermentation “ Advances in food biotechnology “ By Ravishankar Rai

Laboratory Exercise in Food Biotechnology

Code: N-MNP-BFS-310

Food Biotechnology

1. Production of Tempeh.
2. Production of Yoghurt.
3. Extraction and purification of Juice
4. Tissue culture technique.
5. Study of Genetically Modified Food.
6. Study of techniques of fermented foods to extract organic acids.

Course Code and title: N-VAC -I Democracy

Credits: 02 **Total Lectures: 30**

Objective

- To provide knowledge of bakery products.
- To provide knowledge of confectionary designs.
- To study the various Food Laws and regulations pertaining to these.

Topic No.		Lectures
1.	**Unit I:**	07
2.	**Unit II:**	08
3.	**Unit III:**	07
4.	**Unit IV:**	08

Course out Come: After successful completion of the course the students will be able to:

- Understand the basics of Bakery ingredients.
- Understand the basic principles of baking.
- Understand the basics of soft and hard wheat bakery products.
- Understand the extrusion for bakery and confectionary.

Course Code and title: N- VAC-II Environmental Science-I

Credits: 02 **Total Lectures: 30**

Objective

- To provide knowledge of environmental factors.
- To provide knowledge of types of pollution.
- To study the various Food Laws and regulations pertaining to these.

Topic No.		Lectures
1.	**Unit I:** Nature of Environmental Studies. Definition, scope and importance. Multidisciplinary nature of environmental studies. Need for public awareness.	04
2.	**Unit II:** Natural Resources and Associated Problems. a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer-pesticide problems. e) Energy resources: Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. f) Land resources: Solar energy , Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil Erosion and desertification. Role of an individuals in conservation ofnatural resources.	04

3.	**Unit III:** Ecosystems Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers.Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following ecosystem :- a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). 4. Biodiversity and its conservation (6 lectures) Introduction- Definition:	06
4.	**Unit IV:** Biodiversity and its conservation : Introduction- Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega- diversity nation. Western Ghat as a biodiversity region. Hot-spot of biodiversity. Threats to biodiversity habitat loss, poaching of wildlife, man- wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	06

Course out Come:

After successful completion of the course the students will be able to:

- Understand the basics of components of environment.
- Practical survey experience.
- Understand the basics of pollutants.
- Understand the field work

References:

1) Agarwal, K.C.2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.

2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India,Email:mapin@icenet.net (R)

3) Brunner R.C.,1989, Hazardous Waste Incineration, McGraw Hill Inc.480p

4) Clank R.S. Marine Pollution, Clanderson Press Oxford (TB)

5) Cunningham, W.P. Cooper, T.H.Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia,Jaico Pub. Mumbai, 1196p

6) De A.K., Environmental Chemistry, Wiley Wastern Ltd.

7) Down to Earth , Centre for Science and Environment , New Delhi.(R)

8) Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev.,Environment & Security. Stockholm Env. Institute. Oxford Univ. Press 473p.

Course Code and title: N-SEC -II Food Auditing - II

Credits: 02 **Total Lectures: 30**

Objective

- To understand laws with food safety rules.
- To provide knowledge of signs and symbols.
- To study the various auditing procedures.

Topic No.		Lecture
1.	**Unit I:** Historical Perspectives including necessity of Food Laws. Establishment of US Pure Food Law in early 1900s and of Food & Drug Administration to enforce safety of food products; Urbanization of population and necessity of processed and preserved foods and the necessity of ensuring quality of food to prevent adulteration	07
2.	**Unit II:** Food Quality, Safety & Testing: Quality of Foods and Quality Standards like BIS; Agmark and other optional standards; the difference between mandatory and optional standards; enforcement of optional standards; Food Safety Systems: Quality systems standards including ISO; Auditing; Good Manufacturing Practice and HACCP. Various ways of testing the safety of foods; Detection of harmful chemicals and microbes in foods. Responsibility of agriculture, food industry & food supply sector; Standards of Weights & Measures, British Regulatory Consortium(BRC), Important Issues of GM Foods, Fortification, Nutrition Information on Label, Organic Foods, Safety of Additives, Processes etc. affecting consumers and industry.	08
3.	**Unit III:** Food Laws & Implementing Agencies-National: Prevention of Food Adulteration Act 1954 & Rules 1955 established in India to enforce safety and purity of food products; Various aspects of defining adulteration, taking samples of food for analysis by public analyst, prosecution for adulteration and punishment; Standards of various food products; FPO; Infant Milk Substitute Act; Laws relating to vegetable oils; Use of permitted additives like colours, preservatives, emulsifiers, stabilisers, antioxidants.Food Safety & Standards Act 2006 and the provisions therein; Integrated Food Law - Multi departmental -	07

	multilevel to single window control system, consumer protection Act	
4.	**Unit IV:** International Agencies in Food Regulation:Food Codex Alimentarius: The necessity of harmonised Food Standards for international trade; various aspects and relation with domestic laws; Codex Nodal agency, FAO, WHO, WTO, TUV ,Consumer protection forums.	08

References

1. Rajesh, M., and George, J. (2005) "Food Safety Regulations,Concerns and Trade : The Developing Country Perspective", Macmillan.

2. Naomi, R., and Watson, D. (2007) "International Standards for Food Safety", Aspen Publication.

3. Newslow, D.L. "The ISO 9000 Quality System: Applications in Food and Technology", John Wiley & Sons, 2007.

4. Hubbard, Merton R. "Statistical Quality Control for the Food Industry", 3rd Edition, Springer, 2003.

Course Code and title: N-SEC - III Food Product Technology - I

Credits: 02 **Total Lectures: 30**

Objective

- To provide technical steps for products.
- To design functional food. Dietary importance.
- To produce product as per standard.

Topic No.		Lecture
1.	**Unit I: Food Processing Operations**: Manufacturing processes: batch, Semi-batch and continuous Cleaning of raw materials: cleaning methods and contaminations, Size reduction and screening of solids: equipment, modes of operation. Disintegration of materials: slicing, dicing, shredding, pulping. Mixing and emulsification. Filtration and membrane separation: principles, design features and general applications Centrifugation: principles and applications. Solid-liquid extraction and expression. Sorting and grading of foods: weight, size, shape, buoyancy, photometry sorting	07
2.	**Unit II: Bread, Buns And Pizza Base** Ingredients & processes for breads, buns, pizza base, Equipment's used, product quality characteristics, faults and corrective measures	08
3.	**Unit III: Breakfast Cereals, Macaroni Products And Malt** Production adquality of breakfast cereals, macaroni products and malt.	07
4.	**Unit IV: Specialty Food** Space food, Nutraceutical food, Therapeutic food.	08

Course Outcome:

After successful completion of the course the students will be able to:

- Understand the basic concepts of Food Nutrition and Recommended dietary intakes.
- Understand Nutritional requirements for different age groups.
- Understand the concept of Balanced Diets and plan nutritious meals for different age groups.
- Modify the normal diets that can be used for management and prevention of various diseases.

Books

1 Benzamin T. Burton, Human Nutrition, Tata Mc Graw Hill

2 P.S. Howe, Basic Nutrition in Health & Disease,W.B.SaundersCo.,Philadelphia(7thed.)

3 RobertE.C.Wildman,DenisM.Medeiros,AdvancedHumanNutrition,CRC Press

4 ShubhaginiA.JoshiNutritionandDietetics,TataMcGraw-HillEducation

5 B. Srilakshmi: Dietetics, New Age International

6 M. Swaminathan, Advanced Text-Book On Food &Nutrition(Vol-I&II), Bangloı Printing and Publishing

7 N. Shakuntala Manayand M. Swamy: Food Facts &Principles, New Age International

Laboratory Exercise in Food Auditing – II and Food Product Technology – I

Code - NSECP

Food Auditing – II

1. Principles of HACCP.
2. Study of National standards of food.
3. Study of International standards of food.
4. Application of HACCP in food processing unit.
5. Study about food adulterants.
6. Demonstration of principles and steps in Small scale laboratory.

Food Product Technology – I

1. Determination of Centrifugation process.
2. Preparation of Pizza base.
3. Preparation of bread.
4. Preparation of tomato ketchup.
5. Preparation of popcorn.
6. Visit to Food Processing Industry.

Semester IV

Course Code and title: N-MJT-BFS-401 Human Nutrition - II

Credits: 02 **Total Lectures: 30**

Course Objectives:

- To learn the meal planning.
- To study the physiological changes in human.
- To study the important diet for infant and children.

Topic No.		Lectures
	Credit – I	
1.	**Unit I Basic Principles of Meal Planning** Basic Principles & factors to be consider while planning menu for different age groups, My Plate. Recommended dietary allowances-RDA for Indians, basis for requirement of energy allowance for different growth pattern of children, energy allowance for various activities.	7
2.	**Unit II Nutritional Needs during Pregnancy** Stages of pregnancy Normal growth and weight change, complications, Nutritional requirements, & meal planning. Nutritional needs during Lactation - physiology of lactation, hormonal control, nutritional components of colostrum and mature milk. Nutritional requirements of lactating women. Meal planning.	8
3.	**Unit III Nutrition during Infancy** Preparation of Weaning foods, commercially & by other organizations. Uses of growth chart to monitor growth & development. Nutritional requirements of infants‟ up to one year. Problems of feeding in normal and premature infants.	7

4.	**Unit: IV Nutritional needs of children** Nutritional requirements of toddlers & school going children. Factors to be considered while planning meals for pre-school children. Eating problems of children and their management, packed lunch.	8

Course Outcomes:

After completing the credits students should gain knowledge about:

1. Caring attitude towards the infant and children.
2. Practical parameters relevant with Body mass Index.

Books

1. Gaile Moe, Danita Kelley, Jacqueline Berning and Carol Byrd-Bredbenner. 2013. Wardlaw's Perspectives in Nutrition: A Functional Approach. McGraw-Hill, Inc., NY, USA.
2. Carolyn D. Berdanier, Elaine B. Feldman and Johanna Dwyer. 2008. Handbook of Nutrition and Food, 2nd Ed. CRC Press, Boca Raton, FL, USA.
3. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer and Gregory J. Gatto, Jr. 2002. Biochemistry, 7th Ed. W.H. Freeman and Company, NY, USA.

Course Code and title: N-MJT-BFS-402 Fish and Egg Technology
Credits: 02 **Total Lectures: 30**

Course Objectives:

- To provide the classes of fishes and shellfishes.
- To learn about the production of fish and egg products.
- To study the preservation methods.

Topic No.		Lectures
1.	**Unit I:** Egg structure: Composition, quality characteristics, processing and preservation of eggs, Transport and care and grading inspection.	07
2.	**Unit II:** Sources and developments of Fish industries in India and importance in national economy Classification of fish (fresh water and marine), composition of fish. Transport and care and ant mortem inspection, post-mortem inspection and grading of fish Factors affecting post-mortem changes, properties and shelf life of fish.	08
3.	**Unit III:** Characteristics of fresh fish Processing and preservation of Fish- deboning, aging or chilling, freezing, pickling, curing, cooking and smoking, Fish products: surimi; Fish protein concentrates (FPC); Fish protein extracts (FPE), fish protein hydrolysates (FPH).	07
4.	**Unit IV:** Slaughtering of poultry, post-mortem inspection and grading of poultry meat. Technology of manufacture of poultry products.	08

Course Outcomes:

After successful completion of the course the students will be able to:

i. Understand the importance fish technology in industry.
ii. Understand the reactions during processing.
iii. Understand the structure of egg and fish.

Books:

1. Fish Processing Technology. Hall G.M. Springer Publication ISBN: 9781461311133.
2. Meat Products Handbook – Practical Science and Technology. Gerhard Feiner. CRC Press,Boca Raton. ISBN: 9780849380105.
3. Handbook of Meat, Poultry and Seafood Quality. Kerth Wiley Backwell, 2012 ISBN:

9780470958322

Laboratory Exercise in Human Nutrition - II and Fish and Egg Technology

Code: N-MJP-BFS-403

Human Nutrition – II

1. Detection of nutritional biomarkers in body fluids.
2. Assessment of nutritional status of different age group using anthropometric tools.
3. Diet plan for different age groups.
4. Analysis of anti-nutrients in food.
5. Assessment of Protein quality of Dishes and meals by various indices-NDpCal% and PDCAAS.
6. Blood glucose estimation.

Fish and Egg Technology

1. Slaughtering and dressing of poultry bird.
2. Composition and structure of egg.
3. Determination of egg quality by Haugh unit.
4. Preservation of shell egg.
5. Study of anatomy and dressing of fish.
6. Preparation of fish protein concentrate (FPC).

Course Code and title: N-MNT-BFS-409 Food Safety Management

Credits: 02 **Total Lectures: 30**

Objective

- To provide knowledge of Principles of Food Quality &Quality Control
- To provide knowledge of Food Safety and its Management
- To study the various Food Laws and regulations pertaining to these.

Topic No.		Lectures
1.	**Unit I:** Ways of describing of Food Quality. Quality costs. Quality control and Quality Assurance in Food Industry and their functions. Statistical quality control.	07
2.	**Unit II:** Application of Sensory Evaluation in Quality Management of foods. Objectives Panels involved. Lab Set up and Equipments. Sensory Evaluation Tests. Analysis and Interpretation of sensory scores.	08
3.	**Unit III:** Principles of food quality assurance, Total Quality Control (TQC) andTotal Quality Management (TQM) in Food Industry.	07
4.	**Unit IV:** Food Safety: Concept and Risks Associated with Food: Physical, Chemical, Microbiological and Allergens. General awareness regarding Food safety management, Concept of food traceability for Food Safety,	08

Course out Come:

After successful completion of the course the students will be able to:

- Understand the basics of Food Quality, Quality Control, Quality Assurance and FoodSafety.
- Understand the basic principles of Sensory Evaluation applicable to foods.
- Understand the basic principles of HACCP, ISO and sanitation in general.
- Understand the laws and regulations pertaining to Food Quality and Safety.

Books:

1. Food microbiology By William C. Frazier and Dennis C. Westhoff.
2. Food safety and standards act, 2006 By Bare ACT

Laboratory Practices of Food Safety Management

Code: N-MNP-BFS-410

1. Estimation of Salmonella / Shigella / Staphylococcus from food samples.
2. Estimation of fungal toxins from different types of foods.
3. Detection of Lead.
4. Detection of Bacillus cereus.
5. Detection of Campylabacter.
6. Detection of Escherichia coli and coliforms.

Course Code and title: N- VAC-III Environmental Science– II

Credits: 02 **Total Lectures: 30**

Objective

- To provide knowledge of environmental factors.
- To provide knowledge of types of pollution.
- To study the various Food Laws and regulations pertaining to these.

1.	**Unit I :** Environmental Pollution Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of a individual in prevention of pollution.	06
2.	**Unit II:** Social Issues and the Environment Disaster management: floods, earthquake, cyclone, tsunami and landslides. Urban problems related to energy Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions. Global warming, acid rain, ozone layer depletion, nuclear accidents and Holocaust. Wasteland reclamation. Consumerism and waste products.	08
3.	**Unit III :** Environmental Protection From Unsustainable to Sustainable development. Environmental Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Population Growth	08
4.	**Unit IV :** Field Work Visit to a local area to document environmental assets River/Forest/Grassland/Hill/Mountain. or Visit to a local polluted site - Urban / Rural / Industrial /Agricultural. or Study of common plants, insects, birds. or Study of simple ecosystems - ponds, river, hill slopes, etc.	10

Course out Come:

After successful completion of the course the students will be able to:

- Understand the basics of components of environment.
- Practical survey experience.
- Understand the basics of pollutants.
- Understand the field work

References:

9) Agarwal, K.C.2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.

10) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India,Email:mapin@icenet.net (R)

11) Brunner R.C.,1989, Hazardous Waste Incineration, McGraw Hill Inc.480p

12) Clank R.S. Marine Pollution, Clanderson Press Oxford (TB)

13) Cunningham, W.P. Cooper, T.H.Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia,Jaico Pub. Mumbai, 1196p

14) De A.K., Environmental Chemistry, Wiley Wastern Ltd.

15) Down to Earth , Centre for Science and Environment , New Delhi.(R)

16) Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev.,Environment & Security.Stockholm Env. Institute. Oxford Univ. Press 473p.

Course Code and title: N-SEC-IV Food Product Technology - II

Credits: 02 **Total Lectures: 30**

Objective

- To provide technical steps for products.
- To design functional food. Dietary importance.
- To produce product as per standard.

Topic No.		Lecture
1.	**UNIT 1. Technology of Fruits and Vegetables** Introduction and importance of fruit and vegetable preservation, history and need of preservation. Canning and bottling of fruits and vegetables: Selection of fruits and vegetables, process of canning, containers of packing, spoilage in canned foods. Fruits beverages: Introduction, process and preservation of fruit juices .Jams, jellies and marmalades: Processing and technology, defects in jelly. Pickles, chutneys and sauces: Processing, types, causes of spoilage in pickling.	07
2.	**UNIT 2. Technology of cereals, legumes and oilseeds:** Wheat - Types, milling, flour grade. Rice – Variety, milling, parboiling. Corn – Variety, milling, Millets - milling. Pulses- Dry and wet milling, Oilseeds- Extraction of oil and refining.	08
3.	**UNIT 3. Spices &Plantation Products Spices** – Processing and properties of important spices. Tea and Coffee: Processing (Chapter 12 & 20 – Manay)	07
4.	**UNIT 4. Dairy and Fish Technology** Dairy – FSSA Definition of Milk, Types of Market Milk, Physico-chemical properties of milk, processing of Milk, Concept of Filtration, Clarification, Homogenization, Pasteurization, Introduction to various Milk Products: Butter, ghee, flavored milk, yoghurt, dahi, shrikhand, icecream, condensed milk, milk powder, channa, paneer, cheese (cheddar).	08

Course Outcome:

After successful completion of the course the students will be able to:

- Understand the basic concepts of Food Nutrition and Recommended dietary intakes.
- Understand Nutritional requirements for different age groups.
- Understand the concept of Balanced Diets and plan nutritious meals for different age groups.
- Modify the normal diets that can be used for management and prevention of various diseases.

Books

1. Girdharilal, Siddappaa, G.S and Tandon, G.L., 1998, Preservation of fruits & Vegetables, ICAR, NewDelhi
2. Kent.N.L, 2003 , Technology of Cereal, 5th Ed. Pergamon Press
3. Chakraborty, 1988, Post Harvest Technology of Cereals, Pulses and Oilseeds, revised ed., Oxford & IBH Publishing Co. Pvt Ltd, 4. Marshall, 1994, Rice Science and Technology, Wadsworth Ed., MarcelDekker, New York, 1994
5. H. Faride, 1997, The Science of Cookie and Cracker Production, CBS Publication, New Delhi, 1997.

Course Code and title: N-SEC – V Food adulteration-I

Credits: 02 **Total Lectures: 30**

Objective

- Get the basics of food adulteration.
- Understand the adulteration process.
- Know the basic laws.

Topic No.		Lecture
1.	**Unit I: Common foods and adulteration** Definition, Types and poisonous substances, foreign matter, cheap substitutes and Spoiled parts.	07
2.	**Unit II: Adulteration of common foods and methods of detection** Means of adulteration. Methods of detection of adulteration of milk, grain , spices etc.	08
3.	**Unit III: Present laws and procedures of adulteration.** Food Safety Standard authority, 2006: Rules and procedures of local authority.	07
4.	**Unit IV: Quality control Laboratory of companies, Private testing laboratories.** Consumer education, consumer's rights, problems.	08

Course Outcome:

After successful completion of the course the students will be able to:

- Understand the basic procedures of detection of adulterants.
- Understand FSSAI rules. .

Books

1 Benzamin T. Burton, Human Nutrition, Tata Mc Graw Hill

2 P.S. Howe, Basic Nutrition in Health & Disease,W.B.SaundersCo.,Philadelphia(7thed.)

3 RobertE.C.Wildman,DenisM.Medeiros,AdvancedHumanNutrition,CRC Press

4 ShubhanginiA.JoshiNutritionandDietetics,TataMcGraw-HillEducation

5 B. Srilakshmi: Dietetics, New Age International

6 M. Swaminathan, Advanced Text-Book On Food &Nutrition(Vol-I&II), Banglore Printing and Publishing

7 N. Shakuntala Manayand M. Swamy: Food Facts &Principles, New Age International

Laboratory Exercise in Food Product Technology – II and FoodAdulteration-I

Code: N-SECP

Food Product Technology – II

1. Preparation of banana/ potato wafers.
2. Preparation of fruit candy.
3. Preparation of popcorn.
4. Preparation of flavored milk .
5. FSSAI standards for fruit products.
6. Visit to fruits and vegetables processing unit

Food Adulteration

1. Detection of milk adulterant.
2. Detection of adulterant in spices.
3. Detection of adulterant in oils
4. Detection of adulterants in fats.
5. Detection adulterants in flours.
6. Detection of adulterants in sugars.

Course Code and title: N-CC Yoga

Credits: 02 **Total Lectures: 30**

No. of Units	Topics	Number of Lectures
1	Orientation of students towards national problems;	07
2	Study of the philosophy of N.S.S., fundamental rights, directive principles of state policy,	08
3	Socio-economic structure of Indian society, population and five year plans;	07
4	Functional literacy: Non-formal education of rural youth, eradication of social evil, awareness programmes, consumer awareness, highlights of the Consumer Act, environment enrichment and Conservation, health, family welfare and nutrition; Right to information act.	08