NAAC A+ Accredited

Course Curriculum

(As per the recommendations of the VI Deans' Committee)

B. Sc. (Hons.) Food, Nutrition and Dietetics

Degree Programme

University of Agricultural Sciences, GKVK, Bengaluru-560 065

2026

Semester-wise allocation of courses with code for B. Sc. (Hons.) Food Nutrition & Dietetics degree programme as per the Sixth Deans' Committee Curriculum

I Year I Semester

Sl. No.	Course code	Course Title	Credit Hours	Total Credits
1.	DAR6 111*	*Deeksharambh*—	0+2	
2.	AEX6 111	Communication Skills	1+10	
3.	SEN6 111	Cake Making	0+2	
4.	SEN6 112#	Hygiene Management in Food Service Units	0+2	
5.	FND6 111	Introduction to Food Science and Nutrition	3+0	
6.	FND6 112	Principles and Practices of Food Preparation	1+1	
7.	FND6 113	Indian Cuisinology	0+2	23
8.	FND6 114	National Status Assessment	2+1	(9+14)
9.	FND6 115	Convenience and Health Food Formulation	0+2	
10.	KAN6111/112**	Kannada-I*	0+1	
11	MAT6 111*	Introductory Mathematics	1+0	
12.	MDC6 111***	National Cadet Corps (NCC-1) /National Service Scheme (NSS-I)	2+1	
13.	NCC6111/	National Cadet Corps (NCC-1) /National Service Scheme (NSS-I)	0+1	
14.	PED6 111	Physical Educaion, First/Aid. Yoga Practices and Meditation-1	0+1	

***NB* : * Non-Gradial course**

**** For Non-Kannada speaking students**

 # SEN6 112: Jointly offered by Department of Food Science and Nutrition &AgriculturalMicrobiology; Coordinated by Food Science and Nutrition* MDC6 111: Jointly offered by Department of Agro nomy, Agril. Economics, Animal Science and Horticulture; coordinated by the Dept. of Agronomy.**

I Year II Semester

Sl. No.	Course code	Course Title	Credit Hours	Total Credits
1.	AEX6 122	Personality Development	1+1	
2.	SEN6 121	SEC-III : Pickle Preparation	0+2	
3.	SEN6 122	SEC-IV : Savory Snack Preparation	0+2	
4.	FES6 121	Environmental Studies and Disaster Management	2+1	
5.	FND6 121	Bakery Science and Technology	2+1	
6.	FND6 122	Nutritional Program Surveillance	1+2	
7.	FND6123	Food Preservation and Storage	0+2	22
8.	KAN6121/ KAN6122**	Kannada-II*	2+1	(8+14)
9.	MDC6 122***	Entrepreneurship Development and Business Management	2+1	
10.	NCC6 121/ NSS6 121	National Cadet Corps (NCC-II) /National Service Scheme (NSS-II)	0+1	
11.	PED6 121/	Physical Education, First Aid. Yoga Practices and Medi tation-II	0+1	

***NB*:* Non-Gradial Course**

**** For Non-Kannada speaking students**

***** MDC6 122: Jointly offered by Department of Agricultural Economics, Agricultural Extension and**

IABM; Coordinated by the Department of Agricultural Economics.

Post –II Semester Internship (10 weeks, only for exit option for Award of UG-Certificate after first year)

II Year I Semester

Sl. No.	Course code	Course Title	Credit Hours	Total Credits
1.	ABM6 214	Economics and Food Business Management	2+0	
2.	SEN6 211	SEC-V : Assessment of Clinical Signs and Symptoms	0+2	
3.	FND6 211	Principles of Human Nutrition	4+0	
4.	FND6 212	Fundamentals of Food Science	1+1	20
5.	FND6 213	Community Nutrition and Education	2+1	(15+5)
6.	FND6 214	Human Physiology	2+1	
7.	FND6 215	Food Psychology	2+0	
8.	FND6 216	Food Nutrition and Agriculture	2+0	
9.	NCC6 211*/ NSS6 211*	National Cadet Corps (NCC-III) National Service Scheme (NSS-III)	0+1	

***NB* : * Non-Gradial Course**

II Year II Semester

Sl. No.	Course code	Course Title	Credit Hours	Total Credits
1.	BCM6 222	Nutritional Biochemistry	3+0	
2.	CSC6 221	Agricultural Informatics and	2+1	
3.	SEN6 221	SEC-VI : Development of Nutritional Nutritional Educational Material	0+2	
4.	FND6 221	Normal Nutrition and Meal Planning	2+1	
5.	FND6 222	Public Health Nutrition	2+1	
6.	FND6 223	Food Standards and Quality Control	2+1	20 (13+7)
7.	MDC6 222**	Agriculture Marketing and Trade	2+1	
8.	NCC6 221*/ NSS6 221*	National Cadet Corps (NCC-IV)/ National Service Scheme (NSS-IV)	0+1	

***NB*:**

* **Non-Gradial Course**

**** MDC6 222: Jointly offered by IABM andDepartment of Agricultural Economics; coordinatedby**

IABM. Post - IV Semester Internship (10 weeks, only for exit option for Award of UG-Diploma after second year)

III Year I Semester

Sl. No.	Course code	Course Title	Credit Hours	Total Credits
1.	AEG6 311	Current Food Processing Technologies	2+1	
2.	AST6 311	Statistical Methods	2+1	
3.	EDT6 311*	Educational Tour	0+2	
4.	FND6 311	Therapeutic Nutrition	3+1	21
5.	FND6 312	Food Analysis	2+1	(13+8)
6.	FND6 313	Diet and Nutrition Counseling	0+3	
7.	FND6 314	Nutraceuticals and Health Foods	2+0	
8.	FND6 315	Introduction to Clinical Nutrition	2+1	

***NB:* *Non Gradial Course**

III Year II Semester

Sl. No.	Course code	Course Title	Credit Hours	Total Credits
1.	AMB6 411	Food Microbiology	2+1	
2.	FND6 321	Food and Nutrition Security	1+1	
3.	FND6 322	Nutrition, Body Composition and Physical Fitness	2_1	
4.	FND6 323	Milk Processing & Technology	2+1	21
5.	FND6 324	Cereals and Millets Processing and Technology	2+1	(13+8)
6.	FND6 325	Sustainable Nutrition	2+1	
7.	FND6 326	Hospittality Management	1+1	
8.	FND6 327	Food Hygiens and Sanitation	1+1	

IV Year I Semester

Sl. No.	Course code	Course Title	Credit Hours	Total Credits
1.	FND6 411	Ethics in Juman Research	1+0	
2.	FND6 412	Nutrigenmocs	2+0	
3.	FND6 413	Nutrition for Special Conditions	2+1	
4.	FND6 414	Nutrition through life cycle	2+1	
5.	FND6 415	Global Nutrition	2+0	
6.	FND6 411	Food Toxicology and Quility Testing	2+1	20 (12+8)
7.	FND6 412	Sensory Evaluation of Foods	1+1	
8.	FND6 411	Institutional Food Service Management	0+3	
9.	FND6 411	Seminar	0+1	

***NB*: FND6412: Offered by Department of Plant Biotechnology**

IV Year II Semester

Students should register for 20 Credit Hours (either option A or option B)

Sl.No.	Course Code	Course Title	Credit Hours	Duration	Total Credits
Student READY					
1.	SRN6 421*	Practical extension work in Villages	0+2	2 weeks	
2.		Option A			
	SRN6 422**	In-Plant Training in Food Industry/ Research Institution/ organization	0+9	9 Weeks	
	SRN6 423***	Student Project	0+8	8 Weeks	20
		Option B			
3.	SRN6 424#	Internship in Hospital/ Food & Nutraceutical Industry/Food quality & analysis /testing labs	0+17	17 Weeks	
4.	SRN6 425*	Finishing School Programme	0+1	1 Week	

NB: For B.Sc. (Hons.) Food, Nutrition & Dietetics students will undergo practical extension work in villages during the last two weeks of village placement along with students of B.Sc. (Hons.) Agriculture.

*** Compulsory courses for both the option**

**** Inplant training / attachment with Industry/ Research Institute (May be conducted in split manner in more than one industry/ institution/ organization).**

***** The student project will be R and D based/ field study based/ entrepreneurship based (incubation/experiential learning)**

 # The internship can be taken in service Industry (Example: Hospital/ Hotel) OR in Production Industry (Example: Food/Nutraceuticals Industry) OR in Food Quality and Analysis Laboratories

Summaryofcreditdistributionamongdifferentcategoriesofcourses(Credithours)

Semester	Core Courses Major & Minor	Malti Displinary Course (MDC)	Value Added Course (VAC)	Ability Enhance-ment Course (AEC)	Skill Enhance-ment Course (SEC)	Internship Project/ Stident READY	Total Credits	Non-Gradial	Intern Ship	Online Courses (MOOC/ SWAYAM)
I	12	$3^{(6)}$	-	$1^{(3)} + 2^{(2)} + 1^{(10)}$	4	-	22	$2^{(1)}+1^{(4)} +1^{(5)}$	-	
II	8	$3^{(9)}$	$3^{(8)}$	$1^{(3)} + 2^{(7)} + 1^{(10)}$	4	-	21	$1^{(5)}$	-	
Post-II semester	-	-	-	-	-	-	-	-	$10^{(14)}$	
III	18	-	-	-	2	-	**22**	$1^{(3)}$	-	
IV	12	$3^{(13)}$	$3^{(11)}$	-	2	-	20	$1^{(3)}$	-	$10^{(16)}$
Post-IV semester	-	-	-	-	-	-	-	-	$10^{(15)}$	
V	21	8	-	-	-	-	**21**	$2^{(12)}$		-
VI	21	-	-	-	-	-	**21**	-	-	
VII	20	-	-	-	-	-	**20**	-	-	
VIII	-	-	-	-	-	-	**20**	-	-	
Total	**112**	**9**	**6**	**8**	**12**	**20**	**167**	**5+4**	**20**	**10**

(1)*Deeksharambh*

(2)Communication Skills

(3)National Cadet Crops (NCC)/ National Service Scheme (NSS)

(4) Remedial Course

(5)Kannada

(6)Farming based Livelihood systems

(7)Personality development

(8) Environmental Studies and Disaster management

(9)Entrepreneurship Development and Business Management

(10) Physical Education, First Aid, Yoga Practices and Meditation

(11)Agricultural Informatics and Artificial Intelligence

(12)Educational tour (14 days)

(13)Agricultural Marketing and Trade

(14)Internship (Only for those opting for an exit with UG-Certificate)

(15) Internship (Only for those opting for an exit with UG-Diploma)

(16) Online courses: Students will make their own planning and execution of online courses with intimating to the Dean.

SUMMARY OF CREDIT DISTRIBUTIONS

Type of Courses		Credits
Corecourses(Major& Minor)	:	112
Commoncourses(MDC+VAC+AEC)	:	23
SkillEnhancementCourses(SEC)	:	12
Student READY	:	20
Onlinecourses (MOOC/ SWAYAM) – Non- Gradial	:	10
Non- Gradial[*Deeksharambh* (0+2), NCC /NSS (0+2), Remedial (1+0), Kannada (0+2), and Educational Tour(0+2)]	:	9
Total	:	**167+10+9**

Syllabus for B. Sc. (Hons.) Food, Nutrition and Dietetics as per VI Deans Committee

I Year I Semester

DAR6 111 *Deeksharambh* (Induction-cum-Foundation Program) 2(0+2)

The activities to be taken under *Deeksharambh* shall aim at creating a platform for students to

1. Help for cultural integration of students from different backgrounds.

2. Know about the operational framework of academic process in university.

3. Instilling life and social skills.

4. Social Awareness, Ethics and Values, Team Work, Leadership, Creativity, etc.

5. Identify the traditional values and indigenous cultures along with diverse potentialities both in indigenous and developed scenario.

The details of activities will be decided by the parent universities. The structure shall include, but not restricted to:

i. iscussions on operational framework of academic process in university, as well as interactions with academic and research managers of the University.

ii. Interaction with alumni, business leaders, perspective employers, outstanding achievers in related fields, and people with inspiring life experiences.

iii. Group activities to identify the strength and weakness of students (with expert advice for their improvement) as well as to create a platform for students to learn from each other's life experiences.

iv. Activities to enhance cultural Integration of students from different backgrounds.

v. Field visits to related fields/ establishments.

vi. Sessions on personality development (instilling life and social skills, social awareness, ethics and values, team work, leadership, etc.) and communication skills.

AEX6 111 Communication Skills 2 (1+1)

Objective

- To acquire competence in oral, written and non-verbal communication, develop strongpersonal and professional communication and demonstrate positive group communication.

Theory

Communication Process: The magic of effective communication; Building self-esteem and overcoming fears; Concept, nature and significance of communication process; Meaning, types and models of communication; Verbal and non-verbal communication; Linguistic and non-linguistic barriers to communication and reasons behind communication gap/ miscommunication. Basic Communication Skills: Listening, Speaking, Reading and Writing Skills; Precis writing/ Abstracting/ Summarizing; Style of technical communication; Curriculum vitae/ resume writing; Innovative methods to enhance vocabulary, analogy questions. Structural and Functional Grammar: Sentence structure, modifiers, connecting words and verbals; phrases and clauses; Case: subjective case, possessive case; objective case; Correct usage of nouns, pronouns and antecedents, adjectives, adverbs and articles; Agreement of verb with the subject: tense, mood, voice; Writing effective sentences; Basic sentence faults.

Practical

Listening and note taking; Writing skills: precis writing, summarizing and abstracting; Reading and comprehension (written and oral) of general and technical articles; Micro-presentations

and Impromptu Presentations: Feedback on presentations; Stage manners: grooming, body language, voice modulation, speed; Group discussions; Public speaking exercises; vocabulary building exercises; Interview Techniques; organization of events.

Suggested readings

1. Allport, G. W. 1937. Personality: A Psychological Interpretation. Holt, New York.

2. Brown Michele and Gyles Brandreth. 1994. How to Interview and be Interviewed. Sheldon Press, London.

3. Carnegie Dale. 1997. The Quick and Easy Way to Effective Speaking. Pocket Books, New York.

4. Francis Peter, S. J. 2012. Soft Skills and Professional Communication. Tata McGraw Hill, New Delhi.

5. Kumar, S. and Pushpa Lata. 2011. Communication Skills. Oxford University Press.

6. Neuliep James, W. 2003. Intercultural Communication: A Contextual Approach. Houghton Mifflin Co., Boston.

7. Pease, Allan. 1998. Body Language. Sudha Publications, Delhi.

8. Raman, M. and Singh, P. 2000. Business Communication. Oxford University Press.

9. Seely, J. 2013. Oxford Guide to Effective Writing and Speaking. Oxford University Press.

10. Thomson, A. J. and Martinet, A. V. 1977. A Practical English Grammar. Oxford University Press.

SEN6 111 SEC-I:Cake Making 2(0+2)

Practical

Ingredient used in Cake Making, Types and Varieties: Flour, Sugar, Shortening – Fats and oil, Egg, Moistening agent, Leavening Agents; Cake Making Methods: Sugar butter process, Flour butter process, Genoise method, Blending and rubbing method; Characteristic of Cakes: External characteristics, Internal Characteristics; Balancing cake formula; Cake Faults and remedies; Basic Cake Making: Plain Sponge, Madeira Cake, Rock Cake, Fruit Cake, Fatless Sponge, Swiss Rolls, Genoise Sponge; Market survey for cake and confectionary foodstuffs; Project writing of small-scale bakery and confectionery unit.

SEN6 112 SEC-II:Hygiene Management in Food Service Units 2(0+2)

Practical

Introduction, importance and need of food hygiene and sanitation in food service establishments; Identification of micro-organisms, preparation of slides, preparation of media; Collection of water samples, Testing of water for: (i) Physical quality, (ii) Bacteriological quality, (iii) Water hardness; Food-Borne Diseases – Define Food-Borne illness – Food Infections – Food Poisoning – Bacterial infections – Types of Food Inspections; Sanitary Procedures in Catering Industry – Sanitary Procedures for purchasing foods – categories of commodities – Storage areas Temperature Zones – Thawing, Blanching, maceration, Blast Freezing, Pasteurization; Introduction to Daily Cleaning Procedures in Commercial Kitchen; Visit to food service establishments; Survey of food service establishments, data collection, tabulation, report writing and presentation.

FND6 111 Introduction to Food Science and Nutrition 3(3+0)

Objectives

- To make students understand basic nutrients, their functions, requirements and availability in different food groups.
- Understanding of the changes that occur in foods during preparation, processing and preservation.
- Understanding the nutritive value of different foods and methods of preserving them during cooking.

Theory

Introduction and overview of basic principles of nutrition. Relationship of nutrition to health, growth and human welfare. Definitions of terms used in nutrition-Recommended Dietary Allowances, Balanced Diet, Health, Functional Foods, Phytochemicals, Nutraceuticals, Dietary Supplements, Food Groups. Concepts of food science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.). Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactive compounds, important reactions). Food microbiology (bacteria, yeast, moulds, spoilage of fresh and processed foods, production of fermented foods).Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc).Food and nutrition, malnutrition (over and under nutrition), nutritional disorders.Energy metabolism (carbohydrate, fat, proteins).Balanced/ modified diets.Menu planning.New trends in food science and nutrition.Food Groups.

Suggested Readings

1. Khader V (2003) Food, Nutrition and Health. Kalyani Publishers, Ludhiana.

2. Sehgal S and Raghuvanshi R S (2007) Textbook of Community Nutrition. DIPA, Indian Council of Agricultural Research, New Delhi.

3. Gopalan C, Rama Sastri B V and Balasubramanian S C (2011) Nutritive Value of Indian Foods.National Institute of Nutrition, ICMR, Hyderabad.

4. Gurtherie H A (1989) Introductory Nutrition.Times Mirror, St. Louis.

5. Joshi S A (1999) Nutrition and Dietetics. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

6. Roday Sunetra (2010) Food Science and Nutrition. Oxford University Press, New Delhi.

7. Srilakshmi B (2005) Food Science.New Age International (P) Ltd., Publishers, New Delhi.

8. Potter N (2005) Food Science. CBS Publishers and Distributors, Delhi.

9. Srilakshmi B (2015) Nutrition Science. New Age International Pvt. Ltd., New Delhi.

FND6 112 Principles and Practices of Food Preparation 2(1+1)

Objectives

The students will be able to:

- Understand effect of heat transfer on texture, flavour, taste and appearance of food.
- Demonstrate correct use of small equipment and appliances.
- Identify and apply scientific principles of food selection and preparation, prepare and handle food using safe, sanitary practices; in order to retain nutritive value and produce quality food products.
- Demonstrate and understand ingredient substitution for recipe and describe characteristic properties of quality food products.

Theory

Kitchen attire and equipment, cooking of food, heat and heat transfer, cooking methods, effect of cooking on food and their nutritive value, basics of culinary practice; Thickening and binding agents, basic flavouring, stocks, essence and glazes, sauces, soups, garnishes; Basics of cookery of various foods – cereals, pulses, egg, fish, meat and poultry; Principles and practice of boiling, steaming, frying, stewing, roasting, baking, grilling and combined methods of cookery.

Practical

Kitchen Equipment - Identification, description, uses and handling. Market survey to assess the types and availability of processed products. Identification and selection of ingredients.Preparation of cereal products and pulse products- boiling and steaming, puffing, roasting methods.Basic dry heat cooking methods. Basic medium fat cooking– Roasting, grilling, frying. Milk cookery– pudding, custard and ice-creams.Preparation of Vegetable-Boiled vegetables and Glazed vegetables. Preparation of Vegetable-Fried vegetables and Stewed vegetables. Egg cookery - Boiled (Soft and Hard), Fried, Poached, Scrambled, Omelets. Preparation of Simple Salads: Potato salad, Beetroot salad, green salad, Fruit salad. Preparation of baked products. Cold desserts- Caramel Custard, Bread and Butter Pudding, Scoufflé–Lemon/Pineapple, Mousse (Chocolate, Coffee), Apricot Pudding. Hot desserts - Steamed Pudding.Preparation of meat and products.Identification of meat cuts of lamb, Curing of meat – sugar, salt and nitrite. Preparation of Continental Stock: White stock, brown stock, chicken stock and emergency stock. Preparation of confectionery products- fudge, fondant, candies, toffees and chocolates. Cost reporting system – daily, monthly and for special managerial decisions. Visit to kitchen equipment stores.

Suggested Readings

1. Brown, A. (2018). Understanding Food: Principles and Preparation. Wadsworth Publishing Co Inc.

2. Chambers, M. D. (2009). Principles of food preparation; a manual for students of home economics. Boston cooking-school magazine Company, 1914.

3. Sethi,M.(2007).CateringManagement–AnIntegrated Approach. New Age International

(P) Limited Publishers, New D elhi.

4. The BC Cook Articulation Committee (2015). Basic Kitchen and Food Service Management. BC campus, British Columbia.

FND6 113 Indian Cuisinology 2(0+2)

Objectives

- To impart a hands-on, skill oriented intense curriculum on Indian Cuisine and Culture.
- To examine the central place of cuisine in Indian culture and society.
- To understand the importance of cuisine incultural practices.

Practical

Exploring Indian regional cuisines – North India, North East, South India, Western and Eastern India.Familiarization and identification of Indian herbs and spices.Preparation of dry/wet masalas, pastes and curries/gravies.Preparation of common recipes and meals of North, South, East, West and Central zones of the country.Preparation of Mughlai cuisines.Preparation of food according to festivals in India.Preparation of non-alcoholic Indian beverages.Use of modern crockery/cutlery for presentation.Special meals during fasting.Street foods of India– Exploration and preparation.

Suggested Readings

1. Achaya K T (1998) Indian Food: AHistorical Companion. Oxford University Press, USA.

2. PantP(2007)Cuisines–Incredible India. Wisdom Tree, India.

3. O'BrienC(2012) Food Guide to India. Pengu in India.

4. Martl Richard EandDerek EelsyA(1998) Text book of basic cookery, Fundamental recipes and variations.

5. MehtaN(2013) Cook book of Regional Cuisines of India. Snab Publishers, India.

6. ShuklaS (2022) Plant-BasedIndia: Nourishing Recipes Rootedin Tradition. The Experiment.

7. https://www.unigoa.ac.in/uploads/syllabus/bsc-culinary-arts_syllabus_33020210830.055146.pdf

8. https://www.uou.ac.in/sites/default/files/syllabus/BHM-401T.pdf.

FND6 114 Nutritional Status Assessment 3 (2+1)

Objectives

- To cover the basic concepts of malnutrition, describe how nutritional status is assessed, andidentify the most commonly used nutrition indicators.
- To explain the criteria to consider when selecting the indicator sin specific contexts and situations.

Theory

Major Nutritional Problems–Global and India.Nutritional Status assessment – Direct and Indirect methods, Anthropometric and Body composition methodology (indexes and references). Biochemical Methods of NutritionalAssessment, Clinical nutrition methodology, Dietary Assessment methods. Nutrition Intervention programs and policies, Sustainable Nutrition Goals, Mental Health and Well-being.Rapid assessment methods.Nutritional assessment of infants, children, adults, elderly, pregnant and lactating women.

Practical

Assessment of nutritional status of community using dietary surveys, clinical surveys, anthropometric measurements-data collection, tabulation, data analysis (indexes and references), interpretation andreport writing. Target group selection from pediatrics, adults, elderly, pregnant and lactating women, tabulation, interpretation and report writing of their tested biomarkers.

Suggested Readings

1. Sehgal, S. and Raghuvanshi, R.S. (2007). Textbook of Community Nutrition. DIPA, Indian Council of Agricultural Research, New Delhi.

2. Latham M C (1997). Human Nutrition in the Developing World. Food and Agricultural Organization of United Nations.

3. Dahiya S, Boora P and Rani V (2013). A Manual on Community Nutrition, Department of Foods and Nutrition, published under ICAR Assistance scheme.

4. Bamji S M, Rao N P and Reddy V (1996). Textbook of Human Nutrition. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

5. Flamino Fidanza (1991). Nutritional Status Assessment. Springer Science Business Media.

6. Beghan I, Cap M and Dajardan B (1988). A Guide to Nutritional Status Assessment. WHO, Geneva.

7. Raghuvanshi R S and Mittal M (2014). Food Nutrition and Diet Therapy. India: Westville Publishing House, New Delhi.

FND6 115 Convenience and Health Food Formulation 2(0+2)

Objectives

- Imparting understanding of convenience foods among students.
- Nutritional and health benefits of various healthy food recipes and convenience foods.

Practical

Importance and need for convenience foods. Usefulness and types of convenience foods.FSSAI standards on health food formulations.Health foods– definition, classification and types.Food safety and quality control issues in product development.Packaging of convenience foods.Needs for effective marketing of convenience and health foods.Market survey of convenience and health foods.Cereal-based traditional convenience foods and snacks.Convenience foods of millets.Ready-to-eat breakfast cereals.Pasta products.Legume/pulse-based traditional

convenience foods and snacks.Extruded products.Milk-based products and mixes.Vegetable and fruit-based convenience foods. Food adjuncts (Pickles, chutneys, papad/vadi, etc), soup mixes, fried products.

Suggested Readings

1. Arya S S (1990). Grain Based Snack and Convenience Foods. Indian Food Packer, Sept–Oct, pages 17–34.

2. Chattopadhyay P K (2007). Cereal Food Technology. Published by National Institute of Industrial Research, pages 137–139.

3. Chaughan G S, Verma N S and Bains G S (1985). Effect of Extrusion Processing on the Nutritional Quality of Protein in Rice–Legume Blends. Die Nahrung.

4. Fast R B and Caldwell E F (2000). Breakfast Cereals and How They Are Made. American Association of Cereal Chemists, St. Paul, Minnesota.

5. Guy R. Extrusion Cooking: Technologies and Applications. Woodhead Publishing Limited, Abington and Cambridge.

6. Khatkar B S (2007). Food Science and Technology. Daya Publishing House, Delhi.

7. Pant P (2006). Indian Fast Food. Roli Books Pvt Limited.

8. Selves J and Devipriya J (2010). Health Foods as Soyabean. Beverages and Food World, Feb, page 64.

9. Shiby V K, Sinija V R and Mishra H N (2007). Ready-to-Eat Health Foods: A Promising Concept. Indian Food Industry, Nov–Dec, pages 47–53.

10. Shukla S (2022). Plant-Based India: Nourishing Recipes Rooted in Tradition. The Experiment.

KAN6 111 Kannada -I 1 (0+1)

1. ¥j¸g

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KAN6 112 Kannada -I 1 (0+1)

Development of listening and speaking skills with Kannada structure pattern - Introducing each other - Conversation between friends - Enquiring about family - Plan to go for a movie - Routine activities of a student - In a book shop - Introducing College/ University - Conversation between a farmer and a Scientist - Data collection in a village – Conversation on going on a tour.

Development of writing and reading skills with Kannada structure pattern - Kannada Script practice and reading.

MAT6 111 Introductory Mathematics (Need based) 1(1+0)

Theory

Algebra: Progressions – Arithmetic, Geometric and Harmonic Progressions. Matrices: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order by adjoint method; Properties of determinants up to 3rd order and their evaluation. Differential Calculus: Definition – Differentiation of function using first principle, Derivatives of sum, difference, product and quotient of two functions, Methods, Increasing and Decreasing Functions. Application of Differentiation – Growth rate, Average Cost, Marginal Cost, and Marginal Revenue. Partial Differentiation: Homogeneous function, Euler's theorem, Maxima and Minima of the functions of the form y = f(x) and y = f(x, x). Integral Calculus: Integration – Definite and Indefinite Integrals – Methods – Integration by substitution, Integration by parts; Area under simple well-known curves. Mathematical Models: Agricultural systems – Mathematical models – classification of mathematical models – Fitting of Linear, Quadratic and Exponential models to experimental data.

MDC6 111 Farming Based Livelihood Systems 3 (2+1)

Objective

- To make the students aware about farming-based livelihood systems in agriculture.
- To disseminate the knowledge and skill how farming-based systems can be a source oflivelihood.

Theory

Status of agriculture in India and different states, Income of farmers and rural people in India, Livelihood-Definition, concept and livelihood pattern in urban and rural areas, Different indicatorsto study livelihood systems. Agricultural livelihood systems (ALS): Meaning, approach, approaches and framework, Definition of farming systems and farming based livelihood systems PrevalentFarming systems in India contributing to livelihood. Types of traditional and modern farming

systems. Components of farming system/ farming-based livelihood systems- Crops and croppingsystems, Livestock (Dairy, Piggery, Goatry, Poultry, Duckry etc.), Horticultural crops, Agro—forestry systems, Aqua culture, Duck/Poultry cum Fish, Dairy cum Fish, Piggery cum Fish etc. Small, medium and large enterprises including value chainsand secondary enterprises as livelihood components for farmers.Factors affecting integration ofvarious enterprises of farming for livelihood. Feasibility of different farming systems for differentagro-climatic zones, Commercial farming-based livelihood models by NABARD, ICAR and otherorganizations across the country, Case studies on different livelihood enterprises associated withthe farming. Risk and success factors in farming-based livelihood systems, Schemes and programsby Central and State Government, Public and Private organizations involved in promotion offarming-based livelihood opportunities. Role of farming-based livelihood enterprises in 21stCentury in view of circular economy, green economy, climate change, digitalization and changinglife style.

Practical

Survey of farming systems and agricultural-based livelihood enterprises, Study of componentsof important farming- based livelihood models/ systems in different agro-climatic zones, Study of production and profitability of crop based, livestock based, processing based and integrated farmingbased livelihood models, Field visit of innovative farming system models. Visit of agri-based enterprises and their functional aspects for integration of production, processing and distribution sectors and Study of agri-enterprises involved in industry and service sectors (Value Chain Models), Learning about concept of project formulation on farming-based livelihood systems along with cost and profit analysis, Case study of Start-Ups in agri-sectors.

Suggested Readings

1. Dixon, J. and A. Gulliver with D. Gibbon. (2001). Farming Systems and Poverty: ImprovingFarmers' Livelihoods in a Changing World. FAO and World Bank, Rome, Italy and Washington,DC, USA

2. Ashley, C.; Carney, D. (1999). Sustainable Livelihoods: Lessons from Early Experience;Department for International Development: London, UK, Volume 7. [Google Scholar]

3. Reddy, S.R. 2016. Farming System and Sustainable Agriculture, Kalyani Publishers, New Delhi.

4. Panwar et al. 2020. Integrated Farming System models for Agricultural Diversification,Enhanced Income and employment, Indian Council of Agricultural Research, New Delhi.

5. Singh, J.P., et al. 2015. Region Specific Integrated Farming System Models, ICAR-IndianInstitute of Farming Systems Research, Modipuram.

6. Walia, S. S. and U. S. Walia, 2020. Farming System and Sustainable Agriculture, ScientificPublishers, Jodhpur, Rajasthan.

7. Livelihood Improvement of Underprivileged Farming Community: Some Experiences fromVaishali, Samastipur, Darbhanga and Munger Districts of Bihar by B. P. Bhatt, Abhay Kumar,

8. P.K. Thakur, Amitava Dey Ujjwal Kumar, Sanjeev Kumar, B.K Jha, Lokendra Kumar, K. N.Pathak, A. Hassan, S. K. Singh, K. K. Singh and K. M. Singh ICAR Research Complex forEastern Region ICAR Parisar, P.O. Bihar Veterinary College, Patna 800 014, Bihar.

9. Carloni, A. 2001. Global Farming Systems Study: Challenges and Priorities to 2030 – RegionalAnalysis: Sub-Saharan Africa, Consultation Document, FAO, Rome, Italy

10. Evenson, R.E. 2000. Agricultural Producitivity and Production in Developing Countries'. InFAO, The State of Food and Agriculture, FAO, Rome, Italy

11.Agarwal, A. and Narain, S. 1989. Towards Green Villages: A strategy for Environmentally,Sound and Participatory Rural Development, Center for Science and Environment, New Delhi,India.

NCC6 111 National Cadet Corps (NCC-I) 1(0+1)

Objective

AspergovernmentguidelinesforgettingBandCcertificateinNCC, minimum years of requirement is 2 and 3 years along with 1-2 annual camps.

- Aims, objectives, organization of NCC and NCC song. DG's cardinals of discipline.
- Drill – aim, general words of command, attention, stand at ease, stand easy and turning.
- Sizing, numbering, forming in three ranks, open and close order march, and dressing.
- Saluting at the halt, getting on parade, dismissing, and falling out.
- Marching – length of pace, and time of marching in quick/ slow time and halt; side pace, pace forward and to the rear; turning on the march and wheeling; saluting on the march.
- Marking time, forward march, and halt; changing step, formation of squad and squad drill.
- Command and control, organization, badges of rank, honors, and awards.

NSS6 111 National Service Scheme (NSS-I) 1(0+1)

Evoking social consciousness among students through various activities viz., working together, constructive, and creative social work, to be skillful in executing democratic leadership, developing skill in programme, to be able to seek self-employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

All the activities related to the National Service Scheme are distributed under four different courses viz., National Service Scheme I, National Service Scheme II, National Service Scheme III and National Service Scheme IV; each having one credit load.

The entire four courses should be offered continuously for two years. A student enrolled in NSS course should put in at least 60 hours of social work in different activities in a semester other thanfiveregularone-day campinay ear and one special camp for duration of 7days at any semester break period in the two years. Different activities will include orientation lectures and practical works. Activities directed by the Central and State Government have to be performed by all the volunteers of NSS as per direction.

Practical/Awareness activities

- Orientation: history,objectives, principles, symbol, badge; regular programmes under NSS
- Organizational structure of NSS, code of conduct for NSS volunteers,points to be considered by NSS volunteer's awareness about health.
- NSS programmes and activities: Concept of regular activities, specialcamping, day camps, basis of adoption ofvillage/ slums, conductingsurvey, analysing guiding financial patterns of scheme, youthprogramme/schemes of GOI, coordination with different agencies and maintenanceof diary.
- Understanding youth: Definition, profile, profile, categories, issuesand challenges of youth; and opportunities for youth who is agent of thesocial changeCommunity mobilization:
- Mapping of community stakeholders,designing the message as per problems and their culture; identifyingmethods of mobilization involving youth-adult partnership.
- Social harmony and national integration: Indian history and culture,role of youth in nation building, conflict resolution andpeace- building.

· Volunteerism and shramdan: Indian tradition of volunteerism, itsneed,importance, motivation and constraints; shramdan as part ofvolunteerism.

· Citizenship, constitution, human rights, human values and ethics:Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information,human values and ethics.

· Family and society: Concept of family, community (PRIs and othercommunity based organisations) and society.

PED6 111 Physical Education, First Aid, Yoga 1 (0+1)
Practices and Meditation-I

Objectives

i) To make the students awarea bout Physical Education, First Aid and Yoga Practices

ii) To disseminate the knowledge and skill how to perform physical training, perform first aid and increase stamina and general wellbeing through yoga

Practical

Physical education; Training and Coaching - Meaning and Concept; Methods of Training; aerobic andaerobic exercises; Calisthenics, weight training, circuit training, interval training, Fartlek training; Effects of Exercise on Muscular, Respiratory, Circulatory and Digestive systems; Balanced Diet and Nutrition: Effects of Dieton Performance; Physiological changes due to ageing and role of regular exercis eonageing process;

History of sports and ancient games, Governance of sports in India; Important national sporting events; Awards in Sports; History, latest rules, measurements of playfield, specifications of equipment, skill, technique, style and coaching of major games (Volleyball, Kabaddi, Kho-Kho, Badminton) and Athletics.

Need and requirement of first aid. First Aid equipment and upkeep. Firstaid Techniques, First aid related with Respiratory system. First aid related with Heart, Blood and Circulation. First aid related with Woundsand Injuries. First aid related with Bones, Jointsand Musclerelated injuries.

Yoga; History of Yog,Types of Yog, Introduction toYog - Asanas (Definition and Importance) Padmasan, Gaumukhasan, Bhadrasan, Vajrajasan, Shashankasan, Pashchimotasan, Ushtrasan, Tadasan, Padhastasan, Ardhchandrasan, Bhujangasan, Utanpadasan, Sarvangasan, Parvatasan, Patangasan, Shishupalanasan – left leg-right leg, Pavanmuktasan, Halasan, Sarpasan, Ardhdhanurasan, Sawasan and Suryanamskar

Meditation (Definition and Importance), Yogic Kriyas (Kapalbhati), Tratak, Jalneti and Tribandh, Teaching of Asanas– demonstration, practice, correction and practice.

I Year II Semester

AEX6 122 Personality Development 2 (1+1)

Objective

· To make students realize their potential strengths, cultivate their inter-personal skills and improve employability.

Theory

Personality-Definition, Nature of personality, theories of personality and its types. The humanistic approach–Maslow's self-actualization theory, shaping of personality, determinants of personality, Myers-Briggs Typology Indicator, Locus of control and performance, Type A and Type B behaviors, personality and Organizational Behavior.Foundations of individual behavior and factors influencing individual behavior, Models of individual behavior, Perception and attributes and factors affecting perception, Attribution theory and case studies on Perception and Attribution. Learning: Meaning and definition, theories and principles of learning, Learning and organizational behavior, Learning and training, learning feedback. Attitude and values, Intelligence – types of intelligence, theories of intelligence, measurements of intelligence, factors influencing intelligence, intelligence and Organizational behavior, emotional intelligence. Motivation – theories and principles, Teamwork and group dynamics.

Practical

MBTI personality analysis, Learning Styles and Strategies, Motivational needs, FIRO-B, Interpersonal Communication, Teamwork and team building, Group Dynamics, Win-win game, Conflict Management, Leadership styles, Case studies on Personality and Organizational Behavior.

Suggested Reading

1. Andrews, Sudhir (1988). How to Succeed at Interviews (21st rep.). New Delhi: Tata McGraw-Hill.

2. Heller, Robert (2002).Effective Leadership (Essential Manager Series). DK Publishing.

3. Hindle, Tim (2003). Reducing Stress (Essential Manager Series). DK Publishing.

4. Kumar, Pravesh (2005). All About Self-Motivation. New Delhi: Goodwill Publishing House.

5. Lucas, Stephen (2001). Art of Public Speaking. New Delhi: Tata McGraw-Hill.

6. Mile, D. J. (2004).Power of Positive Thinking. Delhi: Rohan Book Company.

7. Shaffer, D. R. (2009). Social and Personality Development (6th ed.). Belmont, CA: Wadsworth.

8. Smith, B. (2004). Body Language. Delhi: Rohan Book Company.

SEN6 121 SEC-III : Pickle Preparation 2 (0+2)

Practical

Nutritional aspect of fruits and vegetables; Basic characteri stics of pickles; Role of various ingredients used in fruit and vegetable preservation; Introduction to various food additives used in pickle making- Spices and other constituents, condiments and other additives and ingredients, and flavouring, colouring agent sand preservatives; Basic tools and equipment used in the prepara tion of pickle such as boilers, choppers, mechanized peelers, sealers, autoclaves, steam jacketed kettle, picklemixer, etc; Introduction to different types of packaging materials used; Identification of different types of spoilage occurring in fruits; Selection and grading of raw and ripe fruits and vegetables for preservation; Preparations of different types of pickles from fruits and vegetables-

(i) Preparation of salty and oily pickle (green mango, green chili, lemon, ginger, mixed type).

(ii) Preparation of sweet pickle (mango, plum, papaya, date, mango lather, mixed type etc.).

Examination of processed products-Detection of benzoic acid, sulphur dioxide and KMS in fruits and vegetable products. Cleaning and maintenance of the equipment; Study of container like Glass, Tin; packaging materials such as plastic pouches, glass containers, plastic bottle and cartons; Information to be mentioned on label and pack; Waste Management and up keeping of workplace.

SEN6 122 SEC-IV:Savory Snack Preparation 2 (0+2)

Practical

Market survey for availability of different types of savory snacks; Preparation of snacks with some shelf life: Types of Namkeen; Preparation of Chiwda; Chakli preparation and its variations; Preparation of mathri in different flavours; Gathiya preparation; Preparation of snacks eaten when prepared: Khaman and Dhokla with chutnies; Preparation of Dahi Vada and its chutnies; Making types of bhelpuri; Making Corn bhel/Chat; Preparations of Sago: Sago Vada and Sago Khichadi; Frying skills by preparing types of fritters and potato twisters; Cutlet preparation with variations; Preparing Sprout Chat and Masala Peanut; Preparation of Garlic bread, Focaccia and Bruschetta; Project writing of small scale savory snack production unit.

Suggested Readings

1.Brown, A. (2018). Understanding Food: Principles and Preparation. Wadsworth Publishing Co Inc.

2. Pant, P. (2007) Cuisines – Incredible India. Wisdom Tree, India.

3. Richard, E. Martland and Derek A. Eelsy. (1998). Text book of Basic cookery, Fundamental recipes and variations.

4. Sethi, M. (2007). Catering Management – An Integrated approach. Newage International (P) Limited Publishers, New Delhi.

FES6 121 Environmental Studies and Disaster Management 3(2+1)

Objectives

· To expose and acquire knowledge on the environment.

· To gain the state-of-the-art skill and expertise on management of disasters.

Theory

Introduction to Environment-Environmental studies-Definition, scope and importance- Multidisciplinary nature of environmental studies-Segments of Environment-Spheres of Earth-Lithosphere-Hydrosphere-Atmosphere-Different layers of atmosphere. Natural Resources: Classification-Forest resources. Water resources.Mineral resources.Food resources.Energy resources.Land resources.Soil resources. Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Energy flow in the ecosystem. Types of ecosystem. Biodiversity and its conservation: Introduction, definition, types. Biogeographically classification of India.Importance and Value of biodiversity.Biodiversity hot spots.Threats and Conservation of biodiversity.

Environmental Pollution: Definition, cause, effects and control measures of: (a) Air pollution. (b) Water pollution. (c) Soil pollution. (d) Marine pollution.(e)Noise pollution. (f) Thermal pollution. (g) Light pollution. Solid Waste Management: Classification of solid wastes and management methods, Composting, Incineration, Pyrolysis, Biogas production, Causes, effects and control measures of urban and industrial wastes. Social Issues and the Environment: Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain,

ozone layer depletion, nuclear accidents and holocaust. Environment Protection Act.Air (Prevention and Control of Pollution) Act.Water (Prevention and control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Human Population and the Environment:Environment and human health: Human Rights, Value Education. Women and Child Welfare.Role of Information Technology in Environment and human health.

Disaster management - Disaster definition - Types - Natural Disasters - Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves. Man Made Disasters - Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, road accidents, rail accidents, air accidents, sea accidents. International and National strategy for disaster reduction.Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community-based organizations and media in disaster management.Central, state, district and local administration in disaster control; Armed forces in disaster response; Police and other organizations in disaster management.

Practical

Visit to a local area to document environmental assets-river/ forest/ grassland/hill/mountain. Energy: Biogas production from organic wastes. Visit to wind mill / hydro power / solar power generation units. Biodiversity assessment in farming system. Floral and faunal diversity assessment in polluted and un polluted system. Visit to local polluted site - Urban/Rural/Industrial/Agricultural to study common plants, insects and birds. Environmental sampling and preservation. Water quality analysis: pH, EC and TDS. Estimation of Acidity, Alkalinity.Estimation of water hardness.Estimation of DO and BOD in water samples.Estimation of COD in water samples.Enumeration of E. coli in water sample.Assessment of Suspended Particulate Matter (SPM).Study

of simple ecosystem – Visit to pond/river/hills. Visit to areas affected by natural disaster.

Suggested Readings

1. Bharucha, Erach. Text book for Environmental studies. University Grants Commission, New Delhi.

2. De, A.K. 2010. Environmental chemistry. Published by New Age International Publishers, New Delhi. ISBN:13–9788122426175.384pp

3. Dhar Chakrabarti, P.G. 2011. Disaster management - India's riskmanagement policy frame works and key challenges. Published by Centre for Social Markets (India), Bangalore. 36 pp.

4. Parthiban, K.T.,Vennila,S., Prasanthrajan,M. and Umesh Kanna, S. 2023.(InPress). Forest, Environment, Biodiversity and Sustainable development. Narendra Publishing House, New Delhi, India.

5. Prasanthrajan, M. and Mahendran, P.P. 2008. A text book on Ecology and Environmental Science.ISBN81-8321-104-6.AgrotechPublishingAcademy,Udaipur-313002.1st edn.

6. Prasanthrajan, M. 2018. Objective environmental studies and disaster management. ISBN 9789387893825. Scientific publishers, Jodhpur, India. Pp. 146.

7. Sharma, P.D. 2009. Ecology and Environment. Rastogi Publications, Meerut, India

8. Tyler Miller and Scot Spoolman. 2009. Living in the Environment (Concepts,Connections, and Solutions). Brooks/cole, Cengage learning publication, Belmont, USA.

FND6 121 Bakery Science and Technology 3(2+1)

Objectives

· To understand the process of different products, how their ingredients play a role in preparation of breads, cakes, biscuits, etc,

their quality testing and how to modify products with desirable nutritional requirements.

· To provide individuals with key knowledge of packaging, labeling, food safety and food laws that can be applied directly in existing products and also in development of new products of bakery.

Theory

Introduction to baking science. Basic materials used in bakery and confectionery, selection, properties and functions. Flours-constituents, functions and characteristics of good flour and tests. Different types of flour mixtures used in bakery, egg structure, composition and its functions in bakery. Different types of fats and oils used in bakery and their functions. Sugars and functions and types of sugars used in bakery and confectionery, Salt and its function in bakery and their functions, Yeast and types of yeast used in bakery and their functions. Improvers, leavening agents and emulsifiers used in bakery and their functions. Tools, equipment and techniques used in bakery.

Practical

Bakery unit: importance of sanitation and personal hygiene. Use of different bakery equipment, microwave baking, balancing the formula for bakery products. Demonstration on standard method of making different types of biscuits, salt, coconut and fruit biscuits. Demonstration on standard method of making different types of cookies, preparation of different types of cookies, plain sponge cake, chocolate cake, pineapple upside down cake, walnut cake, madeira cake, fruit/plum cake, carrot cake, demonstration on standard method of making of pastries, pastries, icings and cake decoration.

Suggested Readings

1. Ashok Kumar Y. 2012. Textbook of Bakery and Confectionery. PHI Learning, India.

2. Bakers Handbook on Practical Baking. 1994. US Wheat Associates, New Delhi.

3. Mathuravalli SMD. 2022. Handbook of Bakery and Confectionary. CRC Press.

4. NIIR Board of Consultants and Engineers. 2014. The Complete Technology Book on Bakery Products (Baking Science with Formulation and Production). NIIR Project Consultancy Services, New Delhi.

5. Scott D. 2020. Bread Baking for Beginners: A Simple Essential Guide to Kneading and Baking Bread.

FND6 122 Nutritional Program Surveillance 3(1+2)

Objectives

This course will enable the students to-· Understand the concept to nutritional status and its relationship to health.

· Know aims, objectives, methods used for assessment of nutritional status.

· Identify the factors responsible for the mal nutrition.

Theory

Nutrition monitoring and surveillance–definition, introduction, need and significance.Principles of a food and nutrition surveillance system and implementation steps.Nutrition surveillance in developed and under developed countries. Setting up food and nutrition surveillance system activities-strengthening a food and nutrition surveillance system.Nutritional programs– implementa tion, monitoring and evaluation. Concept of E-surveillance on the Nutritional situation in the country. Elements of thenutritional assessment-individual and population assessment– measuring mal nutrition. Sampling of population. Supervision, monitoring and evaluation. Realtime monitoring system.Malnutrition–causative factors. Food security assessment, health assessment and its significance in nutrition surveillance. Indicators of food and

nutrition security–types and characteristics of indicators. Application and usefulness of indicators for different objectives and nutritional problems.Selection of indicators and levels of assessment.

Practical

Surveillance of National nutrition programs: ICDS, mid-day meal, availability of iodizedsalt in markets and households, distribution of iron-folifer tablets. Visit to ICDS centers, PHCs, *Aaganwadis*, assessing nutritional status, data analysis and report writing, visit to mid-day meal kitchen, supervising food preparation in hygienic manner, report writing.

Suggested Readings

1. Bamji M S, Rao Prahlad N and Reddy Vinodini. 2003. Text book of Human Nutrition (pp. 197–201). New Delhi. Oxford and IBH Publishing Co. Pvt. Ltd.

2. Beghan IM and Dajardan B. 1988.A guide to Nutritional Status Assessment.WHO, Geneva.

3. Derrick B Jelliffe. 1966. The assessment of the nutritional status of the community (with special reference to field surveys in developing regions of the world). World Health Organization, Geneva.

4. Flamino Fidanza. 1991. Nutritional Status Assessment. Springer Science Business Media.

5. Gopaldas T and Seshadri S. 1987.Nutrition monitoring and assessment.Oxford University Press.

6. Mason JB, Habicht JP, Tabatabai H and Valverde V. 1984.Nutritional Surveillance.WHO.

7. Sehgal S and Raghuvanshi RS. 2007. Textbook of Community Nutrition. DIPA, Indian Council of Agricultural Research, New Delhi.

8. Saln DR, Lockwood R and Scrimshaw NS. 1981. Methods for the Evaluation of the Impact and Nutrition Program. UN University.

9. Spinello S. 2018. The duties of a community nutritionist. Cited from: https://careertrend.com/list-6526713-duties-community-nutritionist.html

10. WHO. 2014. Food and Nutrition Surveillance Systems: A Manual for Policy-Makers and Program Manager.

FND6 123 Food Preservation and Storage 2 (0+2)

Objectives

To provide information about the shelf-life of different food products, different preservation and processing techniques.

·To provide students hands-on experience and knowledge about handling of food items on scientific lines to prepare and develop different preserved food products.

Practical

Market survey of raw and preserved products. Preparation of preserved products- Squash, cordial, crush, jams, jellies, marmalade, candy, preserves, *murabbas*, pickles with and without oil, chutneys, ketchup, sauces, candies, toffees, cheese and syrup. Drying of blanched and unblanched fruits and vegetables by solar dryer, sun and oven drying methods. Shelf life and sensory evaluation of developed products Packaging of fruits and vegeta bles. Labelling and costing of products. Demonstration oncanningandbottling of fruits and vegetables.Demonstration on storage of food grains. Preparation of *papad, wadian*utilizing cereals and legumes and their storage.Visits to food processing and preservation units, canningbottling units, grain storage institute.

Suggested Readings

1. Bhutani, R.C. 2011. Fruit and Vegetable Preservation. Daya Publishing House.

2. Jood, S. and Khetarpaul, N. 2002. Food Preservation. Geeta Somani, Agrotech Publishing Academy, Udaipur.

3. Kalia, M. and Sood, S. 2010. Food Preservation and Processing. Revised Edition, Kalyani Publishers, New Delhi.

4. Potter, N.N. 1996. Food Science. The AVI Publishing Company, Inc., Westport, Connecticut.

5. Sehgal, S., Grewal, R.B., Kawatra, A. and Kaur, Y. 1997. Practical Aspects of Food Preservation. Directorate of Publications, Haryana Agricultural University, Hisar.

6. Sivasankar, B. 2002. Food Processing and Preservation. PHI Learning Pvt. Ltd., Delhi.

7. Srivastava, R.P. and Kumar, S. 2019. Fruits and Vegetable Preservation: Principles and Practices. Revised and Enlarged 3rd edn. CBS Publishers and Distributors.

8. Subbulakshmi, G. and Udipi, S.A. 2006. Food Processing and Preservation. New Age International Publishers.

9. Vijay K. 1999. Textbook of Food Storage and Preservation. Kalyani Publishers, New Delhi.

KAN6 121 Kannada-II 1 (0+1)

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KAN6 122 Kannada-II 1 (0+1)

Development of listening and speaking skills with Kannada structure pattern - Conversation between a Doctor and a Patient; About Children's Education; Halebid-Belur; Discussing about Examination and Future Plan.

Development of writing and reading skills with Kannada structure pattern : Translation of simple sentences English into Kannada, Selected lesson for reading (Nada Geete, Kannada Habbagalu, Prekshaniya Sthalagalu, Kannada Kavi, Kannada Vijnani)

MDC6 122 Entrepreneurship Development and Business Management 3 (2+1)

Objectives

· To provide an insight into the concept and scope of entrepreneurship.

· To expose various aspects of establishment and management of a small business unit.

· To develop financially viable agri business proposal.

Theory

Development of entrepreneurship, motivational factors, social factors, environmental factors, characteristics of entrepreneurs,

entrepreneurial attributes/competencies. Concept, need for and importance of entrepreneurial development. Evolution of entrepreneurship, objectives of entrepreneurial activities, types of entrepreneurs, functions of entrepreneurs, importance of entrepreneurial development, and process of entrepreneurship development. Environment scanning and opportunity identification, need for scanning – spotting of opportunity, scanning of environment – identification of product/service – starting a project; factors influencing sensing the opportunities. Infrastructure and support systems – good policies, schemes for entrepreneurship development; role of financial institutions and other agencies in entrepreneurship development. Steps involved in functioning of an enterprise, selection of the product/services, selection of form of ownership; registration, selection of site, capital sources, acquisition of manufacturing know-how, packaging and distribution. Planning of an enterprise, project identification, selection and formulation of project; project report preparation, enterprise management.Production management – product, levels of products, product mix, quality control, cost of production, production controls, material management.Production management – raw material costing, inventory control.Personnel management – manpower planning, labour turnover, wages/ salaries.Financial management/accounting – funds, fixed capital and working capital, costing and pricing, long-term planning and short-term planning, bookkeeping, journal, ledger, subsidiary books, annual financial statement, and taxation.Marketing management – market, types, marketing assistance, market strategies.Crisis management – raw material, production, leadership, market, finance, natural, etc.

Practical

Visittosmallscaleindustries/agro-industries, Interaction with successful entrepreneurs/ agri- entrepreneurs. Visit to financial institutions and support agencies. Preparation of project proposal for funding by different agencies.

Suggested Readings

1. Charantimath P.M. 2009. Entrepreneurship Development and Small Business Enterprises. Pearson Publications, New Delhi.

2. Desai V. 2015. Entrepreneurship: Development and Management, Himalaya Publishing House.

3. Gupta C.B. 2001. Management Theory and Practice. Sultan Chand and Sons.

4. Grover, Indu. 2008. Handbook on Empowerment and Entrepreneurship. Agrotech Public Academy.

5. Khanka S.S. 1999. Entrepreneurial Development. S. Chand and Co.

6. Mehra P. 2016. Business Communication for Managers. Pearson India, New Delhi.

7. Pandey M. and Tewari D. 2010. The Agribusiness Book. IBDC Publishers, Lucknow.

8. Singh D. 1995. Effective Managerial Leadership. Deep and Deep Publications.

9. Singhal R.K. 2013. Entrepreneurship Development and Management. Katson Books.

10. Tripathi P.C. and Reddy P.N. 1991. Principles of Management. Tata McGraw Hill.

NCC6 121 National Cadet Corps-II 1(0+1)

Objectives

• Nation Building- cultural heritage, religions, traditions, and customs of India. National integration. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizens. Leadership traits, types of leadership. Character/ personality development. Civil defense organization, types of emergencies, firefighting, protection. Maintenance of essential services, disaster management, aid during development projects.

• Social Service and Community Activities

• Basics of social service, weaker sections of society and their needs, NGO's and their contribution, contribution of youth towards social welfare and family planning.

• Structure and function of human body, diet and exercise, hygiene and sanitation. Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health. Adventure activities. Basic principles of ecology, environmental conservation, pollution and its control.

NSS6 121 National Service Scheme (NSS-II) 1 (0+1)

Objectives

· Importance and role of youth leadership: Meaning, types and traits of leadership, qualities of good leader; importance and roles of youth leadership

· Life competencies: Definition and importance if life competencies, problem-solving and decision-making, inter personal communication

· Youth development programmes: Development and policy at the national level, state level and voluntary sector; youth-focused and youth lead organization

· Health, hygiene and sanitation: Definition needs and scope of health education; role of food, nutrition, safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programmes and reproductive health. Youth health, lifestyle, HIV AIDS and first aid: Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid.

· Youth and yoga: History, Philosophy, concept, myths and misconceptions about yoga; yoga traditions and its impacts, yoga as a tool for healthy lifestyle, preventive and curative method.

PED6 121 Physical Education, First Aid, Yoga Practices and Meditation-II 2 (0+1)

Objectives

i) To make the students aware about Physical Education, First Aid and Yoga Practices

ii) To disseminate the knowledge and skill how to perform physical training, perform first aid and increase stamina and general wellbeing through yoga

Practical

Personality,itsdimensionsandtypes;Roleofsports in personality development; Motivation and Achievements in Sports; Learning and Theories of learning; Adolescent Problems and its Management; Posture; Postural Deformities; Exercises for good posture.

History, latest rules, measurements of playfield, specifications of equipment, skill, technique, style and coaching of major games (Cricket, football, table Tennis, Basketball) and Athletics.

Yoga-Pranayama (Definition and Importance) Omkar, Suryabhedan, Chandrabhedan,

AnulomVilom,Shitali,Shitkari,Bhastrika,BhramariMudras (Definition and Importance) Gyanmudra, Dhyanmudra, Vayumudra, Akashmudra, Pruthvimudra,Shunyamudra, Suryamudra,Varunmudra, Pranmudra,Apanmudra,Vyanmudra, Uddanmudra. Role of yoga in sports

First aid related with Nervous system and Unconsciousness. First aid related with Gastro intestinal Tract. First aid related with Skin, Burns. First aid related with Poisoning. First aid related with Bites and Stings. First aid related with Sense organs, Handling and transport of injured traumatized persons. Sports injuries and their treatments.

Post-Semester-II(OnlyforexitoptionforUG-Certificate)

Sl.No.	CourseTitle	Credit Hours
1.	Internship* (10weeks)	10(0+10)*

*Internship(onlyforexitoptionforawardofUG-Certificate)10weeks10(0+10)

Objectives

To provide students with an opportunity to put into practice the skills they have learnedwhile in the institute, so that in case they exit with UG-certificate, they will be able to get proper engagement/ employment and consider having their own startups.

· Integrate theoryandpractice

· Assessinterestsandabilitiesintheirfieldofstudy

· Developworkhabitsandattitudesnecessaryforjobsuccess

· Develop communication, inter personal and other critical skill sin the job interview process

· Explore career alternatives prior to graduation

Activity

The students will have internship/training for 10 weeks' duration either in the parent institute (attaching the students to facilities such as farm machinery testing center, incubation centers, prototype production facilities, etc.) or in associated industry, food service centers, etc. The College/University will facilitate attaching the students to the organisations. After completion of internship, the students will have to submit a report of their learnings and also present in form of a seminar before nominated faculty members and other students.

The assessment will be based on the report/assessment received from the industry/organisation and the report and the presentation made at the University. Ideally the weightage will be 50% each for both internal and external. The SAUs may modify the weightage and breakups.

II Year I Semester

ABM6 214 Economics and Food Business Management 2 (2+0)

Objectives

· To study food from a scientific perspective and the food industry from a business point of view.

· To have opportunities to create new food products and develop new ways to manufacture, preserve, and package food products.

· To study food production, development, and commercialization.

Theory

Economics definition and key concepts; business economics. The working of competitive markets: business in a competitive market; demand and supply population and growth food production availability, price and output determination; elasticity of demand and supply; Government intervention in competitive markets (FCI, Food Subsidies). Background to demand: marginal utility theory anddemandandthefirm.Backgroundtosupply:costandproduction;short vslong-run. Revenue and profit maximization. Market Structures: Perfect competition, monopoly, monopolistic competition. Business in an international environment: globalization (key concepts). Business Management- Definitions, management principles, scientific principles, administrative principles; Maslow's Hierarchy of needs theory; Functions of management: Planning, organizing, staffing, directing, controlling; Organizational structures, principles of organization; Types of organization: Formal and informal, line and staff, matrix, hybrid.

Suggested Readings

1. Dewett, K.K. and Navalur, M.H. Modern Economic Theory. S. Chand and Sons, New Delhi.

2. Dorfman, Jeffrey H. 2013. Economics and Management of the Food Industry. Taylor and Francis.

3. Jain, S.P. Financial Accounting. Kalyani Publications, Ludhiana.

4. Koontz, Harold. Principles of Management. Tata McGraw-Hill Education Private Limited, New Delhi.

5. Prasad, L.M. 2001. Principles and Practices of Management, 9th edn. S. Chand and Sons, New Delhi.

6. Rao, P. Subba. Human Resource Management. Himalaya Publications.

7. Thomas, P.C. Managerial Economics, 9th edn. Kalyani Publishers.

SEN6 211 SEC-V:Assessment of Clinical Signs and Symptoms 2 (0+2)

Practical

Preparation of list of signs and symptoms of PEM; Preparation of poster on signs and symptoms of vitamin deficiency; Preparation of folder on mineral deficiencies; Visit to Aanganwadi to assess signs of PEM deficiency in children; Visit to hospital to assess the deficiency signs and symptoms in pregnant women; Survey of adolescent boys and girls to assess micronutrient deficiency; Assessment of clinical signs and symptoms of malnutrition in school age children; Nutrition education to target groups on micronutrient deficiency; Visit to local health centre to identify clinical signs and symptoms of nutritional problems; Community survey for nutritional deficiency disorders – data collection, tabulation, analysis, interpretation, report writing; Presentation of reports and group discussion; Comparison of data on status of

various deficiency diseases in India (NFHS 3, NFHS 4, NFHS 5) in vulnerable groups; Development of tools for assessing signs and symptoms of micronutrient deficiency in vulnerable groups; Collection of data on locally available common foods and their cost and unavailability of certain foods leading to deficiencies in particular region; Surveillance of national nutrition programs; Data analysis and report writing.

Suggested Readings

1. Bamji M.S., Prahlad R.N. and Vinodini R. 2003. Textbook of Human Nutrition. New Delhi, Oxford and IBH Publishing Co. Pvt. Ltd.

2. Das S. 2022. Textbook of Community Nutrition. Academic Publishers.

3. Mason J.B., Habicht J., Tabatabai H. and Valverde V. 1984. National Surveillance. WHO.

4. Sehgal S. and Raghuvanshi R. 2007. Textbook of Community Nutrition. ICAR Publication.

FND6 211 Principles of Human Nutrition 4 (4+0)

Objectives

Attheendofthecourse,thestudentwillhaveknowledgeof

· Different types of carbohydrates, lipids and fatty acids and proteins and amino acids required for human nutrition.

· Energy requirement and expenditure in the human body during rest and physical activity.

· Physiological and biochemical role of water, minerals and vitamins and their metabolism in the human body.

· Diseases and symptoms resulting from deficiency of major and minor nutrients.

· Biochemical monitors used to assess the nutritional status of different nutrients.

Theory

Historical development and the relationship of nutrition to health, growth and human welfare. Definitions of terms used in nutrition – Recommended dietary allowances, balanced diet, health foods, functional foods, phytochemicals, nutraceuticals, dietary supplements, ethnic foods, organic foods, fabricated foods, extruded foods, convenience foods, junk foods, GM foods and proprietary foods. Food groups (Four, Five, Seven, Nine, Eleven), food pyramid, MyPlate concept, bioavailability, enrichment, fortification and restoration of nutrients. Energy units, sources and requirements, fuel value of foods, methods of measuring energy value of food, energy requirement of body, physical activity and thermogenic effect of food, respiratory quotient, SDA, BMR – methods of measurement, factors affecting BMR, energy expenditure in different activities, energy balance. Carbohydrates – types, functions, sources, requirement, digestion and absorption of carbohydrates, health conditions affected by carbohydrates, dietary fiber – classification, sources, composition, properties and nutritional significance. Lipids – types, functions, sources, requirement, digestion and absorption of lipids, health problems associated with lipids. Proteins – types, functions, sources, requirement, digestion and absorption of proteins, quality evaluation, improvement and deficiency and protein energy malnutrition. Vitamins – classification, functions, sources, requirement, deficiency and toxicity of fat soluble (A, D, E, K) and water soluble (C, B complex – thiamine, riboflavin, niacin, B6, pantothenic acid, B12 and folic acid). Minerals – classification, functions, sources, requirements, deficiency and toxicity of calcium, phosphorus, iodine, fluorine, iron, sodium, potassium, chloride, copper and zinc, factors affecting bioavailability of calcium and iron and other minerals. Water – functions, sources, distribution in body, water balance and electrolyte balance.

Suggested Readings

1. Agrawal, A. and Udipi, A.S. (2022). Textbook of Human Nutrition. Jaypee Brothers Medical Publishers.

2. Recommended Dietary Allowances and Estimated Average Requirements – Nutrient Requirements for Indians (2020). A Report of the Expert Group, Indian Council of Medical Research, National Institute of Nutrition.

3. Raghuvanshi, R.S. and Mittal, M. (2014). Food, Nutrition and Diet Therapy. Westville Publishing House, New Delhi.

4. Bamji, M.S., Krishnaswamy, K. and Brahmam, G.N.V. (2009). Textbook of Human Nutrition. Oxford and IBH Publishing Company Pvt. Ltd.

5. Sehgal, S. and Raghuvanshi, R.S. (2007). Textbook of Community Nutrition. ICAR Publication.

6. Wilson, E.D., Fisher, K.H. and Garcia, P.A. (1980). Principles of Nutrition. John Wiley and Sons, New York.

7. Longvah, T., Ananthan, R., Bhaskarachary, K. and Venkaiah, K. (2017). Indian Food Composition Tables. National Institute of Nutrition, ICMR, New Delhi.

FND6 212 Fundamentals of Food Science 2 (1+1)

Objectives

· To introduce students to the field of food science.

· To cover possible jobs, food harvest, production methods, food chemistry, preserving methods, meeting nutritional needs, grading procedures used, and the science involved.

·To understand both fundamental and applied aspects of food science.

· To provide a fundamental understanding of food chemistry and food microbiology.

To gain insights about the role of specific nutrients in maintaining health and identifying nutrient-specific foods.

Theory

Cooking- Objectives, cooking methods, their types, merits and demerits. Cereals and millets - Structure, composition, processing techniques, effect of heat and acid, functions of starch in the cookery, gelatinization, dextrinization, antinutritional and retrogradation of starch. Legumes, nuts and oil seeds - Composition, processing techniques, effect of heat, acid and alkali. Fruits and vegetables - Types, composition, pigments, changes caused by heat, acid and alkali. Milk and milk products – Composition, types, products, effect of acid on pigments, effect of acid on milk cookery, uses and functions. Egg - Structure, composition, grading of egg, function and changes during cooking. Meat, poultry and fish- Types, structure, composition, pigments, factors affecting tenderness, post-mortem changes and changes during cooking. Sugars- Types, composition, manufacturing process, effect of heat and acid, crystallization factors affecting crystallization, functions of sugar in cookery, fondants and fudge. Fats and oils - kinds, composition, effect of heat, functions in cookery, processing techniques, rancidity of fats; Methods of improving nutritive value of foods – germination, fermentation, malting, mutual supplementation etc. Brief overview of beverages; Condiments and spices, importance in daily life.

Practical

Orientation to kitchen equipment and their uses, weighing and measuring food items.Condiments and spices.Cooking of foods using different methods.Cereal cookery – practical exercise on dextrinization and gelatinization of rice starch, gluten formation in wheat. Legumes – identification and cooking methods. Nuts and oilseeds – use in food preparations. Preparations using germination, fermentation, and mutual supplementation.Vegetable cookery – different preparations with vegetables and effect of heat

and alkali on pigments.Preparation of soups, salads, and beverages.Milk and milk products – Maillard reaction and use in various preparations. Egg cookery – preparations showing functions of egg as binding and coating agent: poached egg, boiled egg, scrambled egg, omelet, egg curry. Meat, poultry and fish cookery – preparations involving various methods of cooking. Sugar – preparations showing functions of sugar in cookery: caramelization, coating agent, crystallization, syrups of different consistencies, sweets, chocolates and candies. Fats and oils – demonstration of smoking point, use in various preparations like deep fat frying, shallow fat frying, shortening effects of oil, and factors affecting absorption of oil.

Suggested Readings

1. Sharma, A. (2017). Textbook of Food Science and Technology. CBS Publication.

2. Fox, B.F. and Cameron, A.G. (1970). Food Science – A Chemical Approach. University Press, London.

3. Raghuvanshi, R.S. and Bisht, K. (2010). Uses of Soybean: Products and Preparation.

4. Raghuvanshi, R.S. and Singh, D.P. (2009). Food Preparations and Use.

5. Shakuntala Manay, N. and Shadaksharaswamy, M. (1998). Foods, Facts and Principles. New Age International Publishers, New Delhi.

6. Singh, Guriqbal (Ed.). Soybean: Botany, Production and Uses. CAB International, U.K.

7. Swaminathan, M. (1988). Handbook of Food Science and Experimental Foods. BAPPCO, Bangalore.

8. William Erskine et al. (Eds.). The Lentil: Botany, Production and Uses. CAB International, U.K.

FND6 213 Community Nutrition and Education 3 (2+1)

Objectives

Attheendofthecourse,thestudentwillhaveknowledgeof:

· Causes, prevalence and consequences of the major nutritional problems existing in India and its control measures.

· Methods of nutritional status assessment of individuals and groups, both directly and indirectly.

· To inculcate the concept of food and nutrition security, and government and international programs running in the field of community nutrition for ameliorating the nutritional status of the population.

· To enable students to assess nutritional status and impart nutrition education among rural and needy people.

Theory

Basic concept of community nutrition and role of nutritionist in improving nutrition in the community. Food habits and influencing factors, food taboos, mortality and morbidity pattern of vulnerable groups and their causes. Nutritional needs of normal infants, prelacteal feeding, exclusive breastfeeding, feeding of full-term and premature infants. Importance of breastfeeding and supplementary foods in combating malnutrition in infants and young children.Growth monitoring. Malnutrition – definition and causes, classification of grades of malnutrition. Assessment of nutritional status – nutritional anthropometry: need and importance, standards for reference, techniques of measuring length/height, weight, head, chest and arm circumference, skinfold thickness, and interpretation of these measurements. Use of growth charts. Clinical signs of deficiencies, especially protein-energy malnutrition (Kwashiorkor, Marasmus), vitamin A deficiency, anemia, rickets and B-complex deficiencies. Biochemical and biophysical assessment. Diet survey – need and importance,

methods of dietary survey, interpretation: concept of consumption unit, individual and total distribution of food in a family, adequacy of diet with respect to RDA, concept of family food security. Major nutritional problems in the community.National programs and policies for improving nutritional status of the community.Role of national and international agencies in improving nutritional status of the community.Nutrition education – objectives, methods, channels and its role in control of malnutrition in the community.Community nutrition education – objectives, principles and importance.Nutritional survey – NFHS.

Practical

Assessing nutritional status of hostel inmates and local community dwellers.Assessing nutritional statusof community as per socio-economic status. Visit to local health centers to identify clinical signs and symptoms of nutritional problems. Visit to Anganwadi centers, MDM and evaluation of feeding provided at these centers. Community survey for nutritional deficiency disorders -Data collection, tabulation, analysis, interpretation report writing. Development of audio- visual aids. Planning, implementation and evaluation of nutrition education program for a target group.

Suggested Readings

1. Bamji, S.M., Rao, N.P. and Reddy, V. (1996). Textbook of Human Nutrition. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

2. Dahiya, S., Boora, P. and Rani, V. (2013). A Manual on Community Nutrition. Department of Foods and Nutrition, published under ICAR Assistance Scheme.

3. Das, S. (2022). Textbook of Community Nutrition. Academic Publishers.

4. Latham, M.C. (1997). Human Nutrition in the Developing World. Food and Agriculture Organization of the United Nations.

5. Sehgal, S. and Raghuvanshi, R.S. (2007). Textbook of Community Nutrition. Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, New Delhi.

FND6 214 Human Physiology 3 (2+1)

Objectives

· To understand the role of molecules, cells, tissues, organs, and organ systems (endocrine, nervous, muscular and immune systems) in human health and disease.

· To understand physiology – the functioning of a living organism and its component parts.

· To acquire an understanding of how and why the body functions the way it does, and what happens when it does not function properly.

Theory

Introduction to anatomy and physiology and structural organization of the body. The cell – structure, its organelles, functions and multiplication, different types of cells and their functions, movement of particles across the cell membrane – active transport and passive transport. Body fluids and their compartments and functions, water input and output in the body and maintenance of water balance in the human body. The tissues – types, structure and their functions. The skeletal system – anatomy and functions, structure, formation and development of bones, different types of bones, types of joints and their movements. Circulatory system – the blood: composition and functions, blood clotting and blood grouping. Heart – structure and functions, types of circulatory systems, blood pressure and heart rate and factors affecting it, electrocardiogram. The respiratory system – anatomy and functions, mechanism of breathing and respiratory volumes, gas transport and respiratory adaptations. The digestive system – anatomy and functions of the alimentary tract and accessory organs,

process of digestion of food, absorption and assimilation of digested food, enzymes involved in digestion of food. Liver – structure and functions. Pancreas – structure and functions. The urinary system – anatomy and functions, formation and composition of urine.The endocrine system – important ductless glands of the body and their functions. The reproductive system – male reproductive system: anatomy and functions; female reproductive system: anatomy and functions, menstrual cycle. The nervous system – elementary study of anatomy and functions.Sensory organs – anatomy and functions. Glossary of terms used in physiology.

Practical

Study of a compound microscope, microscopic structure of epithelial, muscular and connective tissue, bone and cartilage.Measurement of body temperature and basal metabolic rate.Recording of systemic arterial blood pressure, pulmonary function test, pulse rate and respiratory rate, effect of posture and exercise on blood pressure. Visit to anatomy and physiology lab, estimation of hemoglobin, red blood corpuscles, estimation of white blood corpuscles, determination of blood groups, assessment of blood group, determination of bleeding time (BT) and clotting time (CT). Determination of blood glucose. Qualitative tests with urine samples – urine sugar and albumin.

Suggested Readings

1. Arthur, J.V. Human Physiology – The Mechanisms of Body Function. Tata McGraw Hill Publishing Company, New Delhi.

2. Guyton, A.C. Textbook of Medical Physiology. 5th edn. W.B. Saunders Company, Philadelphia and London.

3. Samson's Applied Physiology. 10th edn. Revised by Keele, C.A. and Neil, B. Oxford University Press, New York.

FND6 215 Food Psychology 2 (2+0)

Objectives

· To gain an understanding of the psychological factors that influence food choices, eating behaviors, and our relationship with food.

· To explore the impact of sensory experiences (taste, smell, sight, touch) on food perception and preference.

· To examine the psychology behind food marketing and advertising strategies.

· To develop practical strategies to cultivate a mindful and healthy relationship with food.

Theory

Introduction to Food Psychology, Interaction of Hunger and Satiety, Sensory Perception andFood Preferences, Role of positive and negative emotions on selection / choice of foods – eatingbehavior. Meal composition and effect of specific nutrients on mood / stress., Understanding andManaging Cravings, Anorexia nervosa and binge eating behaviour, Mindful Eating Practices, SocialCues and Dining Environments, Psychological influence of Food Marketing and Advertising, digitalfood marketing – public health challenge, Cultural Food Traditions and Practices, Food and MentalWell-being, Practical Applications of Food Psychology, Overeating, Disordered Eating, and BodyImage Concerns, Strategies for Individual and Community Health.

Suggested Readings

1. Cardoz, F. (2009). India: The Cookbook. HarperCollins Publishers India.

2. Hardcastle, S.J., Thogersen-Ntoumani, C. and Chatzisarantis, N.L. (2015). Food Choice and Nutrition: A Social Psychological Perspective. Nutrients, 7(10), 8712–8715.

FND6 216 Food Nutrition and Agriculture 2 (2+0)

Objectives

· Develop skills to apply and evaluate innovative solutions that place nutrition at the heart of a sustainable food system.

· Students will learn about the components of the food system and their link to nutrition, and acquire the skills to implement and evaluate nutrition-sensitive interventions.

Theory

Food production and consumption situation in India and the world. Food production and consumption trends, food balance sheets. Role of nutrition in agricultural planning and national development.Linkages between agricultural practices, food production, food distribution, and nutritional status.Factors affecting food distribution at macro and micro levels, per capita food availability and consumption.Food and nutrition security at national and household levels.Role of agriculture in enhancing food security.Urbanization and food security.Sustainable food systems.Food crop failure and malnutrition, poverty, and the vicious cycle of low food production. Innovative approaches to enhance local food production and improve food distribution systems. Effect of food production and economic policies on food availability.Impact of physical resources, farming systems, cropping systems, inputs and manipulation, agricultural marketing systems, and post-harvest processing of foods on the food and nutrition situation.Nutritional composition of commonly consumed foods.

Implementation of nutrition policy and agricultural programs.Nutritional impact of agricultural programs, food price control, and consumer subsidies.Contribution of national and international organizations in agricultural development.

Suggested Readings

1. Albert, J.L. (Ed.) (2000). Food, Nutrition and Agriculture. FAO Publication.

2. FAO. (2017). The State of Food and Agriculture – Leveraging Food Systems for Inclusive Rural Transformation. Food and Agriculture Organization, Rome.

3. FAO. (2017). The State of Food Security and Nutrition in the World. Food and Agriculture Organization, Rome. (Latest publications of FAO)

4. GOI. (2001). India 2001: A Reference Annual. Publication Division, Ministry of Information and Broadcasting, Government of India.

5. GOI. (2011). Census of India. Government of India. (New Census Report)

6. GOI. (2017). Agriculture – Statistical Year Book India. Ministry of Statistics and Programme Implementation, Government of India. (Latest publications of GOI)

7. GOI. (2018). A Reference Manual by Publication Division. Ministry of Information and Broadcasting, Government of India.

8. Raghuvanshi, R.S. (2013). Nutritional Security through Diversified Food Production. In Agrarian Change and Small Farmers, Supermarkets, Viability and Food Policy, Ed. by K.N. Bhatt and Pradeep Bhargava, Concept Publishing Company Pvt. Ltd., New Delhi.

9. National Family Health Survey (rchiips.org).

10. Home – Global Nutrition Report.

11. Global Food Security Index (GFSI) (economist.com).

12. https://www.who.in

NCC6 211 National Cadet Corps (NCC-III) 1(0+1)

Objectives

· Arms Drill – Attention, stand at ease, stand easy. Getting on parade. Dismissing and falling out. Ground/take up arms, Exam

ine arms. Shoulder from the order and vice versa, present from the order and vice versa. Saluting at the shoulder at the halt and on the march. Short/long trail from the order and vice versa. Guard mounting, guard of honor, platoon/company drill.

· Characteristics of rifle (.22/.303/SLR), ammunition, firepower, stripping, assembling, care, cleaning and sight setting. Loading, cocking and unloading. The lying position and holding.

· Trigger control and firing a shot. Range procedure and safety precautions. Aiming and alteration of sight. Theory of groups and snap shooting. Firing at moving targets. Miniature range firing. Characteristics of carbine and LMG.

NSS6 211 National Service Scheme (NSS-III) 1(0+1)

Objectives

· Vocational skill development: To enhance the employment potentialand to set up small business enterprises skills of volunteers, a list of 12 to15 vocational skills will be drawn up based on the local conditions andopportunities.

· Each volunteer will have the option to select two skill- areas out of this list.

· Issues related environment: Environmental conservation, enrichment and sustainability, climatic change, natural resource management (rain water harvesting, energy conservation, forestation, waste land development and soil conservations) and waste management.

· Disaster management: Introduction and classification of disaster, rehabilitation and management after disaster; role of NSS volunteers in disaster management.

· Entrepreneurship development: Definition, meaning and quality of entrepreneur; steps in opening of an enterprise and role of financial and support service institution. Formulation of production oriented project:

· Planning implementation, management and impact assessment of project Documentation and data reporting: Collection and analysis of data, documentation and dissemination of project reports.

II Year II Semester

BCM6 222 Nutritional Biochemistry 3 (3+0)

Objectives

· To understand the chemical characteristics of different classes of nutrients with reference to their physical properties, and to relate this to their functions in the body.

· To explain the processes of digestion, absorption, and metabolism of the macronutrients and micronutrients in the context of different meals.

· To consider the main features of metabolism using the concept of energy flux through metabolic pathways as a focus.

· To explore the integration of pathways for the metabolism of fat, protein, and carbohydrate, and to examine the mechanisms for the regulation of flux through these pathways.

· To discuss the established functions of micronutrients and to examine the clinical and biochemical effects of depletion.

Theory

Recapitulation of basic chemistry and biology Water, pH and buffers, Acid-base balance Cellular constituents, Structure and function: Amino acid and proteins, Carbo hydrates, Lipids and bio membranes, Nucleic acids– Vitamins and minerals. Enzymes, function, properties, mechanism, Enzymes - specificity, classification, factors affecting enzyme activity.Metabolism of cellular constituents. Basic concepts of Bioenergetics Carbohydrates metabolism: glycolysis and glycogenolysim, HMP path way, TCA Cycle, Electron transportchain, Gluconeogenesis, Lipids metabolism: Beta-oxidation, Ketone bodies, Fatty acid synthesis. Amino acid metabolism:General reactions of nitrogen assimilation and excretion Biosynthesis of DNA, RNA and Protein replication, transcription, translation and genetic code regulation of gene

expression, Amino acid metabolism: General catabolic reactions of amino acids, Digestion and absorption.

Suggested Readings

1. Conn, E.E. and Stumpf, P.K. (2009). Outlines of Biochemistry. John Wiley.

2. Nelson, D.L. and Cox, M.M. (2004). Lehninger: Principles of Biochemistry, 5th edn. MacMillan.

3. Voet, D., Voet, J.G. and Pratt, C.W. (2007). Fundamentals of Biochemistry. John Wiley.

4. Jayaram, T. (1981). Laboratory Manual in Biochemistry. New Delhi: Wiley Eastern Ltd.

5. Plummer, D. (1988). An Introduction to Practical Biochemistry, 3rd edn. Tata McGraw Hill, New Delhi.

6. Hames, B.D., Hooper, N.M. and Houghton, J.D. (1997). Instant Notes in Biochemistry. BIOS Scientific Publishers.

7. Satyanarayana, U. and Chakrapani, U. (2008). Essentials of Biochemistry.

8. https://epgp.inflibnet.ac.in/Home/View Subject? catid = Nu As6Sre CGryddEfs4kkBA

CSC6 221 Agricultural Informatics and Artificial Intelligence 3 (2+1)

Objectives

· To acquaint students with the basics of computer applications in agriculture, multimedia, database management, application of mobile app and decision-making processes, etc.

· To provide basic knowledge of computer with applications in agriculture.

· To make the students familiar with Agricultural-Informatics, its components and applications in agriculture.

Theory

Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System: Definition and types, Applications of MS-Office for creating, Editing and Formatting a document, Data presentation, Tabulation and graph creation, Statistical analysis, Mathematical expressions, Database, concepts and types, creating database, Uses of DBMS in Agriculture, Internet and World Wide Web (WWW): Concepts and components. Computer programming: General conceptsof C - Identifiers, Operators – unary, binary, ternary, keyword, constant, variables, algorithm, flowchart, structure of C program. Basic programming construct – sequence, selection – simple - if, if-else, if-else-if, switch, iteration.e-Agriculture, Concepts, design and development, Application of innovative ways to use information and communication technologies (IT) in Agriculture, Computer Models in Agriculture: Statistical, weather analysis and crop simulation models, concepts, structure, inputs- outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation, IT applications for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone mobile apps in agriculture for farm advice: Market price, postharvest management etc., Geospatial technology: Concepts, techniques, components and uses for generating valuable agri-information, Decision support systems: Concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc. for supporting farm decisions. Preparation of contingent crop-planning and crop calendars using IT tools, Digital India and schemes to promote digitalization of agriculture in India.

Introduction to artificial intelligence, background and applications, Turing test. Control strategies, Breadth-first search, Depth-first search, Heuristics search techniques: Best-first search,

A* algorithm, IoT and Big Data; Use of AI in agriculture for autonomous crop management, and health, monitoring livestock health, intelligent pesticide application, yield mapping and predictive analysis, automatic weeding and harvesting, sorting of produce, and other food processing applications; Concepts of smart agriculture, use of AI in food and nutrition science etc.

Practical

Study of computer components, accessories, practice of important DoS Commands, Introduction of different operating systems such as Windows, UNIX/ Linux, creating files and folders, File Management. Use of MS-Word and MS PowerPoint for creating, editing and presenting a scientific documents, MS-EXCEL - Creating a spreadsheet, Use of statistical tools, writing expressions, Creating graphs, Analysis of scientific data, handling macros. MS-ACCESS: Creating Database, preparing queries and reports, Demonstration of Agri-information system, Introduction to World Wide Web (WWW) and its components, Introduction of programming languages. Preparation of inputs file for CSM and study of model outputs, computation of water and nutrient requirements of crop using CSM and IT tools, Use of smart phones and other devices in agro-advisory and dissemination of market information, Introduction of Geospatial Technology. Preparation of contingent crop planning, India Digital Ecosystem of Agriculture (IDEA).

Suggested Readings

1. Concepts and Techniques of Programming in C by Dhabal Prasad Sethi and Manoranjan, Wiley India.

2. Fundamentals of Computer by V. Rajaroman.

3. Introduction to Information Technology by Pearson.

4. Introduction to Database Management System by C.J. Date.

5. Introductory Agri Informatics by Mahapatra, Subrat K et al., Jain Brothers Publication.

SEN6 221 SEC-VI :Development of Nutritional Educational Material 2 (0+2)

Practical

Objectives, principles and importance of nutrition education in a community; Deficiency diseases and public health problems - Vit. A, iron and iodine deficiencies, other micronutrient deficiencies; Identification of nutritional problems and target groups (Survey); Communication techniques: Process, its components. Mass, group and individual Communication; advantages and disadvantages; Classification and use of audio-visual aids (Electronic aid, non-projected and three dimensional); Preparation of instructional material (Chart, Poster, Flipbook, Pamphlet, Calendar); Practicing and use of nutrition education material on vulnerable groups in the community, rural and urban; Planning and organizing nutritional education program for community; Evaluation of nutrition education program.

FND6 221 Normal Nutrition and Meal Planning 3 (2+1)

Objectives

· To study general nutrition, principles of meal planning, food safety, consumer guidelines, and management techniques for lab experiences.

To cover a variety of experiences, designed around the actual preparation of foods.

· To cover vocabulary, reading and following recipe and/or modelled directions, selection and storage of food items, cooking methods, and related techniques.

· To successfully complete this course as it is a prerequisite to enrolment in Culinary Arts.

Theory

Basic principles of menu planning, planning menus for individual and family.Classification of vegetarianism.Factors influencing food intake and food habits.Basic principles of meal planning, planning meals for individual and family.Factors affecting food requirements of individuals, families and different groups of people.Meal planning for special occasions. Steps involved in meal planning. Food groups and their use in meal planning.Recommended dietary allowances of macro and micro nutrients for different age groups.Food exchange list. Use of food exchange list in diet planning, planning breakfast, lunch, tea, dinner, packed lunch and snacks; considering RDA for individuals. Importance of balanced diets. Food and nutrient requirement of adults and diet planning (male and female of all activities level), pregnant women, lactating women, old age. Breastfeeding, advantages of breastfeeding, prelacteal feeding, breastfeeding during illness, feeding of pre-term baby, feeding problems. Complementary feeding.Food and nutrient requirement of pre-school children, school age children, adolescents, geriatric nutrition - physiological and psychological factors affecting the diet plan.

Practical

Standardization of serving sizes, portion, cost of locally available common foods. Food exchange list: method of using and portioning. Planning preparation and nutrient calculation of diets of preschool children, school going children, adolescents, adults and senior citizens, packed lunches for schoolchildren. Practice in formal and informal table setting and table manners.

Suggested Readings

1. Gopalan, C. and Krishnaswamy, K. (2000). Nutrition in Major Metabolic Diseases. Oxford University Press, New Delhi.

2. Joshi, Shubhangini A. (2021). Nutrition and Dietetics, 5th edn. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

3. ICMR. (2020). Recommended Dietary Allowance for Indians. ICMR, Delhi.

4. Longvah, T., Ananthan, R., Bhaskarachary, K. and Venkaiah, K. (2017). Indian Food Composition Tables. National Institute of Nutrition, ICMR, New Delhi.

5. Robinson, and Weicley. (1984). Basic Nutrition and Diet Therapy. MacMillian Publishing Co. Inc., New York and London.

6. Raghuvanshi, R.S. and Mittal, M. (2019). Upcharatmak Poshan (Diet Therapy). Brillion Publishing House, New Delhi, pp. 1-352. (Hindi)

7. Raghuvanshi, R.S. and Mittal, M. (2014). Food Nutrition and Diet Therapy. India: Westville Publishing House, New Delhi.

8. Sharma, S. (2006). Human Nutrition and Meal Planning. Delhi, Jnanada Prakasham (P and D).

9. Sehgal, S. and Raghuvanshi, R.S. (2007). Textbook of Community Nutrition. Indian Council of Agricultural Research, New Delhi.

10. https://epgp.inflibnet.ac.in/Home/View Subject? catid= NuAs 6Sre CGryddEfs4kkBA

FND6 222 Public Health Nutrition 3 (2+1)

Objectives

· To equip students with the knowledge of community nutrition, national and international nutrition programs and interventions.

· To develop, implement and evaluate the nutrition programs and policies to address the different nutritional problems with greater impact and efficiency.

· To develop an evidence-based approach to address the nutritional problems and to reduce the risk for malnutrition in different populations.

Theory

Concept of Health, Public health, Public Health Nutrition, Nutritional Epidemiology and Community nutrition - Demography, demographic cycle; Health Indicators and their significance – Birth and death rates, IMR, MMR, TFR, U5MR etc. Health Care System in India – Primary, Secondary and Tertiary, National Health Policy, National Nutrition Policy and National Nutrition Mission - An overview. Public health problems of India, nutrient deficiency diseases and other diseases, their etiology, prevalence, prevention and monitoring.Indicators and data sources from existing macro and micro systems of information in India (NFHS, NSSO, ICDS, NSS, CENSUS).National programs relevant for public health. Vitamin A deficiency disorder control program, National diarrhoeal disease program, national iodine deficiency disorder control program, iron deficiency anemia prophylaxis program, National malaria eradication program, national immunization program, national program for control of tuberculosis, national AIDS control program, other health and nutrition programs. Communicable and infective disease control: Nature of communicable diseases, infections, contamination, transmission, vector borne diseases, environmental agents, control and prevention. National Malaria Eradication program, National Filarial control program, National Leprosy Eradication program, Japanese Encephalitis control and other national control programs (Blindness, Mental Health, etc.). National Mental Health program (NMHP), Universal Immunization program and child survival and safe motherhood program. COVID-19, its origin, lifecycle of virus, mutation, detection, case tracking, vaccine development, and vaccination program. Principles and elements of public health care. Role of NNMB.

Practical

Visit to PHC to study the prevalence of the communicable disease. Epidemiological approach to study individual disease in

a community.Analysis of data and report writing.Discussion for preventive and therapeutic strategies.Public health campaign in a village.Understanding the uses of screening tools.

Suggested Readings

1. DeMaeyer, E.M. (1989). Preventing and controlling iron deficiency anemia through primary health care: A guide for health administrators and program managers. WHO, Geneva.

2. International Institute for Population Sciences (IIPS) and ICF. (2021). National Family Health Survey (NFHS-5), 2019-21: India. Mumbai: IIPS.

3. McLaren, D.S. (1976). Nutrition in the community. John Wiley and Sons, London.

4. Michael, J., Gibney, Barrie, Margetts, M., Kearney, John M. and Arab, Lenore. (2004). Public Health Nutrition. Blackwell Science Ltd, UK.

5. Park, K. (2016). Textbook of Preventive Medicine. New Age International (P) Limited.

6. Sehgal, S. and Raghuvanshi, R.S. (2007). Textbook of Community Nutrition. Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, New Delhi.

7. Vyas, S. (2021). Public Health Nutrition: A textbook. Vishwagyan Prakashan.

8. WHO. (2001). Assessment of iodine deficiency disorders and monitoring their elimination: A guide for program managers, 2nd edn.

9. https://www.who.int/emergencies/diseases/novel-coronavirus-2019

FND6 223 Food Standards and Quality Control 3 (2+1)

Objectives

· To develop qualified and competent human resources in the field of food standards and quality management for regulators, industry, academic/research institutions, certifying and accreditation bodies, food trade, food testing, and training.

· To delve in depth into various aspects of food standards and quality management, i.e., food standards, harmonization with global benchmarks, quality management systems, food analysis, instrumentation, risk analysis/management, traceability, and auditing to transform the food ecosystem.

· To nurture a positive and disciplined food standards and quality culture among professionals.

· To conduct research studies on emerging food standard issues and the formulation of science-based regulatory frameworks.

Theory

Importance of food quality control and assurance. Food Standards and Regulations in India: FSSAI, Prevention of Food Adulteration Act, Fruit Product Order, AGMARK, Essential Commodity Act, Consumer Protection Act, Bureau of Indian Standards, Codex Standards, Food and Drug Administration (FDA). Food additives, preservatives, coloring agents, antioxidants, emulsifying agents, leavening agents and stabilizing agents.Various methods for the assessment of quality of different foods.Food safety management systems - GMP/GHP, HACCP, GLP, GAP, The Kosher and Halal Food Laws.Food packaging, packaging material.Adulteration, heavy metals.Quality criteria of foods – food grains, fruits, vegetables and animal foods.Quality criteria of processed foods.Physical, chemical and microbial contamination of foods.Food adulteration – common adulterants – health hazards.Tests to detect adulterants in food.Pesticides – Mechanisms of Toxicity – Residues in Food, Acceptable daily

limits.FoSTaC – Food Safety Training and Certification. Sensory Evaluation of Food Quality – Introduction, Panel Screening, Selection of Panel Members, Objective/Instrumental analysis of Quality Control. Statistical Quality Control of Foods.Determination of Sensory thresholds and taste interactions.Fundamentals of Food regulations – pertaining to Additives and Contaminants, SOP for Milk and milk products, Meat products, Fruit and vegetable products.Safety in handling of Food Additives.

Practical

Visit to FSSAI, FCI, AGMark. Sensory and nutritional evaluation of some finished products. Detection of adulterants and preservatives in products.Identification of food logos.Study of food labelling. Identification of critical control points in a product line. Sensory evaluation of different food samples. Visit to quality control laboratory/food processing industries and note the procedures and parameters used for quality assessment. Estimation of quality parameters – cereals, pulses, fruits and vegetables.Market survey and quality analysis of street foods.Estimation of quality parameters – cereals, pulses, fruits and vegetables.Evaluation of food quality – objective and subjective methods.Market survey and quality analysis of street foods.

Suggested Readings

1. Detect Adulteration with Rapid Test (DART) booklet, FSSAI. https://www.fssai.gov.in/flipbook.php?bookid=201#book2/7

2. Food Safety and Standards (Food Products Standards and Food Additives) Regulation, 2011.

3. Jellinek, G. 1985. Sensory Evaluation of Foods: Theory and Practice. Ellis Horwood Ltd., Chichester, England.

4. Kalia, M. and Sood, S. 2010. Food Preservation and Processing. Revised edn. Kalyani Publishers, New Delhi.

5. Manual of Food Standards and Quality Control. 2014. Dept. of Foods and Nutrition, CCSHAU, Hisar.

6. Patricia and Cuuring, A. An operational textbook guide to Food Laws and Regulations.

7. Potter, N.N. 1996. Food Science. The AVI Publishing Company Inc., Westport, Connecticut.

8. Radonit Lassztity. 2008. Food Quality and Standards. Encyclopedia of Life Support Systems, USA.

MDC6 222 Agriculture Marketing and Trade 3 (2+1)

Objectives

· To understand the fundamentals of agricultural marketing and trade

· To analyze the factors influencing supply and demand in agricultural markets

· To explore different marketing channels and strategies in agriculture

· To examine the role of government policies and regulations in agricultural markets

Theory

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer's surplus of agri commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marke table and marketed surplus, factors affecting marketable surplus of agri-commodities; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – meaning, merits and demerits; marketing process and functions: marketing process – concentration,

dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); market functionaries and marketing channels: types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; integration, efficiency, costs and price spread: meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs. Role of Government in agricultural marketing: public sector institutions – CWC, SWC, FCI, CACP and DMI – their objectives and functions; cooperative marketing in India; risk in marketing: types of risk in marketing; speculation and hedging; an overview of futures trading; agricultural prices and policy: meaning and functions of price; administered prices; need for innovations in agricultural price policy; trade: concept of international trade and its need, theories of absolute and comparative advantage, present status and prospects of international trade in agri-commodities; WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR; role of APMC and its relevance in the present day context.

Practical

Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behavior over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and

presentation of report in the class; Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning; Application of principles of comparative advantage of international trade.

Suggested Readings

1. Acharya, S.S. and Agarwal, N.L., 2006, Agricultural Marketing in India, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

2. Chinna, S.S., 2005, Agricultural Economics and Indian Agriculture, Kalyani Publishers, New Delhi.

3. Dominic Salvatore, Micro Economic Theory.

4. Kohls, Richard L. and Uhl, Joseph N., 2002, Marketing of Agricultural Products, Prentice-Hall of India Private Ltd., New Delhi.

5. Kotler and Armstrong, 2005, Principles of Marketing, Pearson Prentice-Hall.

6. Lekhi, R.K. and Joginder Singh, 2006, Agricultural Economics, Kalyani Publishers, Delhi.

7. Memoria, C.B., Joshi, R.L. and Mulla, N.I., 2003, Principles and Practice of Marketing in India, Kitab Mahal, New Delhi.

8. Pandey, Mukesh and Tewari, Deepali, 2004, Rural and Agricultural Marketing, International Book Distributing Co. Ltd., New Delhi.

9. Sharma, R., 2005, Export Management, Laxmi Narain Agarwal, Agra.

NCC6 221 National Cadet Corps (NCC-IV) 1 (0+1)

· Introduction to map, scales, and conventional signs. Topographical forms and technical terms.

· The grid system. Relief, contours, and gradients. Cardinal points and finding north. Types of bearings and use of service protractor. Prismatic compass and its use. Setting a map, finding north and own position. Map to ground and ground to map. Knots and lashings, camouflage and concealment, explosives and IEDs.

· Field defenses, obstacles, mines and mine laying. Bridging, watermanship. Field water supplies, tracks and their construction. Judging distance. Description of ground and indication of landmarks. Recognition and description of target. Observation and concealment. Field signals. Section formations. Fire control orders. Fire and movement. Movement with/without arms. Section battle drill. Types of communication, media, latest trends and developments.

NSS6 221 National Service Scheme (NSS-IV) 1(0+1)

· Youth and crime: Sociological and psychological factors influencing youth crime,

· Cybercrime, pear mentoring in preventing crime and awareness for juvenile justice. Civil/self-defence:

· Civil defence services, aims and objectives of civil defence; needs and training of self-defence Resource mobilization:

· Writing a project proposal of self-fund units (SFUs) and its establishment

· Additional life skills: Positive thinking, self-confidence and esteem, setting life goals and working to achieve them, management of stress including time management.

Post-IV Semester Internship (Onlyforexitoptionfor awardof UG-Diploma)

Sl.No.	CourseTitle	Credit Hours
1.	Internship(10weeks)	**10(0+10)***

*MandatoryrequirementforUG-Diploma.

III Year I Semester

AEG6 311 Current Food Processing Technologies 3(2+1)

Objectives

· To explain major food preservation techniques and underlying principles

· To understand the technology available for food processing

· To determine suitable methods of processing techniques for a chosen food

· To understand novel food processing methods including non-thermal food processing techniques

· To understand the purpose and principles of food packaging

· To develop an understanding of major packaging materials used in food packaging

· To evaluate the suitability of packaging material for a particular type of food

· To understand the operations involved in packaging material manufacture

· To gain knowledge of the legal, environmental and quality aspects associated with packaging materials and operations used in the food industry

Theory

Current scenario in food processing industry, post-harvest loss and losses in post-harvest operation.Upcoming trends in food processing-thermal treatment, ultrasound, freezing, pulse electric field, shock wavetechnology. Minimal processing-application of Ultra sonic food processing techniques – membrane processing – applications in food processing industries – robotics – applications and opportunities – issues and obstacles Food preservation using chemicals, radiation and hurdle technology. Nanotechnology in food preservation, food processing, agriculture and in packaging. Processing of convenient cereals and millets, processing of pulses

and legumes, oilseed processing. Principle and method of preservation by- pasteurization, canning, bottling, sterilization. Advance dehydration technologies- Freeze drying, microwave dehydration, electric dehydrator, osmotic dehydration, hybrid drying technologies, vacuum drying methods,s pray drying methods. High pressure processing- principle, safety and stability of high-pressured processed food. Encapsulation technology – principle, mechanism involved, encapsulation agents and uses. 3D printing and application in food manufacture. Government policy on import and export of processed fruits and vegetables.

Practical

Processing of breakfast cereals, Processing of pulses into flour, flakes and fermented Demonstration of dehydration of foods via-freeze drying, osmotic dehydration, spray drying, vacuum drying, microwave dehydration. Processing of fruits and vegetables via-canning using brine and syrup.Blanching in food items. 3D printed foods. Preservation using pasteurization and sterilization. Visit to food processing unit and nanotechnology lab.

Suggested Readings

1. Chakraverty (1995). Post-harvest technology of cereal, pulses and oilseeds, 3rd edn. Oxford and IBH Publishing Co., Pvt. Ltd.

2. Fellows, P.J. (2017). Food Processing Technology: Principles and Practice, 4th Edition, Woodhead Publishing Ltd., Cambridge.

3. Hartel, R.W. and Heldman, D. (2012). Principles of Food Processing. Aspen Publishers Inc., New York.

4. Potter, N.N. (2003). Food Science, AVI Publishing Company Inc., Westport, Connecticut.

5. Shafiur Rahman, M. (2007). Handbook of Food Preservation, 2nd edn. Published by CRC Press, London.

6. Sivshankar, B. (2002). Food Processing and Preservation. Prentice-Hall of India Pvt. Ltd., Delhi.

7. Srivastava, R.P. and Kumar, Sanjeev (1994). Fruit and Vegetable Preservation, International Book Distributing Co., Lucknow.

AST6 311 Statistical Methods 3 (2+1)

Objectives

- Organize, manage and present data
- Analyze statistical data graphically using frequency distributions and cumulative frequency distributions
- Analyze statistical data using measures of central tendency, dispersion and location
- Use the basic probability rules, including additive and multiplicative laws, using the terms independent and mutually exclusive events
- Translate real-world problems into probability models
- Derive the probability density function of transformation of random variables
- Calculate probabilities, and derive the marginal and conditional distributions of bivariate random variables
- Analyze statistical data using MS-Excel

Theory

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency; Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial; Poisson & Normal Distributions, Definition of Correlation, Scatter Diagram.Karl Pearson's Coefficient of Correlation.LinearRegressionEquations.Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample. IntroductiontoTestofSignificance,Onesample; two sample test t

for Means, Chi-Square Test of Independence of Attributes in 2 × 2 Contingency Table. Introduction to Analysis of Variance, Analysis of One-Way Classification.Introduction to various statistical packages.

Practical

Graphical Representation of Data.Measures of Central Tendency (Ungrouped Data) with calculation of Quartiles, Deciles & Percentiles.Measures of Central Tendency (Grouped Data) with calculation of Quartiles, Deciles & Percentiles.Measures of Dispersion (Ungrouped Data).Measures of Dispersion (Grouped Data).Moments, Measures of Skewness & Kurtosis (Ungrouped Data).Moments, Measures of Skewness & Kurtosis (Grouped Data).Correlation & Regression Analysis.Application of One Sample t-test.Application of Two Sample Fisher's t-test.Chi-Square test of Goodness of Fit.Chi-Square test of Independence of Attributes for 2 × 2 contingency table.Analysis of Variance – One Way Classification.Analysis of Variance – Two Way Classification.Selection of random sample using Simple Random Sampling.Use of software packages.

Suggested readings

1. Agarwal, B.L. 2006. Basic Statistics. New Age International Publisher.

2. Sprent, P. 1993. Applied Non-Parametric Statistical Methods, 2nd edn. Chapman and Hall.

3. Wetherill, G.B. 1982. Elementary Statistical Methods. Chapman and Hall.

4. William S. Cleveland (1994). The Elements of Graphing Data, 2nd edn. Chapman and Hall.

EDT6 311 Educatioal Tour 2 (0+2)

There will be a educational tour of 10-14 days duration during the 5th semester of the UG programme. The students will

preferably visit the leading industries / enterprises / institutions / organizations and other places of academic interest outside the state (of location of the institutions). This, in addition to exposeing the students to the indigenous as well as the latest technolgies in their related fields, will also help the students to know about the socio-economic-cultral variations within the country. The course will be of 0+2 credits, non-gradial.

FND6 311 Therapeutic Nutrition 4 (3+1)

Objectives

By the end of the course the students will be able to

· Acquire basic knowledge of nutrient requirements, recommended dietary allowances, and dietary modification under different physiological conditions

· Acquire basic knowledge of food groups, food exchange system and their nutritional significance, and application of knowledge acquired for healthy eating

· Develop practical skills in planning and management of diets for the different age groups under normal/physiological conditions keeping in mind the dietary guidelines

· Gain knowledge on the nature and scope of therapeutic nutrition, and understand the principles of dietary modification and apply in planning

· Understand nutrition-related diseases of the gut, liver, gallbladder, pancreas, and heart

· Know the etiology, incidence, nature, clinical symptoms, diagnosis, and medical and dietary management of disease

· Modify the diet plans to suit the disease condition

Theory

Terminologies used in the therapeutic nutrition; Use of food groups and food pyramid. Importance and components of diet history; Different principle of therapeutic diets, Therapeutic modifications of normal diet in terms of consistency and nutrients;

Normal and artificial feeding methods, Role of Dietician in medical nutrition therapy, Diet during malnutrition- under nutrition and over nutrition; Diet during infection and fever; Diet during Gastro intestinal disorder- esophagitis, diarrhea, constipation, peptic ulcers, IBD/IBS. Liver and gall bladder disorders- dietary manage ment of jaundice, hepatitis, liver cirrhosis, cholelithiasis. Kidney disorders- dietary management of nephrosis, nephritis, renal failure, renal calculi and dialysis. Arthritis and gout, cardiovascular disorders- dietary management of atherosclerosis, hypertension and stroke and congestive heart failure. Diabetes mellitus- dietary management during diabetes mellitus and complications, glycemic index and glycemicload of food items. PCOD/PCOS: etiology, signsand symptoms, types, risk factors and dietary management. Cancer-dietary management; in born errors of metabolism; allergies and intolerance, burns and trauma; Common auto immune diseases/ disorders.

Practical

Planning of food exchange list, taking diet history. Planning and preparation of diet modified in consistency and nutrients for severely ill patients. Plan a diet for artificial feeding patients. Plan a diet for patient with malnutrition, infections and fevers – PEM, typhoid, tuberculosis, and influenza. Plan a diet for a patient with atherosclerosis, hypertension. Plan a diet for patient with diarrhea, constipation, peptic ulcers and esophagitis. Plan a diet for a patient suffering from liver cirrhosis, jaundice, hepatitis and cholelithiasis. Plan a diet for a diabetic patient. Plan a diet of a patient with renal failure, renal calculi. Plan a diet for a patient with cancer. Plan a diet for patient with lactose intolerance and celiac diseases.

Suggested Readings

1. Corinne H. Robinson, Marilyn R. Lawler, Wanda L. Chenoweth and Ann E. Garwick. (2013). Normal and TherapeuticNutrition (pp. 1–16). New York: Macmillan Pub.Co.

2. Mahan, L. K., and Escott-Stump, S. (2000). Krause's Food, Nutrition and Diet Therapy. Philadelphia: W.B. Saunders Company.

3. National Institutes of Health.Diet History Questionnaire. Available at: https://dietassessmentprimer.cancer.gov/questionnaires/

4. Raghuvanshi, R. S., and Mittal, M. (2014).Food, Nutrition and Diet Therapy. New Delhi: Westville Publishing House.

5. Raghuvanshi, R. S., and Mittal, M. (2016).Clinical Nutrition (Chikitskeey Poshan). New Delhi: Vikas Publishing House Pvt. Ltd.

6. Sharma, A. (2017). Principles of Therapeutic Nutrition and Dietetics. New Delhi: CBS Publishers.

FND6 312 Food Analysis 3 (2+1)

Objectives

· To impart knowledge to students on principles and techniques of food analysis by using physical, chemical, and biological methods.

· To apply the knowledge and skills acquired to solve real-world problems associated with food analysis.

Theory

Terminologies associated with food analysis, rules and regulation of food analysis. Different official methods of analysis.Familiarization to terms and calculations used in preparation of various standard solutions.Sample and sampling techniques. Principles, techniques and applications of: spectrophotometer, colorimeter, pH meter, refract meter, electrophoresis, centrifuge, HPLC, GLC, TLC, GCMS, UPLC, AAS, AES. Proximate composition analysis methods.Moisture analysis – direct and indirect methods of analysis.Protein analysis method – dumas, Biuret, Lowry's, dye binding and spectroscopy method, amino acid analyzer.Mineral analysis – dry ashing, wet ashing, titrimetric, gravimetric, colorimetric and instrumental methods

– AAS, AES.Physical characteristic of foods, rheological properties of food. Anti-nutrients in foods: phytate, tannins, oxalates, saponins, trypsin and chymotrypsin. Animal assay: principles, techniques and applications.Principles for estimation of water- and fat-soluble vitamins.

Practical

Orientation of food analysis laboratory.Calculation and preparation of various standard solutions.Preparation of sample for food analysis. roximate composition of analysis – moisture, Kjeldahl method of protein analysis.Fat analysis – soxhlet, soxplus, estimation of free fatty acid (FFA), ashing and CHO by difference. Estimation of sugar, reducing and non-reducing sugars and starch.Mineral analysis – iron, calcium.Testing acidity of foods. Estimation of anti-nutrients: phytate, tannins, oxalates, saponins. Estimation of rancidity in foods and peroxide values. Functioning and use of HPLC, GLC and pH meter, GCMS, UPLC. Visit to food quality control lab.

Suggested Readings

1. AOAC.(2012). Association of Official Analytical Chemists. Washington, DC.

2. Nielsen, S. (2010). Food Analysis.Springer Science and Business Media Publishing.

3. Oser, B. L. (1979). Hawk's Physiological Chemistry. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

4. Pearson, D. (1973). Laboratory Techniques in Food Analysis. United States: Wiley.

5. Pomeranz, Y. (2013). Food Analysis: Theory and Practice. United States: Springer US.

6. Raghuramulu, N., Madhavan Nair, K., and Kalyanasundaram, S. (2003). A Manual of Laboratory Techniques.National Institute ofNutrition, India.

7. Ranganna, S. (2000).Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw-Hill.

FND6 313 Diet and Nutrition Counselling 3 (0+3)

Objectives

· To understand, critically assess and know how to use and apply information sources related to nutrition, food, lifestyle and health.

· To be able to provide nutrition counselling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies.

Practical

Qualities of counsellor (confidence, knowledge, communi cation skills, patient listener, empathetic).Self-assessment of role as a dietitian – pre-test on role and summary of competencies. Developing diet history questionnaire and taking diet history. Preparation of standard protocol based on case studies and group discussion. Preparation of overweight and underweight fact list handout and development of counselling guidelines for weight loss and weight gain. Weight loss counselling using role play technique, counselling on diet, exercise and lifestyle. Visit to hospitals with therapeutic kitchen setup. Diabetic diet counselling, development of dietary fat facts list, cholesterol facts list and sodium facts list. Development of dietary counselling tips for different cardiovascular disorders and counselling cardiac patients using role play technique, presentation in gathering. Diet exhibition on cardiovascular disorders in a specialty hospital or general hospital.Preparation of handouts on ulcer facts list, high fibre facts list, low residue facts list and low lactose facts list.Counselling for patients suffering from diarrhoea, constipation, gastro-esophageal reflux (GERD), colitis, diverticulosis and ulcer. Preparation of SOAP notes and gall bladder facts list hand out and counselling a patient with gall

gallstones. Preparation of liver disease facts list handout and collection of case history of patients suffering from hepatitis, cirrhosis of liver and alcoholics. Counselling the patient and conducting group discussion. Preparation of kidney disease facts list handout and development of counselling tips for kidney disorders. Dietary counselling in a specialty hospital or diet and nutrition counselling centre for kidney disorders and diet exhibition for kidney disorders. Preparation of cancer facts list handout.Preparation of list of parenteral and enteral products available in the market for use during counselling. Setting up a unit for nutrition counselling, role play exercises for counselling and supervised counselling of patients or clients.

Suggested readings

1. Antia, P. 1986. Clinical Dietetics and Nutrition. Oxford University Press, Bombay.

2. Corinne, H. Robinson, Lawler, Marilyn R., Chenoweth, Wanda L., Garwick, Ann E. 1982. Normal and Therapeutic Nutrition (pp. 1–16). New York: Macmillan Publishing Company.

3. Moris, E. S. 1994. Modern Nutrition in Health and Disease. Lea and Febiger, USA.

4. ICMR. 2020. Recommended Dietary Allowances for Indians. ICMR, Delhi.

5. Park, K. 1997. Textbook of Preventive and Social Medicine. 1st edn. Jabalpur: Banarsidas Bhanot.

6. Raghuvanshi, R. S. and Mittal, M. 2014. Food, Nutrition and Diet Therapy. India: Westville Publishing House, New Delhi.

7. Raghuvanshi, R. S. and Mittal, M. 2016. Clinical Nutrition (Chikitskeey Poshan). Vikas Publishing House Pvt. Ltd., New Delhi.

8. https://aghealth.nih.gov/collaboration/qx/dhq.pdf

9. Dietary Guidelines for NIN website PDF.

FND6 314 Nutraceuticals and Health Foods 2(2+0)

Objectives

· To provide an overview of the field of functional foods, nutraceuticals and natural health products.

· To understand the functional food concept as related to ingredient efficacy and safety.

· To familiarize students with examples of bioactive ingredient–disease relationships and the importance of clinical study support; regulatory aspects of functional foods; requirements for standards of evidence of efficacy for health claims; and market determinants of the functional food industry.

Theory

Nutraceuticals and functional food definition, synonymous terms, basis of claims for a compound as a nutraceutical, and regulatory issues including CODEX and FSSAI regulation are important concepts. Classification of nutraceutical substances is based on food sources, mechanism of action and chemical nature. Nutrition claims by FSSAI and regulatory issues for nutraceuticals including national and international standards are also essential. Potential health benefits of major nutraceuticals such as omega-3, lycopene, isoflavonoids, prebiotics and probiotics, glucosamine and phytosterols are widely studied. Metabolism, bioavailability and pharmacokinetics of nutraceuticals play a significant role in their effectiveness. The concept of angiogenesis and the role of nutraceuticals in joint health, cardiovascular diseases, cancer, diabetes, obesity, eye health, cholesterol management, mental health, immune enhancement, age-related macular degeneration, endurance performance and mood disorders are key areas of focus. Clinical testing of nutraceuticals and health foods includes interactions of prescribed drugs and nutraceuticals, as well as adverse effects and toxicity aspects. Nutrigenomics as an emerging field explains the relationship between genes and nutraceuticals. Current research in functional foods

Suggested Readings

1. Robert, E. C. 2013. Handbook of Nutraceuticals and Functional Foods.2nd edn.Wildman.CRC Press.

2. Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, Functional Food and Novel Food) Regulations, 2016.

3. Microsoft Word – 5925gi.doc (fssai.gov.in).

4. Rotimi E. Aluko. 2012. Functional Foods and Nutraceuticals. Springer Publications.

5. Saarela, M. 2011. Functional Foods.2nd edn.Elsevier Publications.

6. Sarkate, A. P., Patil, M. A. and Agharde, P. V. 2021. Nutra ceuticals and Human Health. Brillion Publishing.

FND6 315 Introduction to Clinical Nutrition 3 (2+1)

Objectives

· To acquire a basic understanding of the various clinical changes related to nutrition, which are seen in different diseases, both deficiency and otherwise.

· To understand the etiology, prevalence, clinical signs and symptoms of nutritional deficiency diseases (Vitamin A deficiency, anemia, IDD, PEM etc.).

· To gain understanding of physiology in health and pathophysiology in disease complications occurring in various conditions and the interrelationships thereon.

Theory

Metabolic changes and clinical diagnosis in various diseases include nutrient deficiency diseases like anemia, vitamin B complex deficiencies, vitamin A deficiency disease, iodine deficiency disorders, calcium and vitamin D deficiency diseases, and ascorbic

acid deficiency. Metabolic changes and clinical diagnosis in degenerative diseases such as diabetes, cardiovascular diseases, renal disorders, liver diseases and cancer are also important. Normal cut-off values for blood and urine parameters and interpretation of reports of blood and urine in different disease conditions are essential. Drug and nutrient interactions, effect of drugs on nutritional status, and effect of diet and nutritional status on drug effectiveness are significant considerations. Depletion and repletion studies, nutrient balance studies and use of isotopically labelled nutrients are important methods in nutrition research. Nutrition screening and assessment methods such as Mini Nutritional Assessment (MNA), Subjective Global Assessment (SGA), Patient-Generated Subjective Global Assessment (PG-SGA), Malnutrition Universal Screening Tool (MUST) and disease-specific tools are widely used. Nutrition care process includes assessment, diagnosis, interpretation, monitoring and evaluation (ADIME).

Practical

Identification and interpretation of clinical signs of nutritional deficiency diseases- sampling of blood and urine for nutritional status, estimation of hemoglobin.Estimation of glucose in blood and urine in normal and diabetic persons.Estimation of lipid profile in normal and heart patients. Estimation of Glycosylated Hemoglobin, Estimation of serum to tal protein and serum albumin, visit to a clinical laboratory.

Suggested Readings

1. Bamji, M. S., Krishnaswamy, K. and Brahmam, G. N. V. 2019. Textbook of Human Nutrition. 4th ed. Oxford and IBH Publishing Co. Pvt. Ltd.

2. Connie, W. B. and Christine, S. R. 2016. Handbook of Clinical Nutrition and Ageing. Humana Press. Gibney, M. J., Elia, M., Ljungqvist, O. and Dowsett, J. 2013. Clinical Nutrition. Wiley Blackwell Publishing Company, Boston.

3. Gibney, M. J., Macdonald, I. A. and Roche, H. M. 2011. Nutrition and Metabolism. Wiley Blackwell Publishing Company, Boston.

4. Gopalan, C. and Krishnaswamy, K. 2000. Nutrition in Major Metabolic Diseases. Oxford University Press, New Delhi.

5. Joshi, Y. K. 2004. Basics of Clinical Nutrition. Jaypee Brothers.

6. Lee, R. D. and Nieman, D. C. 1993. Nutritional Assessment. Brown and Benchmark Publishers, USA.

7. Pathak, N. N. 1997. Analytical Techniques in Clinical Nutrition (Manual); Centre of Advanced Studies in Animal Nutrition, IVRI, Izatnagar.

8. Oser, B. L. 1979. Hawk's Physiological Chemistry. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

9. Raghuvanshi, R. S. and Mittal, M. 2014. Food, Nutrition and Diet Therapy. India: Westville Publishing House, New Delhi.

10. Width, M. and Reinhard, T. 2017. The Essential Pocket Guide for Clinical Nutrition. LWW Publishers.

11. https://epgp.inflibnet.ac.in/Home/View Subject? catid = NuAs6S reCGryddEfs4kkBA=

III Year II Semester

AMB6 322 Food Microbiology 3 (2+1)

Objectives

- To understand scope of food microbiology and food safety.
- To understand important genera associated with food.
- To learn techniques for enumeration of microbes and methods (traditional to advanced) for preserving food.
- To understand role of different microorganisms in food spoilage, food fermentation and food-borne diseases.
- To learn about microbiological quality control and food-borne illnesses investigation procedures for ensuring food safety and hygiene.
- To learn food safety rules and regulations, Food Safety Management System (FSMS) and microbiological risk assessment.

Theory

The discovery of micro-organism, spontaneous generation conflict, germ theory of diseases, microbial effect on organic and inorganic matter.Development of microbiology in India and composition of microbial world.Difference between prokaryotic and eukaryotic cells.Basic aspects and scope of food microbiology; Intrinsic and extrinsic factors that affect microbial growth in foods.Food preservation - Physical methods. Chemical preservatives and natural antimicrobial compounds, biology-based preservation system. Importance and scope of microorganisms in food.Primary sources of microorganisms in food.Assessment of microbial load in foods-microscopic, cultural, immunological and DNA based methods. Fermentation: methods, applications, fermented foods. Lactic acid bacteria – production of cultures for food fermentation.Fermented foods- cereals, dairy products, vegetables and fruits. - bread, beer, yoghurt, butter, cheese, kefir, kumiss, sauerkraut, olives, pickles, wine,

vinegar. Control of microorganisms by use of low and high temperature, asepsis, water activity, drying, preservatives, radiation and pressure for control of microorganisms; Microbiology of milk and milk products; Sources of contamination, spoilage and prevention; Microbiology of fruits and vegetables; cereal and cereal products; meat and meat products; fish and other sea foods; poultry and eggs; sugar and sugar products; salts and spices; contamination, spoilage and prevention. Microbial spoilage of fruits, fruit juices, vegetables, cereals, meat, poultry, sea foods, carbonated soft drinks, canned foods; chemical changes caused by microorganisms; control of spoilage.Food borne diseases and safety measures. Present problem in food production/ food processing / fresh food handling industries are facing several restrictions in different stagesboth from domestic and global players and consumers.

Practical

Changes in practices: General laboratory practices in microbiology laboratory, Equipment used in food microbiology laboratory, Aseptic methods, Sterilization methods, Morphological studies, Preparation of media, Isolation and enrichment of microorganisms, Microbial analysis of food products and water. Isolation of molds from foods. Microbial examination of cereal and cereal products, vegetable and fruits, meat and meat products, fish and others eafoods, Eggs and poultry, milk and milk products; sugar, salts and spices. Preparation of fermented whey beverages.

Suggested Readings

1. Adams, M. R. and Moss, M. O. 2008. Food Microbiology. 3rd edn. RCS Publishing, UK.

2. Frazier, J. and Westhoff, D. C. 2017. Food Microbiology. 5th edn. McGraw Hill.

3. Jay, J. M., Loessner, M. J. and Golden, D. A. 2005. Modern Food Microbiology. 7th edn. Springer.

4. Ray, B. 2004. Fundamentals of Food Microbiology. 3rd edn. CRC Press.

5. Steinkraus, K. S. 1996. Handbook of Indigenous Fermented Foods. Marcel Dekker.

6. http://www.gitam.edu/eresource/environmental/em_maruthi/food.htm

7. http://www.cdc.gov

8. http://www.asm.org/division/w/web-sites.htm

9.http://www.fda.gov/downloads/Food/Food born elllness Contaminants/ UCM297627.pdf

FND6 321 Food and Nutrition Security 2 (1+1)

Objectives

· To explain the concepts of food and nutrition, malnutrition, food security and livelihoods. Understanding these concepts is important to assess the nutrition situation, design and implement programs, investments and policies that address nutrition problems (also called nutrition-sensitive), and evaluate the nutritional outcomes of programs, investments and policies.

· To introduce the concepts and tools used in food security analysis. It defines food security and its relationship to the concepts of vulnerability, hunger, malnutrition and poverty.

· To provide guidelines on how to interpret and use conceptual frameworks for analyzing food security.

Theory

Food security: concept and definition, pillars and determin ants, Global Food Security Index. Global Hunger Index and its indicators and how they are measured. Global challenges to food and nutrition security and inter-relationship between hunger and food insecurity. Strategies to achieve food security at household, national and global level. Role of nutrition in human health and sustainable development, and relationship between nutrition,

diet and lifestyle. Growing global concern for non-communicable diseases and opportunities and challenges of nutrition and food preferences as a means of preventing the spread of chronic and non-infectious diseases. Impact of social, cultural and economic factors on food and nutrition security.

Nutrition security: concept and definition, pillars and determinants, and nutrition-sensitive approaches to combat malnutrition. Dietary diversity for nutrition security and dietary diversification through utilization of bio-fortified crops, indigenous and under-utilized foods. Millennium Development Goals and Sustainable Development Goals (SDG II) and way ahead. National and international policies and programs related to food and nutrition security such as POSHAN Abhiyan, NARI (Nutri-sensitive Agricultural Resources and Innovations), NFSA (National Food Security Act), NFSM (National Food Security Mission), NNM (National Nutrition Mission), WFP (World Food Programme), FAO (Food and Agriculture Organization). Public Distribution System in context to food and nutrition security, International Fund for Agricultural Development (IFAD), etc.

Practical

Household survey for assessment of indicators of Food insecurity.Proforma dev, survey, report writing, validation. Assessment of dietary diversity, quality, food security, nutrition security. Food product development and formulation for intervention of nutri-sensitive approaches and strategies to eradicate poverty and mal nutrition. Impact of nutritional policies and programs on the nutritional status of the vulnerable group. Framing question naireto conduct dietary survey–using Food Frequency Questionnaire.

Suggested Readings

1. Coates, J., Swindale, A., and Bilinsky, P. 2007. Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide. Version 3.

2. Ruel, M.T., Garrett, J., Yosef, S., and Olivier, M. 2017. Urbanization, food security and nutrition. In: Nutrition and Health in a Developing World, pp. 705–735.

3. Pingali, P., Alinovi, L., and Sutton, J. 2005. Food security in complex emergencies: Enhancing food system resilience. Disasters, 29(S1), 5–24.

4. Raghuvanshi, R.S. 2013. Nutritional security through diversified food production. In: Agrarian Change and Small Farmers, Supermarkets, Viability and Food Policy. Edited by K.N. Bhatt and Pradeep Bhargava. Concept Publishing Company Pvt. Ltd., New Delhi.

5. Sunderland, T., Powell, B., Ickowitz, A., Foli, S., Pinedo-Vasquez, M., Nasi, R., and Padoch, C. 2013. Food security and nutrition. Center for International Forestry Research (CIFOR), Bogor, Indonesia.

6. Swindale, A., and Bilinsky, P. 2006. Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide. Vol. 2. Washington, D.C.: FHI 360/FANTA.

7. Willett, W. 2013. Nutritional Epidemiology. Oxford University Press.

FND6 322 Nutrition, Body Composition and Physical Fitness 3 (2+1)

Objectives

· To provide understanding of the interactions between nutrition and exercise by integrating metabolism and physiology concepts in the context of recreational physical fitness training.

· To identify and describe disordered eating and exercise patterns.

· To gain an understanding of the training and experience necessary to obtain various nutrition and exercise credentials.

Theory

Body composition, methods of assessment - tools and techniques, changes in body composition with age and fitness. Interrelationship between physical fitness and performance. Basic structure of a muscle with the help of a diagram - functions and locations of muscles in the body - muscle groups – major skeletal muscles. Basics of exercise regime - FITT formula – frequency, intensity, time and type of exercises for fitness. Warm up exercises. Cool down exercises. Exercises - benefits of regular and adequate exercise. Types of exercises and health benefits with suitable examples. Anaerobic exercises. Flexibility exercises. Effect of nutrition in physical fitness and sports performance and athletics. Concept of energy balance - factors affecting energy – equations to assess BMR. Aerobic exercise to increase cardiovascular endurance – benefits and examples - treadmill, elliptical cycle, stationary cycle.Aerobics workouts. Macronutrients metabolism in exercise – carbohydrates: lactose intolerance, diabetes, hypoglycemia; lipids and oils, fatty acids, triglycerides, phospholipids, sterols. Functions of fats, needs, deficiencies.Role of water and electrolytes in performance.Vitamins metabolism in sports - free radicals in exercise - role of antioxidants in exercise.Minerals and trace minerals metabolism in exercise and essential minerals and trace minerals in sports.Sports nutrition products - supplements related to energy metabolism - weight reduction and botanical and herbal supplements - sports nutrition theory to practice.Special consideration in sports nutrition - women, young, diabetic, vegetarian athletes.Sports specific nutrition – gymnastics, weightlifters, skiers, cyclists, swimming, skating. Winning recipes for peak performance.Assessment of physical fitness. Functional tests: cardiorespiratory and muscular assessment. Type of measurement and protocol for evaluation and interpretation of performance. Aerobic power or VO2 max. Anaerobic threshold.Economy of movement. Fitness assessment: types of exercise, components of physical fitness and its evaluation

in health and performance. Activity recording: self-reporting of activities vs. direct monitoring of activities. Techniques to measure energy expenditure and energy intake.Techniques to assess physical fitness.Aging theories, physiology, mechanism and role of nutrients in arresting aging process.

Practical

Recording of Dietary intake by24-hour recall method for 3 consecutive days. Recording of energy expenditure by 24-hour recall method by using multipliers for 3 consecutive days.Calculation of energy balance by using above data. Demonstration and use of body composition analyzer calculation of total fat and fat free muscle mass. Calculation of fat % and BC of adults, equations to assess BMR. Physical tests: Harvard STEP test, Treadmill test to assess heart health, muscular grip test. Visit to established fitness center.

Suggested Readings

1. Falkner, F., and Tanner, J.M. 1978.Human Growth - Principles and Prenatal Growth.Vol. I.

2. Falkner, F., and Tanner, J.M. 1980.Human Growth Methodology.Ecological, Genetic, and Nutritional Effects on Growth. Vol. III. Plenum Press.

3. Heather, Hedrick F., and Mikesky, Alan E. 2015.Practical Application in Sports and Nutrition.4th edn.Jones and Bartlett Learning, Burlington, MA 01803.

4. Srilakshmi, B., Suganthi, V., Ashok, and Kalaivani, C. 2017. Exercise Physiology, Fitness and Sports Nutrition. 1st edn.New Age International (P) Ltd. Publishers, New Delhi.

5. Tindall, Falkner, F., and Tanner, J.M. 1980.Human Growth Methodology.

6. Egyankosh Unit-3 PDF

FND6 323 Milk Processing and Technology 3 (2+1)

Objectives

· To understand chemistry of milk constituents. Milk and various dairy products are discussed from the perspective of the chemical, physical, and biological changes that occur during processing.

· To be able to describe the composition of milk, identify the approximate content of individual types present, and describe physicochemical characteristics of the main components.

· To learn to integrate knowledge of food chemistry, engineering, microbiology, and physical properties of foods to understand the processing of dairy products.

· To be able to explain how dairy products (such as fluid milk, yogurt, butter, powder, cheese) are made and the key functions of the processing steps involved.

Theory

Introduction, importance, and scope of the fluid milk industry in India and abroad, including a brief history and present status. The composition of milk and nutritive value of cow and buffalo milk are discussed, along with the physico-chemical properties of milk and its constituents, such as physical state, acidity, pH, density and specific gravity, freezing point, color, and flavor. Microbiology of milk is covered, including types of microor ganisms, their production, and consequent effects on milk. Various types of milk are described, including sterilized milk, homogenized milk, flavored milks, standardized milk, reconstituted/re-hydrated milk, recombined milk, and toned milk. Traditional milk products such as butter, ghee, khoa, and cheese are introduced theoretically. Steps of milk processing, including collection, chilling, standardization, pasteurization, homogeniza tion, bactofugation, and principles of dehydration, are explained. Management of processing plants, including plant designs and layouts, value

addition, and fortification of milk, is discussed. Waste management and quality control aspects of milk, including the status of antibiotics, pesticides, heavy metals, good manufacturing practices, HACCP standards, and cleaning and sanitization procedures, are also included. Indian standards for milk and milk products as per PFA, BIS, and AGMARK are highlighted, along with judging, grading, defects in milk, their causes, and prevention.

Practical

Platform test of raw milk, including Clot on Boiling (COB) test and alcohol test, is performed to assess milk quality. Adulteration in milk and its detection are studied, along with proper sampling techniques. Estimation of fat, SNF, and total solids is carried out using platform tests, and cream separation and detection of adulterants are demonstrated. Microbiological quality evaluation of milk and milk products is conducted to ensure safety. Practical preparation of milk products such as paneer, chhena, ice-cream, khoa, burfi, flavored milk, and rasogulla is included. Additionally, visits to modern milk processing and manufacturing plants.

Suggested Readings

1. Aneja, R.P., Mathur, B.N., Chandan, R.C., and Banerjee, A.K. 2002. Technology of Indian Milk Products. Dairy India Yearbook.

2. Lampert, L.M. 1970. Modern Dairy Products. Chemical Publishing Company Inc., New York.

3. Srinivasan, M.R., and Anantkrishanan, C.P. 1964. Milk Products of India.

4. Sukumar, De. 2001. Outlines of Dairy Technology. Oxford University Press, New Delhi.

5. Swarup, A. 2013. Milk Processing Technology. Discovery Publishing House Pvt. Ltd.

FND6 324 Cereals and Millets: Processing and Technology 3(2+1)

Objectives

· To create understanding about the processing of major cereals like paddy, maize, etc.

· To study the storage and handling techniques of cereals.

· To study the byproducts obtained during processing along with their uses.

· To gain knowledge on processing and milling of pulses.

Theory

The production and consumption scenario of cereals and millets is an important aspect of food science and nutrition. This includes the structure, chemical composition, and nutritive value of cereals and millets. General unit operations in agricultural process engineering and their importance in grain processing are studied, along with the morphology and physico-chemical properties of cereals, major, and minor millets. Chemical tests such as sedimentation test and flour swelling volume are used to assess quality. Conventional and modern milling technology of paddy processing, estimation of milling efficiency, and quality characteristics of milled cereals and millets are explained, along with parboiling of rice and bran stabilization methods. Wheat milling and processing, including purification and reduction systems, different types of wheat flour, and flour quality characteristics suitable for baking, are covered. Milling and processing of oats, corn, barley, and sorghum, as well as primary and secondary products of cereal processing, are included. Processing of breakfast cereals such as flaked, puffed, expanded, extruded, and shredded products, along with malted cereals and cereal products, is discussed. By-products of cereals and millets processing are explained, and the structure, composition, and processing of major millets like maize and sorghum, using wet

and dry milling methods, are described. Minor millets including pearl millet, finger millet, little millet, kodo millet, foxtail millet, and barnyard millet, along with their processing, are included. Finally, the structure, composition, and processing of oats and barley, malting of cereals and millets, and the production of weaning, supplementary, nutrient-dense, and amylase-rich foods (ARF).

Practical

Study of physico-chemical properties of cereals.Parboiling of paddy. Cooking quality of rice and milling of rice. Conditioning and milling of wheat. Production of cereal flakes. Production of popcorn, flaked rice, puffed rice, and noodles.Preparation of cereal malt.Determination of gelatinization temperature by amylograph.Processing of value-added products from millets.Estimation of gluten content in wheat flour. Preparation of snacks based on cereals and millets, including roasting, popping, pearling, flaking, and malting. Study of different unit operations and machineries in rice mills and wheat/flour mills.Study of the extrusion process.

Suggested Readings

1. Chakraverty, A., and Singh, R.P. 2014. Post-Harvest Technology and Food Process Engineering.CRC Press, Boca Raton, FL, USA.

2. Chakraverty, A., Arun, S., Mujumdar, G.S., Raghavan, Vijaya, and Hosahalli, S. Ramaswamy. 2003. Handbook of Post-Harvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices. Marcel Dekker, Inc., NY, USA.

3. Dash, S.K., Bebartta, J.P., and Kar, A. 2012.Rice Processing and Allied Activities.Kalyani Publishers, New Delhi.

4. David, A.V., Dendy, D., and Dobraszczyk, Bogdan J. 2001. Cereal and Cereal Products: Technology and Chemistry. Springer-Verlag, US.

5. Khader, V. 2001.Textbook of Food Science and Technology.Directorate of Information and Publications of Agriculture, ICAR, Krishi Anusandhan Bhawan, Pusa, New Delhi.

6. Khan, K., and Shewry, P.R. 2009. Wheat: Chemistry and Technology. 4th edn. AACC International, Inc., St. Paul, MN, USA.

7. Manay, N.S., and Shadaksharaswamy, M. 2001.Foods Facts and Principles. Wiley Eastern Ltd., New Delhi.

8. Pillayar, P. 1988. Rice: Post Production Manual. Wiley Eastern Limited.

FND6 325 Sustainable Nutrition 3 (2+1)

Objectives

· To explore the relationship between health, nutrition, environment, and sustainability.

· To investigate the potential causes of unhealthy eating patterns.

· To discover the importance of a sustainable diet.

Theory

Sustainable development goals and sustainable nutrition focus on promoting diets that are healthy for both people and the planet. This includes the definition of sustainable diets and their various dimensions, as well as the aims and guiding principles that support them. The relationship between climate change and sustainable, healthy diets is considered, along with indicators and measures to assess the environmental impact of diets. Nutritional indicators of sustainability are evaluated, and the social and cultural perspectives of sustainable diets are explored. Sustainable diets are linked with food-based dietary guidelines, with traditional foods positioned at the epicenter of the sustainable food system. Determinants of food choice and dietary change, the role of organic food, and the sustainability of Indian diets are examined. Achieving healthy and sustainable diets involves considering

economics, food waste, biodiversity, and the environmental impact of existing food systems. Sustainable healthy diets are analyzed through models and measures that include dietary, economic, sociocultural, and environmental dimensions. Metrics for characterizing sustainable nutrition security cover nutrient adequacy of foods, diets and the food supply, ecosystem stability, food affordability and availability, sociocultural wellbeing, resilience, food safety, and waste and loss reduction.

Practical

Develop amealplan for nutritional adequacy and sustainability; Undertake a market survey of foodproducts with sustainable or climate-friendly labels; Assess the 7-day food menu servedinuniversity hostels in terms of sustainability; Pilot study on assessment of food choice motives of university students.

Suggested Readings

1. Burlingame, B., and Dernini, S. (Ed.). 2019. Sustainable Diets: Linking Nutrition and Food Systems. Wallingford, Oxfordshire; Boston, MA: CABI.

2. Contento, I.R. 2011. Overview of Determinants of Food Choice and Dietary Change: Implications for Nutrition Education. In Nutrition Education: Linking Research, Theory, and Practice (2nd ed., pp. 26–42). Jones and Bartlett Publishers.

3. FAO. 2012. Sustainable Diets and Biodiversity—Directions and Solutions for Policy, Research and Actions (Proceedings of the International Scientific Symposium Biodiversity and Sustainable Diets United Against Hunger). Food and Agriculture Organization of the United Nations. www.fao.org/3/i3004e/i3004e00.htm

4. FAO, and WHO. 2019. Sustainable Healthy Diets – Guiding Principles. www.fao.org/3/ca6640en/ca6640en.pdf

5. Sarilo, S. 2018. Towards Healthy and Sustainable Diets: Perspectives and Policy to Promote the Health of People and the Planet. Springer Briefs in Public Health, Switzerland.

6. https:// www.kerry.com /content/ dam/ kerry/ sustainability/ people/nutrition-health/ Sustainable-Nutrition-Profiling-Whitepaper.pdf

FND6 326 Hospitality Management 2 (1+1)

Objectives

· To develop industry-ready professionals for the hospitality sector.

· Gear students for operational and supervisory roles in all sectors.

· Prepare students for each food production and service roles.

Theory

Food preparation includes the principles and methods of food purchasing and proper storage of foods. It covers different kitchen equipment, including heavy and light equipment, their care, maintenance, and use. Management aspects include principles of management, steps of effective management, and techniques for effective management. Emphasis is placed on attitude towards work, behavior, personal hygiene, and the do's and don'ts while working in the kitchen. Understanding the functioning of the Food Production Department in any catering establishment or setup involves knowledge of organizational structure, layout, and duties and responsibilities. Menu planning covers the definition and principles of menu planning and the types of menus. Financial management includes introduction, principles, costing, budgeting, accounting, food cost control methods, and factors affecting food cost, labor cost, operating cost, and overhead cost. Standardization of recipes involves the definition, standard recipe format and uses, portioning equipment, and portion control. Personnel management includes introduction to personal management concepts, staff employment, employee benefits, methods of selection, orientation, training and development, supervision, and motivation of employees.

Practical

Menu planning is carried out for various settings such as industrial canteens, hospital canteens, cafeterias, snack bars, and residential hostels. It includes the standardization of recipes suitable for fast food outlets, industrial canteens, hospitals, and college hostels. Multiplication of standardized recipes for quantity food production, quantity food management, portioning, and fixing of cost are important aspects. Practical exposure includes visits to any one canteen attached to a hospital and dietary department cafeteria, a 3-star hotel/restaurant, a 5-star hotel/ restaurant, or an industrial canteen. Students are required to present a report on the visited facility in terms of organizational setup, production, preparation, and service. Additionally, calculation of food cost, labor cost, operating cost, and overhead cost for any standardized recipe.

Suggested reading

1. Gregoire, M.B. 2017. Food Service Organizations: A Managerial and Systems Approach, 9th ed. Food Service in Institutions. John Wiley.

2. Sethi, S., and Malhan, S. 1993. Catering Management: An Integrated Approach. Wiley Eastern.

FND6 327 Food Hygiene and Sanitation 2(1+1)

Objectives

To present the rules of personal hygiene and the importance of adhering to safety rules and regulations

· To introduce the causes and prevention of food poisoning and to introduce the requirements of safety in the workplace.

· To introduce local legislation relating to the food service industry.

Theory

Meaning and principles of food hygiene involve understanding the interrelationship of health, hygiene, and sanitation. Food hazards and personal hygiene are essential components, along with water requirements, sources of water supply, water pollution, purification, potable water quality criteria and standards, hardness of water and its treatment, and defluorination of water. Food hygiene also includes contamination of foods from various sources such as green plants and fruits, animals, sewage, soil, air, and water, along with their associated health hazards. Food spoilage is classified into perishable, semi-perishable, and non-perishable foods, and sanitary procedures for preparation, handling, and storage of foods are emphasized. Food-borne infections and intoxications, including food poisoning caused by bacteria such as Salmonella, Staphylococcus, Botulinum, Clostridium perfringens, and Bacillus cereus, are studied with respect to sources, incubation period, and mechanisms of action, as well as investigation, prevention, and control measures. Food poisoning caused by agents other than microorganisms, including poisonous plants, animals, chemicals, metals, and pesticides, is considered. Pests and rodent control, hygiene requirements for licensing and sale, health status of food handlers, and methods to prevent cross-contamination are also addressed. Additionally, introduction to HACCP principles and their application, along with the concepts of Total Quality Management (TQM), Good Manufacturing Practices (GMP), and risk assessment.

Practical

Identification of microorganism, preparation of slides, preparation of media.Collection of watersamples.Testing of water for: (i) Physical quality (ii) Bacteriological quality.Survey of hygienic and sanitary condition in food shops/food vendors/ canteens.Report writing.

Suggested Readings

1. Adams, M.K., and Moss, M.O. 2000. *Food Microbiology.* New Delhi: Panima Corp.

2. Longree, K.L., and Blaker, G.C. 1982. *Sanitary Techniques in Food Service.* New York: John Wiley and Sons.

3. Park, K. 1997. *Textbook of Preventive and Social Medicine,* 1st edn. Jabalpur: Banarsidas Bhanot.

4. Srivastava, A. 2013. *Food Hygiene and Sanitation.* Neha Publishers and Distributors.

5. Yadav, S. 1997. *Food Hazards and Food Hygiene,* 1st edn. Annual Publication Ltd., New Delhi.

6. William, C., Frazier, A., Dennie, and Westheff, C. 1996. *Food Microbiology,* 4th edn. Tata McGraw Hill Company Limited.

IV Year I Semester

FND6 411 Ethics in Human Research 1(1+0)

Objectives

By the end of this course students will:

· Understand key ethical principles (e.g., respect for persons, beneficence and justice).

· Analyze historical and contemporary cases of ethical breaches in human research.

· Learn the role of IRBs in protecting research participants

· Develop skills to assess and resolve ethical dilemmas in research.

Theory

Introduction to Ethics in Research: Definition and importance of ethics in research, Historical background: Nuremberg Code, Declaration of Helsinki, Belmont Report. Ethical Principles in Human Research, Respect for persons, beneficence, justice.Application to real-world research scenarios.Informed Consent. Elements of informed consent, Challenges in obtaining consent, Special populations: minors, cognitively impaired individuals. Confidentiality and Privacy.Data protection and privacy laws (e.g., GDPR, HIPAA) Ethical considerations in handling sensitive data.Institutional Review Boards (IRBs) Role and structure of IRBs.Preparing ethical research proposals.Vulnerable Populations.Research involving prisoners, children, pregnant women, and economically disadvantaged groups. Avoiding exploitation and ensuring equity, Ethical Challenges in Clinical Trials. Risk-benefit analysis, Placebo use, Compensation for harm. Contemporary Ethical Issues in Human Research, Genetic research and bio banking, Artificial intelligence and privacy in research, Cross-border and culturally sensitive research. Case Studies in Ethical Breaches.Tuskegee Syphilis Study.Henrietta Lacks and HeLa cells.Other contemporary examples. Ethical Problem-Solving Frame works Identifying, analyzing, and resolving ethical dilemmas. Student Presentations on Ethical Dilemmas, Group presentations on assigned case studies. Course Review and Assessment, Review of key principles and topics. Final discussion on future ethical challenges in human research.

Suggested Readings

1. National ethical Guidelines for Biomedical and Health Research involving Human Participants.

2. IGNOU, ICMR, Clinical Nutrition Foods, https://www.ignou.ac.in

FND6 412 Nutrigenomics 2 (2+0)

Objective

To understand, in depth, the influence of genetics on micronutrient metabolism, and implications for human diseases including inherited inborn disease, metabolic disease, cancer, neurodevelopment, and neurodegenerative diseases, etc.

Theory

Introduction - role of nutrition in preventing risk of disorders – proposed strategies for management of nutrient disorders – personalized medicine – personalized nutrition; introduction to genomics and its importance in health care, agriculture and environment – introduction to nutrigenomics definition - role of personalized nutrition in human diseases. Genes – structure – biochemical and molecular nature of genes; central dogma of life - regulation of gene expression – role of diet/nutrition in regulation of gene expression – metabolic programming - genetic basis of dietary responses - diet vs gene interactions. Genetic susceptibility to diets. Introduction to methods of developing nutritious foods/diet – intervention of biotechnology/genomics in producing nutritionally important molecules/compounds – Production of therapeutic/medicina proteins / hormones/mole

cules through genetic engineering – biotech processes in value addition of dietary foods - fermentation process, and genetic improvement of food grade microorganisms; crop varieties with enhanced nutrition. Introduction to transcriptomics, proteomics, metabolomics; applications in nutrition research - metabolic syndrome in humans - nucleotide polymorphisms associated with common/major dietary disorders - inborn errors of metabolism – lactose intolerance, gluten enteropathy and phenylketonuria. Biomarkers – importance, discovery and validation - screening for bioactive nutrients and compounds - cell line testing – zebrafish model and animal model - scientific, technological and resource constraints on genomics - important factors affecting development in nutrigenomics.

Suggested readings:

1. Carlsberg, C., Ulven, M.S. and Molnar, F.2016. Nutrigenomics. SpringerPub.

2. Lynnette, Ferguson R. 2013. Nutrigenomics and Nutrigenetics in Functional Foods and Personalised Nutrition. CRC Press.

3. Nestle M. 2003. Safe Food: Bacteria, Biotechnology and Bioterrorism. Univ. of California Press.

4. Rogers PL and Fleet GH. 19

5. Journal of the American Dietetic Association

6. https://scholar.google.co.in/scholar?q=(search).

7. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3602567/pdf/13197_2012_Article_775.pdf.

FND6 413 Nutrition for Special Conditions 3 (2+1)

Objectives

· To gain basic knowledge on changes occurring in the physiology and metabolism of the human body as a result of changes in extreme environments.

· To know the nutrition in emergency situations, nutrition and health problems, food distribution strategies, and dietary management.

· To acquire basic knowledge about immune nutrition in acute and chronic inflammation.

Theory

Nutritional requirements for extreme environments: Introduction - General adaptive mechanisms to environmental extremes and role of nutrition in successful acclimatization – decreased oxygen availability at high altitude – nutrition requirements for high altitude – nutrition requirements in cold and polar environment - thermoregulation in cold – dietary guidelines for cold conditions. Nutrition requirements in hot environments - effect of heat stress – energy expenditure in hot environment. Nutrition requirements for astronauts (space missions); sea and air travel nutrition: introduction, need and scope for space travel, history of space travel; changes in body composition during space expedition and nutrition requirements. Physiological changes in human body, psychological preparedness, health and nutritional problems, nutrient requirements and dietary management during sea and air travel. Nutrition in emergencies: need and importance, types of emergency situations such as natural and manmade, nutritional and health problems in emergencies. Control of communicable diseases through sanitation and immunization - food distribution strategies - nutrient requirement and dietary management during emergencies. Nutritional requirements during starvation: total starvation – biochemistry of starvation, conditions developing starvation, features of starved body – survival period, effects of starvation/human body adaptation, metabolic alterations and nutrition requirements during starvation. Immuno-nutrition: nutrients affecting the immune system at the physiological, cellular and genetic level. Nutrients involved in the inflammatory

response, role of specific nutrients in immune suppression and in immune promotion. Acute inflammation - features, causes, vascular and cellular events, inflammatory cells and mediators. Chronic inflammation - causes, types, classification non-specific and granulomatous with examples, repair, and wound healing by primary and secondary union, factors promoting and delaying the process. Healing in specific site including bone healing.

Practical

Studying the existing ration scale for army personnel in plains/ high altitudes, space foods/emergency ration foods, planning and preparation of diet for army person in the high altitudes, hot environment and cold environment, planning and preparation of diet for space mission, preparation of snacks foods for space, fibre rich foods, ergogenic foods/bars for high altitude, ready to eat appetizers - juices/candy, high energy foods for starvation, RTE/ RTC foods for emergencies, high protein foods, planning and preparation of diet for acute and chronic inflammation condition – Rheumatic arthritis/Asthma, planning and preparation of diet for immunity.

Suggested Readings

1. Aggarwal, Bharat B. and Heber, David (2014) Immuno-nutrition: Interactions of Diet, Genetics, and Inflammation, CRC Press.

2. Corinne, H.R, Marilyn, R. L., L. C. Wanda and Garwick, E. (1982). Normal and therapeutic nutrition. (Pp- 1-16). New York, Macmillan Publishing Company.

3. Kathleen, M.L. and Raymond, J.L. (2016) Krause's Food and the Nutrition Care Process. 14th Edition, Saunders, Philadelphia.

4. Moris, E.S. (1994) Modern nutrition in health and disease. Leaned Febinger, USA

5. Sehgal, S. and Raghuvanshi, R. S. (2007) Textbook of community nutrition Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, New Delhi.

6. WHO (1997) Applied health research priorities in complex emergencies, Geneva

7. https://www.cdc.gov/ncbddd/adhd/index.html.

8. https://www.unhcr.org/45fa745b2.pdf.

9. http://apps.who.int/disasters/repo/13849_files/i/ nutrition_in_emergencies_ppt.pdf.

10. https://www.unicef.org/media.

11. https://www.nasa.gov/sites/default/files/ space_nutrition_book.pdf.

12. http://spacelink.nasa.gov/products

FND6 414 Nutrition through life cycle 3 (2+1)

Objectives

· To cover nutritional needs of individuals during critical stages of development

· To learn about the biological basis for nutritional requirements in normal development and maintaining health in adulthood

· To learn about consequences of over- and under-nutrition and how to identify and address these issues will be discussed

Theory

Infancy – Role of nutrition on physical and mental development, rate of growth - weight as an indicator, assessment of growth, nutrient requirement during infancy, feeding of infants, value of breast feeding on infants, breast feeding versus artificial feeding, types of milk and their use in infant feeding. Weaning and supplementary foods, weaning practices in community, feeding of premature and low-birth-weight infants. Nutritional disorders and common ailments in infancy, feeding the sick child, immunization schedule and growth charts. Preschool age: Physical growth and mental development, prevalence of malnutrition in

preschool years and food habits, nutritional requirements during preschool age and supplementary foods. School age: Physical growth and mental development, nutritional requirements during school age, specific problems, specific problems in feeding school children. Adolescence: Physical and physiological changes, nutritional requirements, food preferences and nutritional problems, problems, growth spurt and nutrition, adolescent fads influencing nutrition. Adulthood: Sex, occupation and income, nutritional requirements, biological and nutritional consequences and complications due to pollutants, vegetarianism. Nutrition, work capacity and physical fitness. Nutrition, infection and immunity, nutrients and drugs interaction. Pregnancy: Eating disorders, preconception nutrition. Nutritional related problems during pregnancy and lactation. Physiological changes in pregnancy, weight gain during pregnancy, food and nutrient requirements. Complications of pregnancy and their nutritional management, impact of nutrition on the outcome of pregnancy. Nutritional need of fetus during different stages of fetal cell growth and maternal nutritional needs. Psycho-physiology of lactation; milk synthesis and secretion, maternal needs during lactation, composition of colostrum and mature human milk, milk of mothers of pre-term babies. Non-nutritional factors of human milk; immunological factors, enzymes, hormones.Human milk banking. Elderly: Physical and physiological changes, nutritional requirements, problems of old age, nutrients influencing aging process.

Practical

Grouping of foods based on richness of nutrients and quantifying foods to give uniform content of each nutrient. Planning and formulation of food exchange lists. Planning, preparation and evaluation of diet for adult men and women involved in different activities. Planning, preparation and evaluation of diets for pregnan two men, lactating mothers, weaning and supplementary foods for infants, pre school children, school going children, packed lunches for preschoolers and school children, adolescent boys and girls, elderly, preschool children with PEM and vitamin. Adeficiency Planning diets for anemic children, adolescents and pregnant women.

Suggested Readings

1. Corinne H.R, Marilyn R. L, Wanda L. C and E. Garwick. (1982). Normal and therapeutic nutrition. (pp- 1-16). New York, Macmillan Publishing Company.

2. Moris, E.S. (1994). Modern nutrition in health and disease. Leaned Febinger, USA

3. Srilakshmi, B. (1995). Dietetics. New Age International Publishers, New Delhi.

T-test, Z-test, F-test, Chi-square test and ANOVA and its applications – Correlation, simple and multiple regression techniques. Steps in report writing.

Practical

Preparing business research proposal – Problem identification and research questions, formulation of research design, sampling framework and hypothesis.Data mining - Collection of primary and secondary data – Sources.Preparation of interview schedule and questionnaire for primary data collection - Administration of mailed questionnaire and on-line survey.Conducting field level enquiry and data collection.Organizing other methods of data collection - Focus group discussion/panel data collection / observation / case study.Application of scaling techniques in business research.Data editing - coding and tabulation - Application of statistical tools (Descriptive statistics) in business research.Understanding cause and effect and functional relationships among the variables.

Suggested Readings

1. Cooper D.R. and P. S. Schindler, 2007, Business Research Methods, Tata McGraw Hill Company Ltd.

2. Kothari C.R., 2007, Research Methodology, New Age International Publishers.

3. Andrea Ahlemeyer-Stubbe and Shirley Coleman, A Practical Guide to Data Mining for Business and Industry, John Wiley and Sons Limited, United Kingdom (e book).

4. Ledolter, Johannes, Data Mining and Business Analytics with R, John Wiley and Sons, New Jersey (e - Book).

ABM6 316 Social Entrepreneurship 1 (1+0)

Objectives

1. Understand the concept and principles of social entrepreneurship

2. Learn about innovative business models that address social and environmental challenges

3. Explore strategies for creating sustainable social impact while ensuring financial viability

4. Develop skills to identify social problems, design solutions, and implement projects that benefit communities

Theory

Social Entrepreneurship: concept, meaning, historical perspective of social entrepreneurship. Factors impacting transformation into social entrepreneurship.Characteristics of social entrepreneurs.Differences between business and social enterprise.Forms of social enterprises, Profit and non-profit Proprietorships, partnership and company; Non-Governmental Organisation, Trust and Company.Third Sector Organizations (TSOs) and social enterprises.Similarities and differences with other forms of enterprises.Organisation of social enterprise.Financing of social enterprise.Legal compliance and management of resistance. Management: strategy, finance, HRM and marketing. Governance challenges - accountability, transparency and democracy. Measurement of social outcomes and impact, social accounting, social return on investment.Innovations in social enterprises.Successful social enterprises in India.

SuggestedReadings

1. Bornstein, David and Susan Davis. 2010. Social Entrepreneurship: What Everyone Needs to Know? Oxford University Press, New York.

2. Bornstein, David. 2007. How to Change the World: Social Entrepreneurs and the Power of New Ideas. Oxford University Press, New York.

3. Doherty, Bob, George Foster and Chris Mason. 2009. Management for Social Enterprise. Sage Publications, USA.

4. International Journal of Social Entrepreneurship and Innovation, Inderscience.

5. Journal of Social Entrepreneurship, Taylor and Francis.

6. Praszkier, Ryszard and Andrzej Nowak. 2011. Social Entrepreneurship: Theory and Practice. Cambridge University Press, Cambridge.

7. Yunus, Muhammad. 2010. Building Social Business: The New Kind of Capitalism that Serves Humanity's Most Pressing Needs. Public Affairs, New York.

AGR6 312 Sustainable Farming Systems and Precision Agriculture 2 (1+1)

Objectives

1. Understand the principles and practices of sustainable farming systems aimed at environmental stewardship and resource conservation

2. Learn about precision agriculture technologies and their applications for optimizing inputs, minimizing waste, and increasing farm efficiency

3. Explore strategies to integrate sustainable practices and precision agriculture techniques for improved crop productivity, profitability, and environmental sustainability

4. Develop skills to implement and manage sustainable farming systems and precision agriculture technologies to address challenges such as climate change, soil degradation, and water scarcity in agriculture

Theory

Farming System-scope, importance, concept and types.Farming systems components, Indicators of Sustainability, adaptation and mitigation, determining production and efficiencies in cropping and farming systems; Sustainable agriculture- problems and its impact on agriculture.Evaluation indices for cropping

system. Integrated Farming System- historical background, objectives and characteristics, components of IFS and its advantages, resource use efficiency and optimization techniques. Operational structure of NPOP.Organic certification process and economic considerations.Marketing export potential of organic products.

Precision agriculture: components, concepts and principles, techniques, their issues and concern for Indian agriculture. Global Positioning System (GPS) and Geographical Information System (GIS), Site Specific Nutrient Management (SSNM) for nutrient and irrigation management practices. Comparative yield, quality and farm profits under SSNM practices v/s Variable Rate Technology (VRT) practices. Yield monitoring and mapping.

Practical

Tools for determining production and efficiencies in cropping and farming system, Visit to cropping systems and IFS models. Evaluation indices for cropping system.Organic farming guidelines and alternative philosophies. Organic nutrient resources and their fortification, Restrictions on nutrient use, enriched compost, vermi-compost, liquid organic manures, green manuring, crop residue management, biofertilizers/bio inoculants and their quality. ITKs in organic farming. NPOP: certification process and standards of organic farming; processing, labelling, marketing and export of organic products. Economic of Organic production systems. Visit to organic farmer's fields.

Use of GPS for agricultural survey and recording the observations with GPS.Area estimation, navigation and recording elevation points. Conversion of GPS readings, Study of maps, topo sheets, cartography, GPS software's, Spatial data creation and editing. Introduction to image processing software.Visual and digital interpretation of remote sensing images. VRT, Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation.Use of UAV in agriculture.

Suggested Readings

1. Joshi M and Prabhakarashetty TK. 2005. Sustainability through Organic Farming, Kalyani Publishers.

2. Palaniappan SP and Anandurai K. 1999. Organic Farming - Theory and Practice, Scientific Publishers.

3. Panda SC, 2014, Cropping and Farming System. Agrobios (India) Publishers.

4. Reddy, S. R., 2017. Geoinformatics and Nanotechnology for Precision Farming. Kalyani Publishers. pp.140.

5. Thomas Lillesand, Ralph W. Kiefer and Jonathan Chipman. 2015. Remote Sensing and Image Interpretation, 7th Edition, Wiley Publications. Pp 736

6. Wright, Richard T. and Bernard J. Nebel Environmental science: toward a sustainable agriculture

AST6 312 Applied Business Statistics 2 (1+1)

Objectives

1. Understand the fundamental concepts and techniques of statistical analysis in business contexts

2. Learn how to collect, organize, and interpret data to make informed business decisions

3. Explore the application of statistical tools and methods in various business functions such as marketing, finance, and operations

4. Develop skills to use statistical software packages effectively for data analysis and visualization in business settings

Theory

Introduction to Sampling Theory, Sampling versus Complete Enumeration, Methods of Sampling: Probability sampling design –Simple Random Sampling (WR and WOR), Use of Random Number Tables for selection of Simple Random Sample. Concept of Stratified Sampling, Determining sample size for Simple

Random and Stratified Sampling under Equal, Proportional, Neyman's and Optimal allocations. Concept of Systematic sampling, Cluster, Multistage and Probability Proportional to Size (PPS) sampling along with their advantage and disadvantages. Non- probability sampling scheme: Judgment, convenience, quota and accident sampling scheme.

Time series analysis: Introduction, Spatial, temporal and conditional series, Objectives of time series, components of time series: Trend, Seasonal, Cyclical and Irregular components. Measurement of trend: Graphical, Semi-Average, Moving Averages and Central Moving Averages, Isolation of trend by moving averages, Ordinary Least Squares (OLS), and fitting of trend.

Index numbers: Concept and Definition, objectives of index numbers, advantages and limitations. Prerequisites of index numbers, Types of Index numbers: Price index number (retail and whole sale), Quantity index numbers, Value index numbers. Construction of Simple index numbers under simple aggregative and simple average of relatives (fixed and chain based) method. Construction of weighted index numbers under weighted aggregative method. Chain index number, conversion of chain base index number to fixed base index number, fixed base index number to chain base index number.

Statistical Quality Control: Definition of control charts, uses of control charts, chance and assignable causes, parts of control charts (central line and control limits). Control charts for variables X-bar and R charts, control charts for fraction defective (p) and control charts for number of defects per unit. Operating characteristic curves for control charts.

Practical

Use of Random Number Tables for selection of Simple Random Sample (WR/WOR).Computing Mean and Variance for Simple random samples.Determining sample size for Simple

Random samples.Determining sample size for Stratified Sampling under Equal, Proportional, Neyman's and Optimal allocation.

Graphical presentation of various time-series components.Presenting trend line using Graphical and Semi-Average methods. Computation of Moving Average and Central Moving Average, Isolation of trend by moving averages. Fitting of trend line using Ordinary Least Squares (OLS).

Construction of Price index number: Retail and Whole sale. Construction of Quantity index numbers and Value index numbers. Construction of Simple index numbers under simple aggregative and simple average of relatives (fixed and chain based) method. Construction of weighted index numbers under weighted aggregative method. Construction of Chain index number, conversion of chain base index number to fixed base index number, fixed base index number to chain base index number.

Construction of X bar and R charts for variables. Construction of fraction defective (p) and number of defects per unit. Construction of Operating characteristic curves for control charts.

Suggested Readings

1. A Textbook of Agril. Statistics. R. Rangaswamy.

2. Advanced Practical Statistics. S.P. Gupta.

3. Fundamentals of Mathematical Statistics. S.C. Gupta and V.K. Kapoor.

4. Introduction to Time Series and Forecasting. Brockwell P.J and Davis RA.

5. Quality Control and Industrial Statistics. John Wiley. Duncan A.J.

6. Sampling Inspection Tables. Dodge H.F. and Romig H.G.

7. Sampling Techniques. Cochran W.G.

8. Statistical Methods in Quality Control. Cowden D.J.

9. Statistical Quality Control. Grant E.L. and Leavenworth R.S.

10. Survey Sampling Theory and Methods. Chaudhari A and Stenger H.

11. Time Series Analysis: Forecasting and Control. Box G.E.P., Jenkins G.M. and Reinsel G.C

EDT6 311 Educational Tour 2(0+2)

There will be a study tour of 10-14 days' duration during the 5th semester of the UG programme.The students will preferably visit the leading industries/ enterprises/ institutions/ organizations andother places of academic interest outside the state (of location of the institution). This, in addition toexposing the students to the indigenous as well as the latest technologies in their related fields, willalso help the students to know about the socio-economic-cultural variations within the country. The course will be of 0+2 credits, non-gradial.

GPB6 312 Intellectual Property Rights 1 (1+0)

Objectives

1. Understand the principles and significance of intellectual property rights (IPRs) in agriculture

2. Learn about different types of IPRs such as patents, trademarks, and plant breeders' rights

3. Explore the legal and ethical implications of IPRs in agricultural innovation, research, and commercialization

4. Develop skills to protect, manage, and utilize intellectual property assets effectively in agricultural enterprises

Theory

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Beme Convention, Budapest treaty, etc. Types of intellectual Property and legislations covering IPR in India- Patents, Copyrights, Trademark, Industrial design, Geographical indications, Appellations of origin, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India,

patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database. Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV and FR Act of India, Plant breeder's rights, Registration of plant varieties under PPV and FR Act 2001, breeders, researcher and farmer's rights. Traditional knowledge- meaning and rights of TK holders.Convention of Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Suggested Readings

1. Intellectual Property Rights - Unleashing the knowledge economy, 2001, Ganguly P., Tata McGraw Hill.

2. Intellectual Property Rights in Agricultural Biotechnology, 1998, Erbisch, F.H. and Maredia, K., CABI.

3. Intellectual Property Rights in Animal Breeding and Genetics, 2003, Rothschild M. and ScottN. (Ed.), CABI.

4. Intellectual Property Rights in NAM and other Developing Countries: A Compendium on Law and Policies, 2006, Saha, R. (Ed.). Daya Publ. House.

5. Ministry of Agriculture, Government of India 2004. State of Indian Farmer. Vol V. Technology Generation and IPR issues. Academic Foundation.

6. The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000; Trademarks Act, 1999; The Copyright Act, 1957 and amendments; Layout Design Act, 2000; PPV and FR Act 2001, and Rules 2003; National Biological Diversity Act,2003.

4. Williams, S.R., Worthington, R.S., Sneholinka, E.D., Pipes, P., Ress, J.M. and Mahal, K.L. (1988).Introduction to nutrition

7. WIPO Intellectual Property Handbook: Policy Law and Use. Fields of Intellectual Property Protection, WIPO, 2008

PBT6 314 Fundamentals of Plant Biotechnology 2 (2+0)

Objectives

1. Understand the principles and techniques of plant biotechnology

2. Learn about genetic engineering, gene editing, and other biotechnological methods used in plant breeding

3. Explore the applications of plant biotechnology in crop improvement, pest resistance, and stress tolerance

4. Develop skills to critically evaluate the ethical, environmental, and regulatory aspects of plant biotechnology

Theory

Introduction, history, concepts and applications of plant biotechnology, cell, DNA structure and function, gene cloning steps, common enzymes used as molecular tools, vectors, transformation and selection of recombinants, construction of genomic libraries, isolation and cloning of coding parts of eukaryotic genes-cDNA cloning. Gene transfer methods, transgenics and its importance, gene editing, biosafety measures and intellectual property rights. Molecular markers, RAPD, RFLP, SSR, SNP etc, and their applications. Concept of tissue culture, organogenesis and embryogenesis, embryo rescue and its significance, micropropagation, somaclonal variation and its use in crop improvement, synthetic seeds and their significance, somatic hybridization and cybrids and cryo-preservation. Use of tissue culture in biotechnology (transgenics and gene editing).

Suggested Readings

1. Brown, T.A., 2006, Gene cloning and DNA analysis: An introduction, Blackwell Publishing, Oxford, UK.

2. Chawla, H.S., 2002, Introduction to Plant Biotechnology, Science Publishers.

3. Gardener, E.J., Simmons, M.J. and Snustad, D.P., 1991, Principles of Genetics, John Singh, B.D., 2013, Biotechnology, Kalyani Publishers.

4. Wiley and Sons, Inc, New York, USA.

ABM6 321 Corporate Social Responsibility and Managerial Ethics 3(2+1)

Objectives

1. Understand the concept and significance of corporate social responsibility (CSR) in business

2. Learn about ethical theories and principles guiding managerial decision-making

3. Explore strategies for integrating CSR practices into business operations and stakeholder engagement

4. Develop skills to analyze ethical dilemmas, make responsible decisions, and promote ethical behavior within organizations

Theory

Introduction to Corporate Social Responsibility (CSR): Meaning and Definition of CSR, History and evolution of CSR. Concept of Charity, Corporate philanthropy, Corporate Citizenship, CSR- overlapping concept.Concept of sustainability.Stakeholder Management. CSR through triple bottom line and Sustainable Business; relation between CSR and Corporate governance; environmental aspect of CSR; Chronological evolution of CSR in India; models of CSR in India, Carroll's model; drivers of CSR; major codes on CSR; Initiatives in India. International framework for corporate social Responsibility, Millennium Development goals, Sustainable development goals, Relationship between CSR and Millennium Development Goals (MDGs). United Nations (UN) Global Compact 2011. UN guiding principles on business and

human rights.Organisation for Economic Co-operation and Development (OECD) CSR policy tool, International Labour Organization (ILO) tri-partite declaration of principles on multinational enterprises and social policy.CSR-Legislation in India and the world.Section 135 of Companies Act 2013.Scope for CSR Activities under Schedule VII, Appointment of Independent Directors on the Board, and Computation of Net Profit's Implementing Process in India. The Drivers of CSR in India, Market based pressure and incentives, civil society pressure, the regulatory environment in India. Counter trends. Performance in major business and Programs.Voluntarism Judicial activism.Identifying key stakeholders of CSR and their roles.Role of Public Sector in Corporate, government Program s that encourage voluntary responsible action of corporations. Role of Non-profit and Local Self- Governance in implementing CSR; Contemporary issues in CSR and MDGs. Global Compact Self-Assessment Tool, National Voluntary Guidelines by Govt. of India. Understanding roles and responsibilities of corporate foundations.

Practical

Review of current trends and opportunities in CSR. Review of successful corporate initiatives and challenges of CSR. Analysis and presentation of case Studies of Major CSR Initiatives.

Suggested Readings

1. Bharat's Corporate Social Responsibility by Kamal Garg. Edition 2023

2. Business Ethics and Corporate Social Responsibilities, 1st Edition 2017, by Mathur, SP, Mathur, Nishu, New Age International (P) Ltd. Publishers.

3. Corporate Social Responsibility, Jun 2019, by Andrea Giordani.

throughout the lifecycle.Times Mirroe/Mosby College Publishers.

FND6 415 Global Nutrition 2 (2+0)

4. Corporate Governance Values and Ethics Book for MBA by Dr Neeru Vasishth and Dr Namita Rajput.

ABM6 322 Introduction to Managerial Economics 3 (2+1)

Objectives

1. Understand the application of economic principles in managerial decision-making

2. Learn how to analyze market conditions, demand, and cost structures to optimize business strategies

3. Explore the role of managerial economics in pricing, production, and resource allocation within firms

4. Develop skills to make informed decisions that maximize profitability and efficiency in various business contexts

Theory

Managerial Economics: Definition, scope and significance of managerial economics, Basic economic concepts and principles – firm, industry and economy. Demand estimation: Demand forecasting – meaning, importance and techniques. Production analysis: Cobb-Douglas and CES production functions. Modern Firms: Changing objectives of modern firms and their cost curves, Leaning curve, Meaning, uses and types of cost control, revenue concepts and break-even analysis. Monopoly: Monopoly types, characteristics and degrees of price discrimination under monopoly. Monopolistic Competition: Types, characteristics and pricing and output determination, Pricing strategies of modern firms. Macro-economic equilibrium: Money concept, functions, demand for and supply of money. Inflation: Meaning and types of inflation, price indices, causes, effects and control of business cycles using monetary and fiscal policies.

Practical

Objectives

· To analyze the global burden of malnutrition and its various

Computation of different types of demand function. Computation of elasticity of demand-price, income, cross and promotional.Computation of total, average and marginal revenue under different market conditions. Demand estimation through regression analysis. Demand forecasting using non-quantitative and quantitative techniques - trend method, regression method, leading indicator method, simultaneous equations method. Analysis of important demand forecasting methods.Computation of average product, marginal product and elasticity of output with respect to one variable input.Analysis of optimal factor combination using C-D production function. Computation of elasticity of substitution using C-D and CES production functions. Calculation of optimal output combination of multi-product firms. Derivation of cost functions from production functions and break-even analysis. Determination of market price, market price and normal price.Price determination in perfect competition. Computation of break-even point, learning curve and economies of scope.Calculation of equilibrium price and output under conditions of monopoly and oligopoly.Calculation of market concentration under oligopoly.Price and output determination.Computation of macro-economic equilibrium models.

Suggested Readings

1. Ahuja, H.L. (2008). Managerial Economics – Analysis of Managerial Decision Making. S. Chand and Company Ltd.

2. Chaturvedi, D.D. and S.L. Gupta. (2012). Business Economics Theory and Application. International Book House.

3. Dewett, K.K. 2002. Modern Economic Theory. Syamlal Charitable Trust, New Delhi.

4. Seth, M.L. (2000). Principles of Economics. Lakshmi NarainAgarwal Co., New Delhi.

ABM6 323 Marketing Management 3 (3+0)

Objectives

1. Understand the principles and theories of marketing management

2. Learn strategies for product development, pricing, promotion, and distribution

3. Explore market research techniques to understand consumer behavior and preferences

4. Develop skills to create and implement effective marketing plans to achieve organizational objectives

Theory

Marketing– meaning, importance, functions. Marketing Management- definition, difference between marketing and selling.Guiding philosophy of Marketing. Marketing planning: importance, steps, nature. Market Segmentation – meaning, bases and advantages; Market Targeting– Approaches. Positioning – meaning and strategies. Marketing environment analysis. Marketing Mix – 4 Ps and 7 Ps; Product.Product classifications and new product development and launching. Product life cycle – stages; Branding – meaning, selecting a brand, advantages and disadvantages of branding, types of brands; Packaging: meaning, importance, and functions of packaging. Pricing Methods and strategies. Marketing channel–meaning, market intermediaries, types of channels and functions of marketing channel; channel management strategies, channels of distribution, channel management decisions, management of retailing and wholesaling. Direct marketing–methods and advantages and disadvantages; Promotional mix: meaning, elements and objectives. Services Marketing– introduction, meaning, characteristics and Service Marketing Mix.

Suggested Readings

1. Andrew J. Dubrin, 2012, Essentials of Management, Thomson Southwestern, 9th edition.

2. Chabra and Grover, 2012, Marketing Management, Dhanpatrai and Co, New Delhi.

3. Chandrasekar, K.S., 2010, Marketing Management-Text and Cases, Tata McGraw Hill- Vijaynicole.

4. Charles W.L Hill and Steven L McShane, 2007, Principles of Management, McGraw Hill Education, Special Indian Edition.

5. Harold Koontz and Heinz Weihrich, 2012, Essentials of Management: An International and Leadership Perspective, 9th edition, Tata McGraw-Hill Education

6. Philip Kortler and Kevin Lane Keller, 2012, Marketing Management, PHI 14th Edition.

7. Rajan Sexena, 2005, Marketing Management, Tata McGraw-Hill Education.

8. Samuel C. Certo and Tervis Certo, 2012, Modern Management: Concepts and Skills, Pearson education, 12th edition.

9. Sherlekar, 2013, Marketing Management, Himalaya Publishing House, New Delhi.

10. Sontakki, 2005, Marketing Management, Kalyani Publishers, New Delhi.

ABM6 324 Agribusiness Project Management 3 (2+1)

Objectives

1. Understand the principles and practices of project management specific to the agribusiness sector

2. Learn to plan, execute, and monitor agribusiness projects effectively, considering factors such as time, cost, and resources

3. Explore risk assessment and mitigation strategies to ensure successful project outcomes in agricultural settings

4. Develop skills to lead teams, coordinate activities, and communicate effectively to stakeholders in agribusiness projects

Theory

Meaning and definition of project, general features of projects, importance and objectives of project analysis. Categories of projects based on various criteria. Project cycle, stages of project cycle – conception, formulation, appraisal, implementation, monitoring and evaluation. Criteria for appraising projects – ex-ante and ex-post evaluation. Differences between economic and financial analysis in project evaluation.Costs and benefits of agribusiness projects, comparing costs and benefits of agribusiness projects. Externalities – meaning and definition, positive externalities, negative externalities and internalization of externalities, divergence between social costs and benefits of a project. Undiscounted measures of project worth – Accounting Rate of Return (ARR), ranking by inspection, payback period, proceeds per rupee of outlay and average annual proceeds per rupee of outlay.Time value of money - compounding and discounting, choice of discount rate. Discounted cash flow measures of project appraisal – Net Present Worth (NPW), Benefit-Cost Ratio (BCR) and Internal Rate of Return (IRR). Risk and uncertainty. Sensitivity analysis, general kinds of sensitivity analyses, social cost benefit analysis, and rationale for social cost benefit analysis. Project management– meaning, importance and triple constraint. Project management structures functional organization, project organization and matrix organization - meaning, advantages and disadvantages. Project Rating Index (PRI), Work Breakdown Structure (WBS) and Responsibility Assignment Matrix (RAM / RACI). Network analysis – CPM and PERT.Project financing - sources of financing a project.Business incubators - definition, types and their benefits. Project control- monitoring time performance (Gantt Charts, Control Charts), performance index and per cent complete index. Project audit and project closure.

Practical

Generation of agribusiness project ideas, project proposals in agribusiness sector (private and public), exercises on feasibility

studies and formulation of detailed project proposals. Investment analysis - undiscounted measures and discounted measures of project worth. Review of case studies pertaining to management of agribusiness projects.

Suggested Readings

1. Austin James .1992. Agro Industrial Project Analysis Critical Factors. John Hopkin University Press, London.

2. Joseph Phillip Hella and Daniel Wilson Ndyetabula. 2012. Agribusiness Project Appraisal: Theory and Applications, Intersperses – Tanzania.

3. Prasanna Chandra, 2014. Projects: Preparation. Appraisal, Budgeting and Implementation, Tata McGraw Hill.

4. Price Gittinger, J. 1982. Economic Analysis of Agricultural Projects. John Hopkins University Press.

5. UNIDO. 1978. Manual for Preparation of Industry Feasibility Studies. United Nations.

ABM6 325 Strategic Business Management 3 (2+1)

Objectives

1. Understand the concepts and frameworks of strategic management

2. Learn to analyze internal and external factors influencing business strategy

3. Develop skills to formulate, implement, and evaluate strategic plans to achieve organizational objectives

4. Explore strategies for sustainable growth, competitive advantage, and adaptation to dynamic business environments

Theory

Introduction to Strategies: Introduction, Fundamentals of Strategy, Conceptual Evolution of Strategy, Scope and Importance of Strategies. Strategic Management: Introduction, Need, scope, key features and importance of strategic management. Strategists

at various management levels, Types of Strategies, Limitations of Strategic Management.Strategy Analysis and its Importance. The External Environment-The General, Industry, and Competitor Environments-External Environmental Analysis -Scanning–Monitoring-Forecasting–Assessing. Segments of the General Environment-The Demographic Segment-The Economic Segment-The Political/Legal Segment - The Socio-cultural Segment - The Technological Segment - The Global Segment-Industry Environment Analysis- Competitor Analysis-Ethical Considera tions. The Internal Environment-The Nature of Internal Environmental Analysis -The Context of Internal Analysis-Creating Value -The Challenge of Internal Analysis-Resources, Capabilities, and Core Competencies-Building Core Competencies - Value Chain Analysis –Outsourcing-Competencies, Strengths, Weaknesses, and Strategic Decisions. Business-Level Strategy -The Purpose of a Business-Level Strategy -Types of Business-Level Strategies -Cost Leadership Strategy -Differentiation Strategy - Focus Strategies - Integrated Cost Leadership/Differentiation Strategy. Competitive Rivalry and Competitive Dynamics-Competitor Analysis-Market Commonality -Resource Similarity -Drivers of Competitive Actions and Responses - strategic and Tactical Actions type of Competitive Action.

Corporate-Level Strategy-Levels of Diversification-Value-Creating Diversification: Related Constrained and Related Linked Diversification -Unrelated Diversification - Value-Neutral Diversification: Incentives and Resources -Value-Reducing Diversification: Managerial Motives to Diversify. Acquisition and Restructuring Strategies -Merger and Acquisition Strategies - Reasons for Acquisitions -Restructuring -Downsizing -Downs coping. International Strategy -Identifying International Opportunities: Incentives to Use an International Strategy-International Business-Level Strategy -International Corporate-Level Strategy-Environmental Trends-Risks in an International

Environment -Political Risks -Economic Risks. Cooperative Strategy -Strategic Alliances as a Primary Type of Cooperative Strategy-Business-Level Cooperative Strategy Corporate-Level Cooperative Strategy- International Cooperative Strategy -Network Cooperative.

Practical

Case studies of agribusiness units with respect to their objectives and evaluation of their business strategies, strategic alliances, strategy implementation, implications and challenges.

Suggested Readings

1. Global Strategic Management, 2015 by Jedrzej George Frynas and Kamel Mellahi.

2. Strategic Management: Planning for Domestic and Global Competition, 2018, by John A. Pearce, Richard B. Robinson, and Amita Mital.

3. Strategic Management and Business Policy: Globalization, Innovation and Sustainability, 2018, by Thomas L. Wheelen, J. David Hunger and Alan N. Hoffman.

4. The Secrets of Strategic Management: The Ansoffian Approach, 2006 by Igor H. Ansoff and Peter H. Antoniou.

ABM6 326 Rural Marketing 3 (2+1)

Objectives

1. Understand the unique characteristics and challenges of marketing in rural areas

2. Learn strategies for reaching and engaging rural consumers effectively

3. Explore methods for adapting marketing tactics to suit rural market dynamics and preferences

forms (undernutrition, overnutrition, micronutrient deficiencies)

· To explore the ethical considerations in global food systems, including food justice, sustainable practices, and

4. Develop skills to analyze market trends, assess risk-reward scenarios, and make informed trading decisions in commodity futures markets

Theory

History and Evolution of commodity markets – Terms and concepts: spot, forward and futures, Markets – factors influencing spot and future markets. Speculatory mechanism in commodity futures. Transaction and settlement – delivery mechanism - role of different agents - trading strategies - potential impact of interest rate, Foreign Exchange, FDI in Commodity Markets. Risk in commodity trading, importance and need for risk management measures - managing market price risk: hedging, speculation, arbitrage, swaps - pricing and their features. Important global and Indian commodity exchanges - contracts traded – special features - Regulation of Indian commodity exchanges – SEBI and its role. Fundamental vs Technical analysis – construction and interpretation of charts and chart patterns for analyzing the market trend – Market indicators – back testing. Introduction to technical analysis software – analyzing trading pattern of different commodity groups.

Suggested Readings

1. Acharya, S.S., 1988, Agricultural Production, Marketing and price policy- A study of Pulses, Mittal Publications, Delhi.

2. Jagadish Prasad, 1966, Encyclopedia of Agricultural Marketing, Mittal Publishers Pvt. Limited, Bombay.

3. Kahlon, A.S. and George, M.V., 1965, Agricultural Marketing and Price Policies, Allied Publishers Private Limited, New Delhi.

4. Nayyar, H. and Ramaswamy, P., 1995, Globalization and Agricultural Marketing, Rawat Publications, Jaipur

5. Prasad, A. Shivarama, Agricultural Marketing in India, Mittal Publications, Delhi.

6. Singhal, A.K., 1989, Agricultural Marketing in India, Anmol Publications, New Delhi.

corporate accountability

· To examine the role of technology and innovation in addressing global nutrition challenges

· To understand the effectiveness of international nutrition programs and initiatives

Theory

Defining Global Nutrition: Scope and Challenges, Nutritional Transition, Global Trends and Regional Difference sin Food Systems and Nutrition, Sustainable Agriculture and FoodProduction Practices, Micronutrient Deficiencies, Nutritional Epidemiology, Food Traditions and Dietary Practices in Different Regions, Food Waste and Loss: Global Challenges and Solutions, Ethics of Industrial Food Productionand Food Justice Issues, Global Nutrition Programs and Policies, National Governments and International Collaboration, Issues and Trends in Global Food and Nutrition Security.

Suggested Readings:

1. Albert, J.L. (Ed.) 2000. Food, Nutrition and Agriculture. FAO Publication.

2. Branca, F., Lardeux, M., and Leroy, J. 2007. Food security, food safety and the right to adequate food. Agriculture and Human Values, 24(3), 285-294.

3. Fanzo, J., Hawkes, C., and Berry, E.M. 2013. Global food security and the right to food. Public Health Reviews, 35(1), 22-31.

4. Home – Global Nutrition Report.

FSC6 411 Food Toxicology and Quality Testing 3(2+1)

Objectives

· To give an introduction to possible toxic effects of food additives and naturally occurring environmental toxins in food.

· To be able to define toxicology.

· To be able to define the most important contaminants in food, the toxicology of various additives and environmental toxins, as well as their sources.

· To explain food safety and the substances that are of relevance for food safety.

· To be able to explain what risk analysis, assessment, and management in relation to food safety is, and know which organizations are involved in this type of work nationally and internationally.

Theory

Food toxicology – definition, introduction and significance. Classification of toxic constituents. Food poisoning – types, causative factors, signs and symptoms, preventive measures. Natural food toxins – pulses, oil seeds, sea foods, processed animal foods. Anti-nutritional factors, other food toxins, their harmful effects and methods of removal. General characteristics, occurrence, properties and inactivation of protease inhibitors, trypsin inhibitors, haemagglutinins, goitrogens, gossypol.General characteristics, occurrence, properties and inactivation of saponins, lathyrogens, avidin and other antimetabolites.Microbial toxins – classification, source of contamination, effect on health, preventive measures, methods of inactivation/destruction.General characteristics, occurrence and properties of mycotoxins, aflatoxin, ochratoxin and patulin.Methods to detect and prevention of mycotoxins.Chemical toxins – pesticides – pesticide and insecticide residual toxicity – sources and health hazards, insecticides, metallic and others. Mineral toxicity – chlorine and fluorine, heavy metals toxicity – lead and chromium, mercury, arsenic and iron, residual effects, preventive measures, methods of removal. Food additives – classification, toxicity and effects. Toxins developed during processing. Food packaging material – potential contaminants from food packaging material.Detection of toxins in food chain.

Practical

Methods of detect aflatoxin and gossypol. Methods of detect trypsin inhibitors and protease inhibitors. Use of AAS for detection of lead, chromium, mercury, arsenic, iron, detection of tannin and phytic acid.Visitto toxicology lab and public health laboratory. Visit to Quality Testing Laboratory, food processing industry/ government laboratory.

Suggested readings:

1. Debasis Bagchi, Anand Swaroop. 2016. Food Toxicology, CRC Press.

2. Derelanko, M.J. and Hollinger, M.A. 2002. Handbook of Toxicology, 2nd edn, CRC Press.

3. Gordon L. Robertson, 2006. Food Packaging Principles and Practice, 2nd edn, CRC Press. London.

4. Hodgson, Ernest. 2004. A Textbook of Modern Toxicology. John Wiley and Sons, Inc I.

5. Srinivasan Damodaran, Parkin, Kirk L., and Fennema, Owen R. 2007. Fennema's Food Chemistry, 4th edn. Taylor and Francis.

6. Takayuki Shibamoto and F. Bjeldanes, Leonard. 2012. Introduction to Food Toxicology. Academic Press.

7. Compendium_Food_Additives_Regulations_08_09_2020-compressed.pdf (fssai.gov.in)

8. http://www.fda.gov/down loads/ Food/ Food Safety/ Food borneIllness/ Food borne Illness Food borne Pathogens Natural Toxins/Bad Bug Book/UCM297627.pdf

9. http://www.fda.gov/

10. www.standards data. in/

11. www.fssai.gov.in

12. http://www.foodqualitynews.com/

13. http://www.cdc.gov/

FSC6 412 Sensory Evaluation of Foods 2 (1+1)

Objectives

· To introduce the methodology used in sensory evaluation of food product

· To expose students to the ability of humans to use their senses to evaluate the quality attributes of food product using sensory evaluation methods such as analytical and effective methods

· To cover the use of relevant statistics in analyzing sensory evaluation data

Theory

Sensory quality evaluation - introduction, method, sensory panel; physiological and psychological foundations of sensory evaluation; Principles of good practice: the sensory testing environment, test protocol considerations, Factors influencing sensory measurements, Basic principles: Sensesand sensory perception, Physiology of sensory organs, Sensory and instrumental analysis in quality control. Sensory attributes of foods and beverages and their perceptions, appearance, flavor, taste, aroma, texture/mouthfeel, trigeminal sensations, Sensory evaluation methodology, threshold measurements, difference tests, scaling procedures, descriptive analytical methods, consumer tests, Instrumental measurements, color, texture, flavor, Correlation of sensory and instrumental measures, Application sof sensory tests for quality assurance. Product development, product optimization, marketing.Objective methods of evaluation.Relationship between objective and subjective methods.

Practical

Determination of threshold value for basic tastes and odor; Odor recognition, difference (PC, Duo trio, triangle); Selection of judging panel; Training of judges, for recognition of certain common flavor and texture defects using different types of sensory tests; Descriptive analysis methodology; Texture profile methodology; Sensory evaluation of various food products using different scales, score cards and tests; Estimation of color; Designing a sensory laboratory.

Suggested Readings

1. Amerine, M.A., Pangborn, R.M. and Rossles, E.B. 1965. Principles of Sensory Evaluation of Food. Academic Press, London.

2. Early, R. 1995.Guide to Quality Management Systems for Food Industries. Blackie Academic.

3. Lawless, H.T. and Klein, B.P. 1991.Sensory Science Theory and Applications in Foods.

4. Lawless, Harry, T. and Heymann, Hildegarde. 2010. Sensory Evaluation of Food: Principles and Practices. 2nd edn, Springer, New York or Dordrecht Heidelberg, London.

5. Marcel Dekker. y Macrae, R., Rolonson Roles and Sadlu, M.J. 1994. Encyclopedia of Food Science and Technology and Nutrition.Vol. XI.Academic Press.

6. Maslowitz, H. 2000. Applied Sensory Analysis of Foods.Vols.I, II.CRC Press, Boca Raton, FL, USA.

7. Rai, S.C. and Bhatia, V.K. 1988.Sensory Evaluation of Agricultural Products. Indian Agricultural Statistics Research Institute (ICAR), New Delhi.

FSM6 411 Institutional Food Service Management 3 (0+3)

Objectives

· To cover designing the kitchen and work space, selection of equipment and maintenance, personal and finance manage

ment, foodmanagement, hygiene and sanitation, menup lanning and food composition and nutritional values.

· To help those who are interested in establishing a food service industry in making available hygienically prepared, wholesome and nutritious food to the consumers.

Practical

Introduction to quantity food production, familiarization to equipment for quantity food production, Weight, measures and conversion, Recipe conversion standardization of recipes – procedure. Practical exercise on standardization of recipe, multiplication of standard recipe, portioning and cost calculation.Standardization of recipes suitable for different catering services i.e., cafeterias /canteens, snack bars, industrial canteens, residential hostels. Costing of recipes planned and fixing the price. Exercise on quantity food production for different type of food service establishments. Visit to residential hostel, hospital canteen, industrial canteen, star hotel and fast- foodcentre to observe the organization, management and administration. Making a detailed project report for establishing a food service unit including making purchase documents for equipment purchase and tenders etc. Organizing and planning menu for college canteen as a catering enterprise, setting up of a canteen, management of college canteen-procurement of materials. Practical exercise on food preparation, pricing and sale.Preparation and presentation of report on management of canteen.Catering for Birthday party/Mocktail Party/ Convention/ Seminar / Conference.

Suggested Readings

1. Fuller J. 1966. Chefs Manual and a Kitchen Management. B.T. Batsford Ltd.

2. Raske L. 2017. Foodservice Management Fundamentals by Lina, Scitus Academics

3. Ratti M. 2000. Food Service Management. Neha Publishers and Distributors.

4. Sethi M and Malhan S. 1997. Catering Management – An Integral Approach. New Age International.

5. Treat N and Richards. 1997. Quantity Cookery. Little Brown and Co.

6. West B.B., Wood L., Harger V.F. and Shugart G.S. 1977. Food Service in Institutions. John Wiley and Sons.

SEM6 411 Seminar 1 (0+1)

A power point presentation on any topic chosen from the subjects studied will be prepared and presented in the department.

IV Year II Semester

Students should register for 20 Credit Hours (either option A or option B) with compulsory RAWE (0+2) credit as a mandatory course

IV Year II Semester

Students should register for 20 Credit Hours (either option A or option B)

Sl.No.	Course Code	Course Title	Credit Hours	Duration	Total Credits
Student READY					
1.	SRN6 421*	Practical extension work in villages	0+2	2 weeks	
2.		Option A			
	SRN6 422**	In-Plant Training in Food Industry/ Research Institution/ organization	0+9	9 Weeks	
	SRN6 423***	Student Project	0+8	8 Weeks	20
3.	SRN6 424#	Option B Internship in Hospital/ Food & Nutraceutical Industry/Food quality & analysis /testing labs	0+17	17 Weeks	
4.	SRN6 425*	Finishing School Programme	0+1	1 Week	

*Compulsory course for both the option

** Inplant training / attachment with Industry/ Research Institute (May be conducted in split manner in more than one industry/ institution/ organization).

***The student project will be R and D based/ field study based/ entrepreneurship based (incubation/ experiential learning)

#The internship can be taken in service Industry (Example: Hospital/ Hotel) OR in Production Industry (Example: Food/ Nutraceuticals Industry) OR in Food Quality and Analysis Laboratories.

SRN6 421 Practical extension work in villages 2 (0+2)

As a part of this programme, students will camp at one of the Extension Unit (RSK) in a village and work.

The details of Scheduled Activities:

1. Orientation, Data Collection & Analysis, Identification of Problems, Leader, identification

2. Programme Planning and Execution to solve the problems related to Food Nutrition and Dietetics

3. Practice of Participatory Rural Appraisal techniques in field situations

4. Awareness programmes on Balance Diet, Health, Nutrition, Personal hygiene, Food safety, Complimentary and Supplementary foods.

5. Model demonstration on Nutrition garden / Kitchen garden.

6. Organizing Group Discussion meetings on topics related to Food Nutrition and Dietetics

7. Skill training activities related to Food Processing and Value Addition

8. Field visits to FPO's and training programmes for SHG's

9. Community works as part of social responsibility

10. Demonstration/Exhibition cum interaction meetings and other suitable extension activities in villages.

Evaluation for Practical Extension Work in Villages

- Inititation, Creativity & Diligence -15 Marks
- General Conduct and Discipline -10 Marks
- Work Experience and Examination 55 Marks (35+20)
- Presentation and Evaluation of Reports -20 Marks

Total -100 Marks

Student should register for 17 Credit hours (Either Option A or Option B) along withSSRN 421 courses

OPTION A

I. SRN6 422 In-plant training in food industry/Research institutions/Organizations 9 (0+9)

A. In-plant in hospitals

Understanding role of dietitian – role, concept, the recipients, duties, work schedule, Licenses, Certifications and Registrations.Preparation of SOAP notes based on case studies and group discussion.Planning component.Preparation of list of parenteral and enteral products. Diabetic diet Counseling-organizing exhibition in for the benefit of public- food exchange list and software used in diabetic diet Counseling. Cardiovascular diseases- planning and presentation of different types of diet for disease conditions. Practicing diet Counseling for CV patients. Preparation of diet chart for different types of liver diseases, collection of case history of patient suffering from hepatitis, cirrhosis of liver and alcoholics. Kidney diseases- preparation of facts list handout and development of Counseling tips- dietary Counseling in a specialty hospital and diet exhibition for kidney disorder. Diet for gastro intestinal disorders- preparation of handouts- ulcer, high fiber, low residue Counseling- diarrhea, constipation, colitis, diverticulosis and ulcer. Preparation of overweight and underweight fact list handout and development

of Counseling guidelines, workshop for patients, Weight loss Counseling– use of role play technique and workshop for patients at obesity clinic and fitness centers. Diet for pre- and post-surgery, burns.Preparation of cancer facts list handout.Home care for critically ill and requiring long term nutrition support.Planning normal and therapeutic diets – diabetes, cardiovascular diseases, liver diseases, kidney diseases, gastrointestinal disorders. Role play exercises for Counseling. Supervised Counseling of patients/ clients.

or

B. In-plant in testing labs

Role of regional testing laboratories - methods of sample collection- handling and storage ofsamples, physical, chemical and microbiological. FSSAI - Role of Food Safety officer, method of inspection, processing of license, conducting awareness camps for stakeholders. Analysis of energy, protein, fat, vitamin, mineral and antioxidants in food groups.Attachment with food testing laboratories.

or

C. In-plant in food processing units

Attachment with – primary processing cereal, pasta making, flaking and puffing, cereal basedconvenience foods manufacturing, primary pulse processing, RTE / RTU foods manufacturing, fruit beverage manufacturing, Canning, pickling, preserve/ candy/ jam manufacturing, banana processing, milk processing, oil manufacturing, bakery and confectionary units.

II. SRN6 423 Student Project 8(0+8)

The student project will be R&D based / Field study based / Entrepreneurship based (Incubation /Experiential security, Reprot writing, and presentation of the results and submission of project reports.

Option - B

SRN6 424 Internship in Hospitals/ Food / Nutraceutical industry / Food quality & Analysis / Testing lab — 17 (0+17)

A: Internship in Hospitals — 17 (0+17)

Duration (Weeks)	Internship in Hospitals Activity/Placement Training Institution
1st and 2nd week	FOOD SERVICE ADMINISTRATION Ø Orientation regarding functioning, systems and activities of the dietetic department. Ø Kitchen functioning, Facility Layout and Management (including kitchen and equipment layout). Ø Issue of daily ration, Store room management, purchasing and Food procurement methods, receiving and accounting practices. Ø Studying the dietetic department organizational and administrative set up (in terms of organizational chart, job description, work schedule, wage structure, allowances and benefits of the different employees *etc*.). Ø Studying the work centres (receiving area, weight checking area, storage area, pre-preparation and production area, service area etc.), their functions and their inter-relationships. Ø Review of the Sanitation, Hygiene and Waste management policy of the centre.
3rd and 4th week	Ø Studying the budgeting and food costing of the dietetic department.

Ø Menu Planning: Studying the diet scale (i.e. the amount of food to be allotted per person/day for normal diet as per hospital policy), the cycle menus planned for general/private wards, therapeutic diets and feeds.

Ø Food Production (Review of General/ Private ward cooking area, therapeutic diet area. special Feed Preparation Area etc.).

Ø Standardization of portion sizes (studying the process) of the items served to patients.

Ø Filling of proforma - master diet charts, expense books, instruction sheets, diet slips, feed slips for therapeutic diets, intending diet in diet sheets etc. Check diet prescriptions and diet sheets for proper indents.

Ø Practicing calculation of mock master chart sand expense books.

Ø Preparation of therapeutic diets and feeds for the critically ill.

Ø Checking Trolley Loading.

Ø Checking Food Service and Distribution (with reference to timings, schedule, and mode of food service and distribution) in both general and private wards.

Ø Exposure to OPD Diet Clinics (Observing the dieticianimparting nutrition/diet counseling).

Ø Exposure to nutrition/diet counseling print material (diet sheets, diet charts, other promotional and general awareness material specific to disease conditions, etc.) available in the department.

5th to 11th weeks	Ø	Master ward round with chief dietician.
	Ø	Ward round with dieticians' initially to interact with patients, study case sheets and collect information on disease condition and treatment/diet prescription and interpreting doctor's dietary prescription.
	Ø	Clinical posting in different general wards (*i.e*., medicine, renal, gastrointestinal, pediatric, endocrinology, surgical and post-operative, cancer ward *etc*.).
	Ø	Diet planning for indoor patients based on doctor's prescription and on the basis of nutrition principles and patient's ability to eat food under the supervision of the dietitian initially and then independently.
	Ø	Prescribing therapeutic diets to discharged indoor patients under the supervision of dieticians. Independent posting in the wards or in the unit to interact with patients, study case sheets, collects information on disease treatment and diet prescription, and interpreting doctor's dietary prescription.
	Ø	Posting in private ward to interact with patients.
	Ø	Prescribing therapeutic diets to OPD patients.
	Ø	Nutrition and diet counseling at OPD clinics (specific to diabetes, overweight, renal diseases, cardiovascular diseases, peptic ulcer/ulcerative colitis, gall stones, protein energy malnutrition, etc.) initially with the dieticians and subsequently independently.

12th to 16th Weeks	Ø	Independent ward rounds (as instructed by the dietitians).
	Ø	Nutrition and diet counseling at OPD clinics (specific to diabetes, overweight, renal diseases, cardiovascular diseases, peptic ulcer/ulcerative colitis, gall stones, protein energy malnutrition, etc.) independently.
	Ø	Case Study work (identification, review of cases in the renal, gastrointestinal, cardiology, endocrinology, cancer, surgery/post-operative ward, on nutritional support i.e. enteral/parenteral feeding, etc.).
	Ø	Selection of five cases (one each from renal, endocrinology, cardiology, surgery/ post-operative, liver disorders, tube feeding, etc.) for detailed review.
	Ø	Review of the cases in terms of patient profile, present problem, physical Examination report, treatment prescribed (both drug and diet), blood parameters related to the disease conditions before and after the treatment, dietary management and dietary counseling provided during the patient's stay in the hospital, and patient prognosis.
	Ø	Preparation of Case Study Reports.Ø Any other assignment given by the dietitians
17th to 19th Week	Ø	Independent ward rounds.Ø Nutrition and diet counseling at OPD clinics (specific to diabetes, overweight, renal diseases, cardiovascular diseases, peptic ulcer/ ulcerative colitis, gall stones, protein energy malnutrition etc.) initially with the dietician and subsequently independently.

	Ø	Prescribing therapeutic diets to OPD patients/discharged warded patients independently.
	Ø	Presentation of Case Studies at the departmental seminar organized by the chief dietician.Presentation of the recent research of interest.
20th week	Ø	Project report preparation, presentation, Examination and evaluation.

OR

B. Internship in testing labs 17 (0+17)

SI. No.	Duration	Activities
1	1st week	Student READY Orientation programme about the in-plant in testing laboratories
	2nd week to 18th week	Attachment with in-plant testing laboratories Acclimatization about regional testing laboratory: quality control and assurance, regulatory compliance, and public health in various sectors. methods of sample collection, Handling and storage of samples Physical, chemical and micro biological changes during storage. FSSAI - Role of Food Safety officer, method of inspection, processing of license Conducting awareness camps for stake holders Skill acquisition on analysis of energy, protein, fat, vitamin, mineral and antioxidants in food groups.

2	19th to 20th week	Project report preparation, presentation, Examination and evaluation.

OR

C. Internship in food processing units 17(0+17)

Duration	Activities
1st week 2nd to 18th week	Orientation to in-plant training – Attachment to Food Processing Units-Attachment to Primary processing units-cereal, pasta making, flaking and puffing, cereal based convenience foods manufacturing/ Primary Pulse processing/ RTE/RTU foods manufacturing/Fruit beverage manufacturing/ Canning, pickling, preserve, candy, jam manufacturing/ banana processing/milk processing, oil manufacturing, bakery and confectionary units. Production line observation Observing the different stages of food processing, from raw material intake to packaging, to understand how nutritional values are impacted by each step. Ingredient analysis: Learning to analyze the nutritional content of raw ingredients and finished products using laboratory techniques. Product formulation: Participating in the development of new food products, considering nutritional goals and dietary restrictions while formulating recipes. Quality control: Understanding the quality control

measures in place to ensure consistent nutritional value and food safety through out production.
Labeling and nutrition information: Gaining expertise in creating accurate nutritional labels that comply with regulatory standards.ü
Research and development (R&D): Assisting the R&D team in developing new food products with specific nutritional benefits.

19th – 20th week — Project report preparation, presentation, examination and evaluation

Note : Students can have a rotation of the internship in hospital / food industry / quality

and testing labs for fixed duration to meet 17 credit hours.

SRN6 425 Finishing School Programme 1(0+1)

Introduction of soft skills, Communication and leadership skills, Preparation for interviews, Personal presentation skills and group discussion, Time and stress management, Planing decision making and prioritization, Basics of professional writing skills, Reports and research articles writing skills, Enterpreneurship development – Concepts of entrepreneur and enterpreseurship, Enterpreeureship development – Importance of planning, budgeting monitoring, evaluation and follow up in runiing and enterprise etc.

Evaluation : FSP Exam (MCQ for 100 marks).

ONLINE COURSES

In addition, students will have to opt for minimum 10 credits onlione courses(as per UGC guidelines for online courses) as a partialre quirement for the B.Sc(Hons.) Food Nutrition & Dietetics

Suggestive list of on-line courses SWAYAM Portal

1. Foodchemistry
2. Foodfortification
3. Foodmicrobiology
4. FoodmicrobiologyandFoodsafety
5. FoodpreservationTechnology
6. Food andNutrition
7. FoodLawsandstandards
8. Functionalfoodsand Nutraceuticals
9. Fundamentalsoffoodprocessengineering
10. Thermal processing ofFoods
11. Dairyand Food process andproduct technology
12. Adolescentnutrition
13. Basicsofnutrition
14. MotherhealthandNutrition

PGPathshala

1. Food Safety and Quality Control
2. Food Preservation
3. Principles of Food Processing
4. Innovation in Food Packaging
5. Food Biotechnology
6. Food Science
7. Macronutrients

8. Micronutrients

9. Human Physiology

10. Nutritional Biochemistry

11. Functional Foods and Nutraceuticals

12. Nutrition through Lifespan

13. Nutrition Wellness and Fitness

14. Therapeutic Nutrition

15. Research Method in Nutrition

Courses on Nutrition (Available on mooc.org (edx))

1. Nutrition and Cancer - WageningenX

2. Nutrition, Heart Disease and Diabetes - WageningenX

3. Plant Based Diet: Food of a Sustainable Future - WageningenX

4. Nutrition and Health: Human Microbiome - WageningenX

5. Nutrition and Health - Food Safety - WageningenX

6. Nutrition and Health: Micronutrient and Malnutrition - WageningenX

7. Nutrition and Health: Macronutrient and Over Nutrition - WageningenX

8. Nutrition, Exercise and Sports - WageningenX

9. Feeding a Hungry Planet: Agriculture, Nutrition and Sustainability - SDG AcademyX

10. Introduction to Food and Health - Stanford Online

11. Mental Health and Nutrition - UCX

12. Sustainable Food Security: Food Access - WageningenX

13. Staying Fit - Stanford Online

14. Lifestyle Management Treatment of Chronic Disease - Part 1 - DoaneX

15. Lifestyle Management Treatment of Chronic Disease - Part 2 - DoaneX

16. The Health Effect of Climate Change - HarvardX

17. Global Public Health - SDG AcademyX

18. Sustainable Food System: A Mediterranean Perspective - SDG AcademyX

19. Early Childhood Development: Global Strategies for Implementation - HarvardX

20. Beer - The Science of Brewing - KU LeuvenX

21. Fitness Corporative

22. Sustainable Global Food Systems

CoursesonNutrition(AvailableonIGNOUportal)

1. Diploma in Nutrition and Health Education

2. Certificate in Nutrition and Child Care

3. Certificate in Foods and Nutrition

Suggested Institutions / areas for Internship in Nutrition

1. Sports Authority of India (SAI)

2. Agricultural and Processed Food Products Export Development Authority (APEDA)

3. Food Safety and Standards Authority of India (FSSAI)

4. Centre for Health Research and Development, Society for Applied Studies

5. Defense Institute of Physiology and Allied Sciences (DIPAS)

6. Public Health Foundation of India (PHFI)

7. WHO Internship Program (WHO)

8. Hospitals – AIIMS, Apollo, Max, Fortis, Medanta, etc.

9. Food Industries – Britannia, Perfetti, PepsiCo India, Coca-Cola, Haldiram's, Bikaner

10. World Bank – Young Professional Program (WBG)