Programme Structure, Syllabi, Outline of Tests, and Course of Reading

under the Faculty of Sciences – Amity School of Health Sciences

Semester-Wise Programme structure for B.Sc. Nutrition and Dietetics [3 year]						
Sr. No.	**Year 1**		**Year 2**		**Year 3**	
	Semester 1	**Semester 2**	**Semester 3**	**Semester 4**	**Semester 5**	**Semester 6**
1	Fundamentals of Food and Nutrition (FST101) [**CU:6**; L-4, P-2] {CC}	Food Science – I FST104) [**CU:6**; L-4, P-2] {CC}	Food Science-II [CU:6; L-4, P-2] {CC}	Therapeutic Nutrition - I [CU:6; L-4, P-2] {CC}	Nutritional Biochemistry –I [CU:6; L-4, P-2] {CC}	Nutritional Biochemistry– II [CU:4; L-4, P-2] {CC}
2	Fundamentals of Human Development (NUD102) [**CU:6,** L-4, P-2] {CC}	Lifespan Nutrition (FST105) [**CU:6**; L-4, P-2] {CC}	Dietetics [CU:6; L-4, P-2] {CC}	Human Physiology - I [CU:6; L-5, P-1] {CC}	Human Physiology– II [CU:6; L-4, P-2] {CC}	Therapeutic Nutrition – II [CU:6; L-4, P-2] {CC}
3	Fundamental of Food Chemistry (NUD103) [**CU:4,** L-3, P-1] {AC}	Chemistry-I (FST108) [**CU:4,** L-3, P-1] {AC}	Food Microbiology -I [CU:6; L-4, P-2] {CC}	Food Microbiology-II [CU:6; L-4, P-2] {CC}	***SEC-Any Two from (a-c); a) Public Health Nutrition-I [CU:4, L-3, P-1] {SE}**	**Public Health Nutrition-II [CU:4, L-4] {SE}**
4	Behavioural Skills (PSY101) [**CU:1,** L-1, P-0] {VAC}	Behavioural Skills (PSY101) [CU:1, L-1, P-0] {VAC}	Chemistry – II [CU:4, L-3, P-1] {AC}	Chemistry-III [CU:4, L-3, P-1] {AC}	**b) Food Sanitation and Hygiene [CU:4, L-4] {SE}**	**Advancements in Clinical and Therapeutic Nutrition [CU:4, L-4] {SE}**
5	Communication Skills (ENG101) [**CU:1,** L-1] {VAC}	Communication Skills [CU:1, L-1] {VAC}			c) Quality Control-I [CU:4, L-4] {SE}	Quality Control – II [CU:4, L-4] {SE}

6	Introduction to French Culture & Language (FOL101)/ Introduction to German Culture & Language (FOL102) [**CU:1,** L-1] {VAC}	German Grammar/ French Grammar (FOL XXX) [CU:1, L-1] {VAC}			d) Nutritional Assessment and Surveillance [CU:4, L-4] {SE}	Food Sanitation and Hygiene [CU:4, L-4] {SE}
7	Environmental Science (ENV101) [**CU:2**, L-2] {AEC}	Environmental Science [CU:2, L-2] {AEC}				
8	Punjabi (INL101)/ History and Culture of Punjab for BSc (INL103) [**CU:1**, L-1] {AEC}	Punjabi Language/Punjab History & Culture [CU:1, L-1] {AEC}			Programming in Python Lab//MOOCs [CU:2, P-2] {SEC}	Research Methodology /MOOCs [CU:2, L-2] {SEC}
9	Mathematics for Biosciences//MOOCs **(XXX)** [CU:2, L-2] {SEC}	Statistics for Biosciences/ /MOOCs [CU:2, L-2] {SEC}	Programming with C//MOOCs [CU:2, L-1, P-1] {SEC}	Nutritional Assessment Methods and Techniques// MOOCs [CU:2, L-1, P-1] {SEC}	Bioentrepreneurship//MOOCs [CU:2, L-2] {SEC}	Biosensors/MOOCs [CU:2, L-2] {SEC}
Credits	24	**24**	**24**	**24**	**24**	**24**
Total Programme Credits						**144**

Semester 1

B.Sc. (Hons.) Nutrition and Dietetics (3 year)

Semester-wise Distribution of Courses			Semester 1						
S. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**					**Credit Units**
				L	**T**	**P**	**FW**	**SW**	
1	NUD101	Fundamentals of Food and Nutrition	Core Course	4	0	2	0	0	6
2	NUD102	Fundamentals of Human Development	Core Course	4	0	2	0	0	6
3	NUD103	Fundamental of Food Chemistry	Allied course	3	0	1	0	0	4
4	PSY101	Behavioural Skills	Value Addition Course	1	0	0	0	0	1
5	ENG101	Communication Skills	Value Addition Course	1	0		0	0	1
6	FOL101/FOL102	Foreign Business Language	Value addition Course	1	0	0	0	0	1
7	INL101/INL102	Punjabi Language and Literature-1/Punjab History & Culture	Ability Enhancement Courses	1	0	0	0	0	1
8	ENV101	Environmental Science	Ability Enhancement Courses	2	0	0	0	0	2
9		Mathematics for Biosciences/MOOCs	Skill Enhancement Course	2	0	0	0	0	2
			Total Credits						**24**

Fundamentals of Food and Nutrition

L	T	P	SW/FW	Total Credit Units
4	0	2	0	6

	Teaching hours
Unit I: Definition & Terms	**18 h**
Definitions and Terms – Food, Nutrition, Nutrients (Macronutrients & Micronutrients), Balance Diet, Health, Malnutrition Food Groups, Food Pyramid, Classification of foods, Functions of Foods, Relationship between Health Recommended Dietary Allowances, Estimated Average requirements (EAR), Adequate Intakes (AI), Tolerable Upper Intake levels (TUL) Energy requirements - Components of energy expenditure (Basal Metabolic Rate, Physical Activity, Thermic Effect of Food, Measurement of energy in foods) Measurement of human energy expenditure, Body Composition and Body Weight (Lean body mass, Body fat, Body water, Body mineral mass)	
Unit II: Principles and Methods of Cooking	**18 h**
Preliminary treatment of foods Moist heat methods: Boiling, Simmering, Poaching, Stewing, Steaming, Pressure cooking, Dry heat methods: Air as medium of cooking: Grilling, Pan broiling or roasting, Baking Fat as medium of cooking: Sauteing, Shallow fat frying, Deep fat frying, Other cooking methods: Microwave cooking, Solar cooking. Advantages and Disadvantages of Cooking, Water : Functions of water in the body, Water Balance - Body's major water sources (water in) and routes of water loss (water out)	
Unit III: Macronutrients: Carbohydrates, Proteins and Fats	**18 h**
Classification, Functions and Food sources	
Unit IV: Macronutrients: Vitamins and Minerals	**18 h**
Fat Soluble Vitamins (A,D,E,K) - Functions, Food Sources, Deficiency Diseases and Toxicity, Water Soluble Vitamins (B- Complex and C) - Functions, Food Sources, Deficiency Diseases and Toxicity, Minerals (Major - Calcium, Magnesium, Phosphorus, Potassium/Trace – Iron, Zinc, Chromium, Selenium and Flouride) - Functions, Food Sources, Deficiency Diseases and Toxicity	

Lab/ Practical details: (72 Hours)

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

1) Market survey of locally available food items like cereals, pulses, fruits and vegetables, milk and milk products, fats and oils, nuts and oilseeds, sugar and jaggery, meat, fish, and poultry and miscellaneous food items like biscuits, jams, jellies, ketchup etc. and their cost.
2) Classify foods on the basis of nutrients: Protein, Iron, Calcium, Vitamin A, Vitamin C, etc.
3) Controlling techniques: Weights and measures - standard and household measures for raw and cooked foods.
4) Weights and Measures, Determination of Edible Portion of Foods, preparing market order and table setting.

5) Food Preparation using different methods of cooking
a. Moist heat method
b. Dry heat method
c. Other cooking methods

Course Learning Outcomes:

- Understand both fundamental and applied aspects of Food Science and nutrition.
- Evaluate the functions of specific nutrients in maintaining health.
- Identifying nutrient specific force and apply the principles from the various factors of foods and related disciplines to solve practical as well as real world problems.
- Use of latest digital technologies to apply evidence-based guidelines and protocols for critical thinking in the field of health, diet special nutritional needs and nutritional counseling.

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Longvah, T, Ananthan, R., Bhaskarachary, K., Venkaiah, K	Indian Food Composition Tables (IFCT)	Indian Council of Medical Research, National Institute of Nutrition, Hyderabad	2017	9352676777, 978-9352676774	580
Sunetra Roday	Food Science and Nutrition	Oxford University Press	2018	9780199489084, 978-0199489084	482
Raina U, Kashyap S, Narula V, Thomas S Suvira, VirS, Chopra S	Basic Food Preparation: A Complete Manual, 4th Edition,	Orient Black Swan Ltd, Mumbai	2010	8125023003, 9788125023005	357
Srilakshmi, B.	Nutrition Science	New Age International (P) Ltd., New Delhi	2017	9386418886, 9789386418883	572
Maney S	Foods, Facts and Principles, 3rd Edition	Wiley Eastern, New Delhi	2008	8122422152, 9788122422153	520

Fundamentals of Human Development

L	T	P	SW/FW	Total Credits
4	0	2	0	6

Lab/ Practical details:

Course Contents/syllabus:

COURSE CODE: NUD102 (Fundamentals of Human Development)	Teaching hours (h)
Unit I: Introduction to Human Body	**18 h**
Introduction to Human Body, Basic concepts of Organs, tissue and cell, Cell structure, cellular organelle and their functions, Blood- Composition, blood groups and Functions, Structure and Functions of lymph System	
Unit II: Cardiovascular System and Respiratory Systems	**18 h**
Cardiovascular System: Structure and functions of heart, Properties of Cardiac Muscle and Functional Tissues, Cardiac Cycle, Heart Rate, Cardiac Output, Blood Pressure (Systolic & Diastolic Blood pressure), ECG. **Respiratory System:** Physiological Anatomy of Respiratory Tract, Mechanism of Respiration, Transport of Respiratory Gases in Blood, Gaseous Exchange in Lungs and tissues	
Unit III: Digestive System and Excretory Systems	**18 h**
Digestive System - Principal organs of the digestive system: Mouth, tongue, Teeth, Esophagus, Stomach, Small Intestine, Large Intestine, Rectum, Anus- structure & function. Principal accessory organs- salivary glands, liver, gall bladder, pancreas- structure & function, Role of gut hormones & enzymes in Digestion and mechanisms involved in absorption of food. **Excretory System:** Structure of Excretory System- Kidney, Nephron, Urinary Bladder; Urine Formation, Composition of Urine, micturition, Glomerular Filtration Rate (GFR)	
Unit IV: Endocrine, Nervous and Reproductive System	**18 h**
Endocrine Systems: Introduction to Endocrinology, Functions and Hormones secreted by Pituitary Gland, Thyroid Gland and Parathyroid Gland and Adrenal Gland, Sex glands, Functions of Pancreas. **Nervous System:** Structure and functions of Neuron, Brain and Central nervous system (Autonomic Nervous System, Parasympathetic Nervous System, **Reproductive System:** Structure, hormones secreted and functions of Male and Female Reproductive Organs, **Physiology of Menstruation** - estrogen verses progesterone, Pregnancy and associated changes, physiology of lactation.	

(72 Hours)

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

1. Microscope and its uses
2. Histology of epithelial, connective, muscular and nervous tissues.
3. Find out RBC and WBC count
4. Determination of pulse rate in resting condition and after exercise (30 beats/10 beats method)

Determination of blood pressure by Sphygmomanometer (Auscultator method).

5. Measurement of Peak Expiratory flow rate.
6. Determination of Bleeding Time (BT) and Coagulation Time (CT).
7. Detection of Blood group (Slide method).
8. Measurement of Hemoglobin level (Sahli`s or Drabkin method).

Course Learning Outcomes:

- Obtain an insight into the structure and functions of cells, tissues and organs in human body.
- Understand the anatomy and physiology of the various systems in the human body.
- Comprehend the functions of systems of the human body.
- Gain knowledge on Endocrine, Nervous and Reproductive System.

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Chatterjee C.C	Human Physiology Volume I	CBS	2020	9388902718, 9789388902717	616
Chatterjee C.C	Human Physiology Volume II	CBS	2020	9388902726, 9789388902724	580
Sembulingam, K.	Essentials of Medical Physiology	Jaypee Brothers Medical Publishers (P) Ltd., New Delhi	2019	9352706927, 9789352706921	1186
Chaudhri, K.	Concise Medical Physiology	New Central Book Agency (Parentral) Ltd., Calcutta.	2016	8173818673, 9788173818677	682
Kathleen J. W. Wilson, Anne Waugh, Allison Grant. Ross and Wilson Anatomy	Ross & Wilson Anatomy And Physiology In Health And Illness 13th Edition,	Elsevier Publication, New Delhi	2018	9780702072772	560

Fundamental of Food Chemistry

L	T	P	SW/FW	Total Credit Units
3	0	1	0	4

Course content and syllabus

Fundamental of Food Chemistry	Teaching Hrs
Unit I: Water, water activity and shelf-life of food	**14 h**
Water: Definition of water in food, Structure of water and ice, Types of water, Sorption phenomenon, Water activity and packaging, Water activity and shelf-life	
Unit II: Classification and structure of carbohydrates and Proteins	**13 h**
Carbohydrates: Classification, Structure of important polysaccharides, Chemical reactions of carbohydrates –oxidation, reduction, with acid & alkali modified celluloses and starches **Proteins:** Protein classification and structure, Nature of food proteins (plant and animal proteins), Properties of proteins (electrophoresis, sedimentation, amphoterism and denaturation), Functional properties of proteins.	
Unit III: Classification and Technology of edible fats and oils	**14 h**
Lipids: Classification and physical properties of lipids. **Chemical properties of lipids** **Effect of frying on fats** **Changes in fats and oils**: rancidity, lipolysis, flavor reversion, Auto-oxidation and its prevention, **Technology of edible fats and oils**: Refining, Hydrogenation and Interesterification, Fat mimetics	
Unit IV: Introduction to vitamins and flavors	**13 h**
Vitamins: Structure, Importance and Stability, Water soluble vitamins, Fat soluble vitamins, Flavor **Flavors:** Definition and basic tastes, chemical structure and taste, description of food flavors and flavor enhancers	
Words (2021-2025): 189; Words (2022-2026): 179	

Lab/ Practical details: (36 Hours total)

Objective*:* The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

1) Preparation of primary and secondary solutions
2) Estimation of moisture content
3) Estimation of reducing and non-reducing sugars using potassium ferricyanide method and DNS method.
4) Estimation of protein content in the flours of cereals and pulses by spectrophotometric methods.
5) Determination of refractive index and specific gravity of fats and oils.
6) Determination of smoke point and percent fat absorption for different fat and oils.
7) Determination of percent free fatty acids

8) Estimation of saponification value

Course Learning Outcomes:

- Understand the basic chemical structure of the major components of foods (water, proteins, carbohydrates, and lipids).
- Determine major food components like starch protein and fats
- Compare the effect of processing on the composition of raw and processed food.
- Perceive basic knowledge about the chemical structure of various flavor components

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
DeMan, John M.	Principles of Food Chemistry	New York: Springer	2020	9783319636054, 3319636057	625
Damodaran, Srinivasan, and Kirk L. Parkin.	Fennema's Food Chemistry	Boca Raton CRC Press	2017	9781482243611, 148224361X, 9781482208122, 1482208121,	1107
Potter, Norman N.	Food Science	Springer,	2013	1461372631, 9781461372639	623
Sehgal, Shalini,	A Laboratory Manual of Food Analysis,	New Delhi: IK International Publishing House,	2016	9789384588847, 9384588849	162
Whitehurst, Robert J, and Maarten Oort.	Enzymes in Food Technology,	Chichester: John Wiley and Sons	2010	9781405183666, 1405183667	368
Wong, Dominic W. S.	Food Enzymes: Structure and Mechanism	New York: Springer,	2011	9781441947222, 1441947221	406

COURSE CODE: PSY101 (Understanding Self for Effectiveness)

L	T	P	Total Credits
1	0	0	1

Course Learning Outcomes: At the end of this course, the students will be able to:

- The student will apply self-introspection as a tool for self-awareness.
- The student will understand self-concept for self-recognition, self-improvement and perception of others.
- The student will be able to analyze their physical self, social self, the competent self and psychological self.

The student will be able to analyze what motivates his/her actions and the actions of others

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN
Singh A.	Achieving Behavioural Excellence for Success	Wiley Publication	2012	978812658027
Towers, Marc	Self Esteem	American Media	1995	9781884926297
Pedler Mike, Burgoyne John, Boydell Tom	A Manager's Guide to Self-Development	McGraw-Hill	2006	978-0077114701
Covey, R. Stephen	Seven habits of Highly Effective People	Simon & Schuster Ltd	2013	978-1451639612
Khera Shiv	You Can Win	Macmillan	2005	978-0333937402
Gegax Tom	Winning in the Game of Life	Harmony Books	1999	978-0609603925
Singh, Dalip	Emotional Intelligence at Work	Publications	2006	9780761935322
Goleman, Daniel	Emotional Intelligence	Bantam Books	2007	9780553095036
Goleman, Daniel	king with E.I	Bantam Books	1998	9780553104622

Communication Skills-I

L	T	P	Total Credits
1	0	0	1

Course Contents/syllabus:

COURSE CODE: ENG101 (Communication Skills-I)	Teaching hours
Unit I: Basic Concepts in Communication	3.5 h
Definition of communication, Nature and process of communication, role and purpose of communication, types and channels of communication, communication networks/flow of communication: vertical, diagonal, horizontal, barriers to communication: physical, language, and semantic, socio-psychological, organizational, gateway to effective communication, towards communicative competence, choosing the appropriate channel and medium of communication, social communication: small talk and building rapport, barriers in communication.	
Unit II: Communication Types	5.5 h
Verbal communication: Oral Communication: Forms, Advantages & Disadvantages, Written Communication: Forms, Advantages & Disadvantages, Introduction of Communication Skills (Listening, Speaking, Reading, Writing), Nonverbal communication: functions and effective use, KOPPACT(Kinesics, Oculesics, Proxemics, Para-language, Artifacts, Chronemics, Tactilics). The implication of appropriate communication; effective ways of using social media, importance of digital literacy.	
Unit III: Reading and Writing Skills	3 h
Significance of reading; Reading Comprehension, gathering ideas from a given text, identify the main purpose and context of the text, evaluating the ideas, interpretation of the text, Paragraph development; essay writing.	
Unit IV: Speaking and Presentation Skills	6 h
Speaking skills: fluency, vocabulary, grammar, and pronunciation; effective speaking: selection of words, your voice, and non-verbal communication, functions of speaking: interaction, transaction, and performance; structuring the message; effective speaking strategies. Planning, preparation, practice, and performance; audience analysis, audio-visual aids, analyzing the non-verbal communication, methods of delivery: impromptu, extemporaneous, memorization, manuscript, and outlining.	

Course Learning Outcomes:

- Students will be able to understand the basic processes of communication, both verbal as well as non-verbal—nature, scope, and power of communication processes.
- Students will be able to demonstrate cultural sensitivity in communication and appreciation of cultural variations of diverse socio-cultural contexts.
- Students will be able to develop an awareness of the role of mass media in shaping public psyche, beliefs, and perceptions about social realities and build an informed and critical perspective.
- Students will be able to analyze situations and audiences to make right choices about the most effective and efficient ways to communicate and deliver messages.
- Students will be able to assess various barriers in communication and develop communicative competence thereby for effective communication.

Books/literature

Author	Title	Publisher	Year of publication	ISBN

P. D. Chaturvedi and Mukesh Chaturvedi	Business Communication: Concepts, Cases and Applications	Pearson Education	2006	9788131701720
Meenakshi Raman and Prakash Singh	Business Communication	Oxford University Press	2012	9780198077053
Jeff Butterfield	Soft Skills for Everyone	Cengage Learning	2017	9789353501051

Introduction to French Culture & Language

L	T	P	Total Credits
1	0	0	1

Course Contents/syllabus:

COURSE CODE: FOL101 (Introduction to French Culture & Language)	**Teaching hours**
Unit-I Introduction to French language	**3 h**
Brief introduction of French and Francophone countries, Presenting oneself, Getting information about someone else, Greeting and taking leave, Asking/giving personal information	
Unit-II- A rendez-vous ; Visiting a place	**6 h**
Pronouncing and writing numbers in French , Spell and count numbers, Telling the time, Temporal expressions, Communicating in class, Fixing an hour, place for a meeting. Describing a person. Identifying a person, object and place, Describing relation in a family, A specific person, object and place	
Unit-III- An interview	**4.5 h**
Description of objects, people and places, Nationalities, Speaking about one's professions, Expressing Actions using regular –er ending verbs; avoir, être; reflexive verbs – usage, conjuagation, Interview of celebrity	
Unit-IV- At the discotheque	**4.5 h**
Portrait by a journalist, Giving a positive or negative reply, Asking questions, Discussion with a person, Activities in a day	

Course Learning Outcomes: At the end of this course, the students will be able to express themselves in writing and orally in basic French. This course content focuses on the speech of the students in a lucid and a concurrent manner using appropriate vocabulary and pronunciation techniques. Extra stress will be given on their understanding of grammatical structures and the foreign accent of the language. At the end of the course, the student shall be able to :

- Understand information; Express in his own words; Paraphrase; Interpret and translate.
- Apply information in a new way in a practical context
- Analyse and break-down information to create new ideas
- Evaluate and express opinion in a given context

Text / Reference Books:

Author	**Title**	**Publisher**	**Year**	**ISBN No**
Christine Andant, Chaterine Metton, Annabelle Nachon, Fabienne Nugue	A Propos - A1 Livre De L'Eleve, Cahier D' Exercices	Langers International Private Limited	2010	978-9380809069
Manjiri Khandekar and Roopa Luktuke	Jumelage - 1 Methode De Fraincais - French	Langers International Private Limited	2020	978-9380809854
Michael Magne, Marie-Laure Lions-Olivieri	Version Originale 1: Cahier d'exercices	Maison Des Langues	2010	9788484435617

Introduction to German Culture & Language

L	T	P	Total Credits
1	0	0	1

Course Contents/syllabus:

COURSE CODE: FOL102 (Introduction to German Culture & Language)	**Teaching hours**
Unit-I Introduction to German Language (Einführung)	**3 h**
Introduction to German as a global language, Self-introduction and Greetings, Die Alphabeten, Phonetics: the sound of consonants and vowels, Wie buchstabieren Sie Ihren Name?	
Unit-II- Numbers and everyday conversation (die Zahl und Gespräche)	**6 h**
Counting in German from 1-100, Simple Calculation and verb 'kosten' - Wie viel kostet das? Plural Forms, Vocabulary: Wochentage, Monate, Jahreszeiten, Ordinal numbers and the question - Wann haben Sie Geburtstag?	
Unit-III- Regular verbs and nominative case: articles and pronouns (Regelmässige Verben und Nominativ Kasus: Artikel und Pronomen)	**4.5 h**
Introduction to all personal pronouns and conjugation of Regular verbs Detailed exercise on regular verbs. Reading a text on regular verbs. Introduction to definite. Vocabulary: Schulsachen und Getränke, Nominative case/ Articles (der, die, das) Nominative Pronouns: - Applicability of pronouns for both persons and things. Usage of nominative Personal Pronouns Introduction of nominative possessive pronouns usage of nominative possessive pronouns	
Unit-IV- The Family, Work-life and Professions (Familienmitglieder und Berufe) & Interrogative sentences (W-Fragen)	**4.5 h**
The Family, Work-life and Professions (Familienmitglieder und Berufe) Vocabulary: Professions and conjugation of the verb 'sein' Introduction to simple possessive pronouns with the help of the verb ‘haben’ Usage of possessive pronouns. Interrogative sentences (W-Fragen) W-Fragen: who, what, where, when, which, how, how many, how much, etc. Exercises on the question pronouns	

Course Learning Outcomes: At the end of this course, the students will be able to express themselves in writing and orally in basic German. This course content focuses on the speech of the students in a lucid and a concurrent manner using appropriate vocabulary and pronunciation techniques. Extra stress will be given on their understanding of grammatical structures and the foreign accent of the language. At the end of the course, the student shall be able to:

- Understand information; Express in his own words; Paraphrase; Interpret and translate.
- Apply information in a new way in a practical context
- Analyse and break-down information to create new ideas
- Evaluate and express opinion in a given context

Text / Reference Books:

Author	**Title**	**Publisher**	**Year**	**ISBN**
Rolf Bruseke	Starten Wir A 1	Langers International Pvt Ltd (Max Hueber Verlag)	2017	978-3190160006

Giorgio Motta	Wir Plus Grundkurs Deutsch fur Junge Lerner Book	Ernst Klelt Verlog	2011	978-8183072120
Heimy Taylor, Werner Haas	Station en Deutsch Self Study Course German Guide	Wiley	2007	978-0470165515

Environmental Studies-I

L	T	P	Total Credits
2	0	0	2

Course Contents/syllabus:

COURSE CODE: FOL101 (Environmental Studies-I)	Teaching hours
Unit-1- Multidisciplinary nature of environmental studies	**9 h**
Multidisciplinary nature of environmental studies: Definition, scope and importance; components of environment –atmosphere, hydrosphere, lithosphere and biosphere. Concept of sustainability and sustainable development.	
Unit-2-Ecosystems	**9 h**
Ecosystem: What is an ecosystem; Structure and function of an ecosystem; Energy flow in the ecosystem; Food chains, food webs and ecological succession. Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).	
Unit-3- Natural Resources	**9 h**
Natural resources: Land resources and land use change, land degradation, soil erosion and desertification. Deforestation: causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal population. Water Resources-Use and over-exploitation of surface and groundwater, floods, drought, conflicts over water (international and inter-state). Heating of earth and circulation of air; air mass formation and precipitation. Energy resources-renewable and non-renewable energy sources, use of alternate energy sources, Growing energy needs, Case studies.	
Unit-4- Biodiversity and its conservation	**9 h**
Biodiversity: Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; biodiversity patterns and global biodiversity hot spots. India as a mega–biodiversity nation; endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; conservation of biodiversity: in-situ and ex-situ conservation of biodiversity. Ecosystem and biodiversity services: ecological, economic, social, ethical, aesthetic and information value.	

Course Learning Outcomes: At the end of this course, the students will be able to develop:

- Appreciate the multi-disciplinary nature of environmental science
- Understand natural resources and evaluate limitations surrounding renewable and non-renewable resources
- Understand the nuances of ecosystem and learn about behaviour of various ecosystem
- Learn about the types, services and threats to our biodiversity and importance of conserving it.

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN
William P. Cunningham, Mary Ann Cunningham	Principles of Environmental Science	McGraw-Hill	2019	9781260219715
Dash and Dash	Fundamentals of ecology	Tata McGraw-Hill Education	2009	978-0070083660
William P. Cunningham, Mary Ann Cunningham, Barbara Woodworth Saigo	Environmental Science: A global concern,	McGraw-Hill	2021	9781260363821
Gaston K.J. and Spicer, J. I.	Biodiversity – An Introduction 2nd edition	Blackwell Publishing	2004	978-1-405-11857-6

Punjabi Language and Literature-1

L	T	P	Total Credits
1	0	0	1

Course content and syllabus:

Punjabi Language and Literature-1 Subject Code- INL 10	Teaching Hours
Unit I:	**4 h**
ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਕਵਿਤਾ ਦਾ ਅਧਿਐਨ (ਕਾਵਿ-ਸੁਮੇਲ ਪਾਠ-ਪੁਸਤਕ) ਕਵਿਤਾ ਦਾ ਸਾਰ/ਕੇਂਦਰੀ ਭਾਵ ਅਤੇ ਪ੍ਰਸੰਗ ਸਾਹਿਤ ਵਿਆਖਿਆ ਕਵੀ ਦੇ ਜੀਵਨ ਅਤੇ ਸਾਹਿਤਕ ਯੋਗਦਾਨ ਬਾਰੇ ਮੁੱਢਲੀ ਜਾਣਕਾਰੀ	
Unit II:	**4 h**
1.ਲੇਖ-ਰਚਨਾ ਲੇਖ-ਰਚਨਾ: ਮਹੱਤਵ, ਕਿਸਮਾਂ ਅਤੇ ਵੱਖ-ਵੱਖ ਵਿਸ਼ਿਆਂ ਅਨੁਸਾਰ ਵਿਹਾਰਕ ਅਭਿਆਸ **2.ਸੰਖੇਪ-ਰਚਨਾ** ਸੰਖੇਪ-ਰਚਨਾ: ਮਹੱਤਵ ਅਤੇ ਤਕਨੀਕ	
Unit III:	**5 h**
ਵਿਆਕਰਨ ਸਿਧਾਂਤ ਅਤੇ ਵਿਹਾਰ: 1.ਵਿਆਕਰਨ: ਪਰਿਭਾਸ਼ਾ;ਮਹੱਤਤਾ;ਉਦੇਸ਼;ਵਿਆਕਰਨ ਦੇ ਅੰਗ 2. ਪੰਜਾਬੀ ਧੁਨੀਵਿਓਂਤ: ਸ੍ਵਰ ਅਤੇ ਵਿਅੰਜਨ ਧੁਨੀਆਂ ਦਾ ਵਰਗੀਕਰਨ, ਉਚਾਰਨ ਅੰਗ	
Unit IV:	**5 h**
ਵਿਆਕਰਨ ਸਿਧਾਂਤ ਅਤੇ ਵਿਹਾਰ: ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ: ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਪ੍ਰਕਾਰ ਨਾਂਵ, ਪੜਨਾਂਵ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸਬੰਧਕ,ਯੋਜਕ ਅਤੇ ਪ੍ਰਸ਼ਨ-ਸੂਚਕ ਸ਼ਬਦ	

Course Learning Outcomes:

- Understand modern Punjabi Poetry.
- Interpret the importance of essay and precise writing
- Analyze the Punjabi language structure and grammar.
- Examine the impact and importance of grammar and language structure.

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
ਡਾ. ਕਰਮਜੀਤ ਸਿੰਘ (ਸੰਪਾ.),	ਕਾਵਿ ਸੁਮੇਲ	ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ, ਪੰਜਾਬ ਯੂਨੀਵਰਸਿਟੀ ਚੰਡੀਗੜ੍ਹ	2020	-	-
ਸੁਰਿੰਦਰ ਸਿੰਘ ਖਹਿਰਾ (ਸੰਪਾ.),	**ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਆਕਰਨ ਅਤੇ ਬਣਤਰ**	ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ,ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ ਪਟਿਆਲਾ	**2015**	-	-

ਡਾ.ਹਰਕੀਰਤ ਸਿੰਘ,	**ਕਾਲਜ ਪੰਜਾਬੀ ਵਿਆਕਰਨ ਅਤੇ ਲੇਖ ਰਚਨਾ**	ਪੰਜਾਬ ਸਟੇਟ ਯੂਨੀਵਰਸਿਟੀ ਟੈਕਸਟ ਬੁੱਕ ਬੋਰਡ,ਚੰਡੀਗੜ੍ਹ	**1999**	**-**	**-**
ਡਾ. ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼ ਸਿੰਘ	**ਕਾਲਜ ਪੰਜਾਬੀ ਵਿਆਕਰਨ ਅਤੇ ਲੇਖ ਰਚਨਾ**	ਮਦਾਨ ਪਬਲੀਕੇਸ਼ਨਜ਼, ਪਟਿਆਲਾ	**2002**	**-**	**-**
ਡਾ. ਬੂਟਾ ਸਿੰਘ ਬਰਾੜ	**ਪੰਜਾਬੀ ਵਿਆਕਰਨ ਸਿਧਾਂਤ ਅਤੇ ਵਿਹਾਰ**	ਚੇਤਨਾ ਪ੍ਰਕਾਸ਼ਨ, ਪੰਜਾਬੀ ਭਵਨ,ਲੁਧਿਆਣਾ	**2012**	**-**	**-**
ਡਾ. ਬੂਟਾ ਸਿੰਘ ਬਰਾੜ	**ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਸ੍ਰੋਤ ਅਤੇ ਸਰੂਪ**	, ਵਾਰਿਸ ਸ਼ਾਹ ਫ਼ਾਊਂਡੇਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ	**2012**	**-**	**-**
ਦੁਨੀ ਚੰਦ੍	**ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦਾ ਵਿਆਕਰਣ**	, ਪੰਜਾਬ ਯੂਨੀਵਰਸਿਟੀ ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ, ਚੰਡੀਗੜ੍ਹ	**1995**	**-**	**-**
ਜੋਗਿੰਦਰ ਸਿੰਘ ਪੁਆਰ ਅਤੇ ਹੋਰ	**ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦਾ ਵਿਆਕਰਨ (ਭਾਗ 1,2,3),**	ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਕਾਦਮੀ ਜਲੰਧਰ	**2003**	**-**	**-**
ਸੁਖਵਿੰਦਰ ਸਿੰਘ ਸੰਘਾ	**ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਗਿਆਨ**	ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਕਾਦਮੀ ਜਲੰਧਰ	**2010**	**--**	**-**
ਅਗਨੀਹੋਤਰੀ,ਵੇਦ	ਪਰਿਚਾਇਕ ਭਾਸ਼ਾ ਵਿਗਿਆਨ	ਦੀਪਕ ਪਬਲਿਸ਼ਰਜ਼ ਜਲੰਧਰ	**1981**		

History and Culture of Punjab

L	T	P	Total Credits
1	0	0	1

Course Contents/syllabus

COURSE CODE: FOL102 (History and Culture of Punjab)	Teaching hours
Unit I:	**4.5 h**
Harappan Civilization: extent and town planning and socio-economic life. Life in Vedic Age: socio-economic and religious; Growth and impact of Jainism and Buddhism in Panjab.	
Unit II:	**4.5 h**
Society and Culture under Maurayas and Guptas. Bhakti movement: Main features; prominent saints and their contribution. Origin and development of Sufism	
Unit III:	**4.5 h**
Evolution of Sikhism: teaching of Guru Nanak; Institutional Development- Manji, Masand, Sangat and Pangat Transformation of Sikhism: Martyrdom of Guru Arjan; New policy of Guru Hargobind, martyrdom of Guru Tegh Bahadur. Institution of Khalsa: New baptism; significance	
Unit IV:	**4.5 h**
Changes in Society in 18th century: social unrest; emergence of misls and other institutions - rakhi, gurmata, dal khalsa. Society and Culture under Maharaja Ranjit Singh. MAP (of undivided physical geographical map of Punjab): Major Historical Places: Harappa, Mohenjodaro, Sanghol, Ropar, Lahore, Amritsar, Kiratpur, Anandpur Sahib, Tarn Taran, Machhiwara, Goindwal, Khadur Sahib.	

Course Learning Outcomes:

- Understand the history of various cultures in Punjab.
- Interpret the importance of Maurayan,
- Gupta and Bhakti influences on Punjab
- Apply the teaching of Sikhism on the emergence of the Khalsa.
- Examine the impact societal changes on socio-cultural and physical landscape of Punjab

Text / Reference Books:

Author	Title	Publisher	Ed/year	ISBN No
L.M Joshi,	History and Culture of the Punjab, Part-I	Punjabi University, Patiala	1989,3rd	-
Buddha Prakash	Glimpses of Ancient Punjab	Punjabi University, Patiala,	1983	-
Khushwant Singh	A History of the Sikhs, vol I: 1469-1839,	oxford University Press, Delhi	1991	-

Mathematics for Biosciences

L	T	P	TOTAL CREDIT UNITS
2	0	0	2

Course Contents/syllabus:

Mathematics for Biosciences	Teaching Hours
Unit I: Sets, Relations and Function	**9h**
Sets and their properties, Cartesian product of Sets, relations, functions and their types and graphs	
Unit II: Matrix Algebra	**9h**
Matrices, Types of Matrices, Addition of matrices, Subtraction of matrices and Product of matrices. Properties of Matrix Multiplication. Transpose of Matrix, Symmetric and Skew-symmetric Matrices, Inverse of Matrix and system of linear equations	
Unit III: Differential Calculus	**9h**
Algebra of limits, Continuity, Derivative of a function, Fundamental rules for differentiation, increasing and decreasing functions, Introduction to Partial derivatives	
Unit IV: Integral Calculus	**9h**
Indefinite and definite integrals, methods of Integration, Properties of definite integrals	

Course Learning Outcomes: On the successful completion of this course,

- Students will demonstrate the ability to distinguish corresponding sets as representations of relations or functions by the analysis of graphical, numeric, or symbolic data
- Students will demonstrate the ability to apply the concept of matrices in real-life situations
- Students will understand the concepts of Limits, Continuity and Differentiability and their applications
- Students will understand and analyze the concept of Integration with the help of Differentiation and study its various applications

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN
George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir	Thomas' Calculus (14th edition)	Pearson Education	2018	978-9353060411
H.K. Dass	Higher Engineering Mathematics	S. Chand	2014	978-8121938907

Semester 2

B.Sc. (H) Nutrition and Dietetics (3 year)									
Semester-wise Distribution of Courses				**2nd Semester**					
S. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**					**Credit Units**
				L	**T**	**P**	**FW**	**SW**	
1		Food Science - I	Core Course	4	0	2	0	0	6
2		Lifespan Nutrition	Core Course	4	0	2	0	0	6
3		Chemistry-I	Allied course	3	0	1	0	0	4
4		Behavioural Skills	Value Addition Course	1	0	0	0	0	1
5		Communication Skills	Value Addition Course	1	0	0	0	0	1
6		German Grammar/ French Grammar	Value addition Course	1	0	0	0	0	1
7		Punjabi Language and Literature-1/Punjab History & Culture	Ability Enhancement Courses	1	0	0	0	0	1
8		Environmental Science	Ability Enhancement Courses	2	0	0	0	0	2
9		Statistics for Biosciences/MOOCs	Skill Component	2	0	0	0	0	2
			Total Credits						**24**
L: lecture; T: training; P: practical; FW: field work; SW: self-work.									

Food Science – I

L	T	P	SW/FW	Total Credits
4	0	2	0	6

Course content and syllabus:

Food Science - I	Teaching Hrs
Unit I: **Cereal and Cereal Products**	**18 h**
Cereals - Basic structure of a cereal grain, Composition and nutritive value Wheat: Milling and milled products, Types of flour, Gluten, Germination Rice: Types, processing, products and fermentation Corn and other millets – processing and culinary uses Starch: Sources, functional properties, gelatinization, factors affecting gelatinization, gelation, dextrinization, retrogradation. Post-harvest alterations: Nutrition loss, methods to conserve nutritive value	
Unit II: **Pulses & Legumes, Oilseeds and Nuts**	**18 h**
Pulses - Introduction to the term pulse, legumes and dals, Nutritive value, Conserving and enhancing nutritive value, milling, toxic materials (antinutrients), germination, fermentation, digestibility, nutrition loss, methods to conserve nutritive value. Oilseeds and Nuts: Types, composition, processing and antinutrients. Post-harvest alterations: Nutrition loss, methods to conserve nutritive value	
Unit III: **Fruits and Vegetables, Oils and Fats and Sugar**	**18 h**
Fruits and vegetables - Structure, composition and classification, nutritive value, changes occurring during maturation, ripening, post-harvest changes and storage, Plant pigments viz Chlorophyll, Carotenoids, Anthocyanins, Anthoxanthins Oils & Fats -Types, processing, difference between fats and oil, esterification of fats, shortening value of fats and oils, Fat replacers – fat substitutes Sugar - Nutritive value, physical and functional properties, sources	
Unit IV: **Spices and condiments, beverages**	**18 h**
Spices & Condiments: Definition, classification & composition of spices & condiments, other flavoring agents, importance and functional properties, adulteration Beverages (tea, coffee and cocoa) – types, processing	
Word Count (2022-2026): 430; Word Count (2023-2027): 232	

Lab/ Practical details: **(72 Hours)**

Objective: The laboratory exercises in this section have been so designed that the students learn toverify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

Preparation of recipes with same food group or combination of two or more:

a. Cereals
b. Pulses & legumes
c. Fruits
d. Vegetables
e. Oils & Fats

f. Sugars

Course Learning Outcomes

- Understand Nutritional value and significance of cereal, pulses and oilseeds.
- Perceive knowledge about fruits and vegetable
- Demonstrate compositional evaluation different food systems
- Gain knowledge of the processing and preservation of cereal, pulses, fruits and vegetables.

Author	Title	Publisher	Year of publication	ISBN	Pages
Manay NS, Shadaksharaswamy M	Foods - Facts and principles	New Age International Publ., New Delhi	2010	9788122422153	490
Roseville LJ, Viera ER	Elementary food science, 3rd Ed.,	Chapman and Hall, New York	1992	9780834216570	423
Potter NN, Hotchkiss JH	Food Science, 5th Ed.,	CBS Publisher and Distributors, Delhi	2013	9781461372639	608

Lifespan Nutrition

L	T	P	SW/FW	Total Credits
4	0	2	0	6

Course content and syllabus:

Lifespan Nutrition	Teaching Hrs
Unit I: **Meal planning**	**18 h**
Basic principles of meal planning: Reference man and woman, Balanced diet, Food exchange list, Factors affecting meal planning, Objectives of meal therapy Type of diet Quality of various nutrients - proteins, fats, minerals, vitamins, fibres and antioxidants Recommended dietary allowances [RDA] and its approaches of assessing nutrient requirements.	
Unit II: **Nutrition through Lifecycle- Pregnancy and Lactation**	**18 h**
Pregnancy: Stages of development of the fetus, Effect of Nutritional Status on Pregnancy 0utcome, Birth weight, Maternal Weight Gain During Pregnancy, Physiological changes during pregnancy, Nutritional Requirement, Pica, Complications during pregnancy, Effect of obesity on pregnancy, Pregnancy in Adolescence Lactation: Composition of breast milk and advantages of breast feeding to infant and mother, exclusive breast feeding 0-6 months, Nutritional requirements during Lactation, Physiology of Lactation.	
Unit III: **Nutrition through Lifecycle- Infancy to childhood**	**18 h**
Nutrition during infancy: Growth and development, Recommended breast feeding and complementary feeding practices, Nutritional requirements, Use of growth chart to monitor growth, Artificial feeding, Factors to be considered in bottle feeding, Feeding problems Nutritional needs for children: Pre School: Nutritional requirements, Factors to be considered in planning meals for preschool children, Factors affecting nutritional status, Pica School children: Nutritional requirements, Nutritional problems of school children School, Mid-day meal scheme	
Unit IV: **Nutrition through Lifecycle- Adolescents, Adults and elderly**	**18 h**
Nutritional requirement for adolescents, Special needs for adolescent girls Nutritional concerns for adolescents- obesity, eating disorder, osteoporosis, anaemia, under nutrition, premenstrual syndrome, PCOD. Nutritional requirement for Adult, Nutritional concerns Geriatric nutrition – Ageing and nutritional needs, recommended dietary allowances, special considerations in planning meals for the geriatric group, special care of old people	

Lab/ Practical details: *(72 Hours total)*

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

Meal planning for category belonging to different income group, type of diet, physiological condition, age, sex:

1. Pregnant women
2. Lactating women
3. Complementary foods (CF) for infants
4. Enhancing micronutrient content of CF
5. Pre-school children
6. School going children
7. Packed tiffins for School Going Child
8. Adults
9. Elderly

Author	Title	Publisher	Year of publication	ISBN	Pages
Anderson L, Dibble MV, Turkki PR, Mitchall HS, Rynbergin HJ	Nutrition in health and disease, 17th Ed.,	JB Lippincott and Co., Philadelphia	1982	9780397542826	794
Williams SR	Nutrition and diet therapy, 6th Ed, Time,	Mirror, Mosby College Publ.	1989	977103274	850
Joshi SA,	Nutrition and dietetics	Tata McGraw Hill Publications, New Delhi	1992	9780070472921	627

***Recommendation to change Dietetics-I to Lifespan Nutrition was proposed.**
***The recommendation was endorsed by HoS, ASHS.**

CHEMISTRY – I

L	T	P	SW/FW	Total Credits
3	0	1	0	4

Course Content

CHEMISTRY – I	Teaching Hrs
Unit I Structure and Bonding	**14 h**
Chemical bonding, types of chemical bonds – ionic, covalent, coordinate. Hybridization – sp, sp2, sp3, bond length, bond angles, bond energy, van der Waals interactions, Hydrogen bonding – inter and intramolecular and their significance – anomalous properties of water. Solvents - Types of solvents and their characteristics, weak interactions in aqueous solutions, interaction between water and polar solutes, solubility of ionic solids and its dependence on lattice energy and solvation energy. Explanation for solubility of alcohols and sugars in water	
Unit II Methods of analysis	**14 h**
Qualitative, quantitative volumetry, gravimetry and instrumental methods of analysis. Errors in quantitative analysis, minimization of errors. Accuracy, precision, significant figures, measurement of accuracy – absolute error, relative error, measurement of precision – standard deviation, variance. Viscosity and surface tension - Definition, effect of temperature, determination, applications. Reaction Kinetics - Molecularity and order of reactions, second order reactions, differential integral equations, methods of determining order of a reaction, theories of reaction rates – collision theory and transition state theory, parallel and consecutive reactions with examples	
Unit III Acids and bases	**13 h**
Arrhenius, Bronsted Lowry, solvent system and Lewis concept of acids and bases. Hard and soft acids and bases. Ionic product of water, common ion effect and applications, pH scale, buffers, buffer capacity, Henderson's equation, preparation of acidic and basic buffers, buffers in biological system – blood plasma, RBC and tissue fluids, theory of acid-base indicators, pH titration curves and isoelectric pH of amino acids. Choice of indicators of acid base titrations. Binary Liquid mixtures - Liquid-liquid mixtures, ideal liquid mixtures, non-ideal liquid mixtures. Azeotropes HCl – water, ethanol-water systems. Principle of fractional distillation, partially miscible liquids – phenol water system. Trimethyl amine – water and nicotine water systems. Lower and upper consolute temperature. Effect of impurityon consolute temperature, steam distillation – principle and applications.	
Unit IV Introduction to Organic Chemistry	**13 h**
Classification, unique characteristics, IUPAC nomenclature of organic compounds, isomerism. Investigation of organic compounds. Detection and quantitative estimation of elements Nitrogen, Sulphur, Phosphorus and Halogens (problems to be solved). Field effects and reaction intermediates. Resonance, hyper conjugation, aromaticity inductive and field effects, hemolytic and heterolytic bond breaking, electrophiles, nucleophiles, energy consideration, reactive intermediates, carbo – cations, carbanions free radicals, carbenes with examples. Arenes: Structure of benzene, mechanism of nitration and Fridel-Crafts reaction. Electronic interpretation of orienting influence of the substituents in the electrophilic substitution of chlorobenzene, toluene, nitrobenzene and phenol	

Lab/ Practical details: (36 Hours)

Objective: The laboratory exercises in this section have been so designed that the students learnto verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

Qualitative analysis of the following:

1. Urea
2. Benzamide
3. Aniline
4. Acetophenone
5. O-cresol
6. Nitro benzene
7. Chlorobenzene
8. Benzoic acid
9. Resorcinol benzyl alcohol
10. Benzaldehyde

Textbooks

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages
Soni PL	A textbook of Inorganic chemistry	Sultan Chand & Sons	1988	9788180547928	3352
Vogel AI	Textbook of quantitative chemical analysis,	ELBS Ed.	2000	9780582226289	806

Statistics for Biosciences

L	T	P	SW/FW	Total Credit Units
2	0	0	0	2

Course Contents/syllabus:

Biostatistics-II	Teaching Hrs
Unit I: Distribution	**9 h**
Joint probability distribution, Conditional and marginal distribution, Expectation, Variance and Covariance, Means and variances of linear combinations of random variables, Chebyshev's inequality.	
Unit II: Probability	**9 h**
Joint probability distribution, Conditional and marginal distribution, Expectation, Variance and Covariance, Means and variances of linear combinations of random variables, Chebyshev's inequality.	
Unit III: Standard distributions	**9 h**
Elementary ideas of Standard distributions -: Uniform distribution. (Discrete and continuous), Binomial distribution, Poisson distribution, Normal distributions. Standard normal distributions.	
Unit IV: Sampling distributions	**9 h**
Methods of sampling, Sampling distributions, Central Limit Theorem, Hypothesis Testing	

Course Learning Outcomes: This course will enable the students to

- Use statistical methods to collect and analyze the data.
- Understand distributions in the study of the joint behaviour of two random variables
- Estimate unknown parameters of populations
- Understand and applying hypothesis testing and different errors, sampling distributions

Author	Title	Publisher	Year of publication	ISBN	Pages
Antonisamy; Christopher S; Samuel P Prasanna	Biostatistics : principles and practice	New Delhi : Tata McGraw Hill Education, ©2010.	**2010**	9780070151482	**349**
Miller, Irwin	Mathematical statistics with applications	Pearson	2019	978-0134995373	529
Ross, Sheldom M	Introduction to Probability models	Elsevier	2019	978-0128143469	826
A M Gun	Fundamental of statistics Vol 1 & Vol II	World Press	2008	978-8187567806	619

Meyer, P L	Introductory Probability and statistical Applications	Oxford & IBH Publishing	1972	9780201047103	367
Walpole, Myers	Probability and Statistics for engineers and scientists	Pearson		978-0321629111	
Khan, Irfan A	Fundamental of biostatistics	Ukaaz Publications		978-8190044103	

Environmental Studies-2

L	T	P	SW/FW	TOTAL CREDIT UNITS
2	0	0	0	2

Course Contents/syllabus:

Environmental Studies-2	Teaching Hrs
Unit-1- Environmental Pollution	**9 h**
Environmental Pollution: types, Cause, effects and controls –Air, water, soil, chemical and noise pollution. Nuclear hazard and human health risk Solid waste Management-control measures of urban and industrial waste. Pollution case studies.	
Unit-2- Environmental Policies and practices	**9 h**
Environmental Policies and practices: Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment laws: Environment Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act, international agreements: Montreal and Kyoto protocols and convention on biological diversity (CBD), The Chemical Weapons Convention (CWC). Natural reserves, tribal population and rights and Human-wildlife conflict in Indian context.	
Unit-3- Human communities and the Environment	**9 h**
Impacts on environment, human health and welfare. Carbon foot-print. Resettlements and rehabilitation of project affected persons, case studies. Disaster management: floods, earthquake, cyclone and landslides. Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. Environmantal ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).	
Unit-4- Field work	**9 h**
Visit to an area to document environmental assets: river/forest/flora/fauna, etc. Visit to local polluted Site-Urban/Rural/Industrial/Agricultural, Study of common plants, insects, birds and basic principles of identification., Study of simple ecosystems-pond, river, Delhi Ridge, etc.	

Course Learning Outcomes: At the end of this course, the students will be able to develop:

- Understanding the types of pollution and their impact on environment and human health.
- Understand the environmental concerns and their impact on humans and agriculture.
- Able to analyse the impacts of natural and manmade disaster on human population and settlements.
- Sensitization about the environmental issues and concerns leading to proactive actions to improve the environmental conditions in our daily life.
- Able to imbibe practical approach and solution to solve environmental concerns.

Author	Title	Publisher	Year of publication	ISBN	Pages
William P. Cunningham, Mary Ann Cunningham	Principles of Environmental Science	McGraw-Hill	2019	9781260219715	--
William P. Cunningham, Mary Ann Cunningham, Barbara Woodworth Saigo	Environmental Science: A global concern,	McGraw-Hill	2021	9781260363821	--
Gurjar B. R., Molina L.T., Ojha C.S.P. (Eds.)	Air Pollution: Health and Environmental Impacts	CRC	2010	9781439809624	--
Elaine M.A. and Bugyi G.(Eds.)	Impact of Water Pollution on Human Health and Environmental Sustainability (Practice, Progress, and Proficiency in Sustainability)	Idea Group, U.S	2016	978-1466695597	--
Bryant E.	Natural Hazards, 5th Edition	Cambridge University Press	2004	978-0521537438	--
Keith Smith	Environmental Hazards Assessing Risk and Reducing Disaster	Oxford University Press	2013	978-0415681063	--

German Grammar

L	T	P	SW/FW	Total Credit Units
1	0	0	0	1

Course Contents/syllabus:

German Grammar	Teaching Hrs
Module I: Time (Uhrzeit); People and the World: Land, Nationalität und Sprache	**4 h**
Introduction of time, Read text related to time and teach the students the time expressions, Exercises related to Time, Adverbs of time and time related prepositions, Vocabulary: Countries, Nationalities, and their languages, Negation: “nicht/ kein”, Ja/Nein Fragen. All the colors and color related vocabulary, adjectives, and opposites, Exercises and comprehension for the same.	
Module II: Irregular verbs (unregelmässige Verben)	**3 h**
Introduction to irregular verbs and their conjugation e.g. fahren, essen, lesen etc, Read a text related to the eating habits of Germans, Vocabulary: Obst, Gemüse, Kleiderstück with usage of irregular verbs, Free time and hobbies, Food and drinks	
Module III: Accusative case: articles and pronouns (Akkusativ Kasus: Artikel und Pronomen)	**3 h**
Introduction to the concept of object (Akkusativ), Formation of sentences along with the translation and difference between nominative and accusative articles, Usage of accusative Definite articles, Usage of accusative Indefinite articles	
Module IV: Accusative case: possessive pronouns (Akkusativ Kasus: Possessivpronomen) Family and Relationship	**3 h**
Accusative Personal Pronouns: - Revision of the nominative personal pronouns and introduction of accusative. Applicability of pronouns for both persons and things. Usage of accusative Personal Pronouns, Introduction of accusative possessive pronouns, Difference between nominative and accusative possessive pronouns, usage of accusative possessive pronouns	

Course Learning Outcomes: After completing these modules, the students will be capable of constructing sentences with possessive and demonstrative adjectives in German. In addition, they will be proficient in formulating meaningful sentences as they will be capable of applying their knowledge of all the irregular verbs they have learnt during the session. They will also have an idea of German culture by studying about various German festivals.

At the end of the course, the student shall be able to:

- Understand information; Express in his own words; Paraphrase; Interpret and translate.
- Apply information in a new way in a practical context
- Analyse and break-down information to create new ideas
- Evaluate and express opinion in a given context

Author	Title	Publisher	Year	ISBN No	Pages
Dora Schulz, Heinz Griesbach	Deutsche Sprachlehre Fur Auslander	Max Hueber Verlag	1984	978-3190010066	-
Hartmut Aufderstrasse, Jutta Muller, Helmut Muller	Themen Aktuell: Glossar Deutsch	Max Hueber Verlag	2003	978-3190816903	-
Giorgio Motta	Wir Plus Grundkurs Deutsch fur Junge Lerner Book German Guide	Goyal Publishers	2011	9788183072120	248

French Grammar

L	T	P	SW/FW	Total Credit Units
1	0	0	0	1

Course Contents/syllabus:

French Grammar	Teaching Hrs
Unit-I : My family and my house	**4 h**
Descriptors/Topics, Talk about your family members, Usage of possessive adjectives, Describe your house/apartment, Prepositions of location, Negation	
Unit-II- Lifestyle	**3 h**
Descriptors/Topics, Talk about your hobbies and pastimes, Usage of appropriate articles : definite and contracted, Talk about your daily routine Usage of pronominal verbs	
Unit-III- In the city	**3 h**
Descriptors/Topics, Filling up a simple form, Ask for personal information, Usage of interrogative adjectives, Give directions about a place, Ordinal numbers, Usage of demonstrative adjectives	
Unit-IV- Week-end	**3 h**
Descriptors/Topics, Talk about your week-end plans, Usage of disjunctive pronouns, Usage of Near Future tense, Talk about weather, Write a simple post card	

Course Learning Outcomes: At the end of this course, the students will be able to interact in a simple way on everyday topics. This course content focuses on the speech of the students in a lucid and a concurrent manner using appropriate vocabulary and pronunciation techniques. Extra stress will be given on their understanding of grammatical structures and the foreign accent of the language. At the end of the course, the student shall be able to:

- Understand information; Express in his own words; Paraphrase; Interpret and translate.
- Apply information in a new way in a practical context
- Analyze and break-down information to create new ideas
- Evaluate and express opinion in a given context

Author	Title	Publisher	Year of Publication	ISBN No
Christine Andant, Catherine Metton, Annabelle Nachon, Fabienne Nugue,	A Propos - A1, Livre de l'élève et Cahier d'exercices.	Langers International Pvt. Ltd.	2010	978-9380809069
Collins Dictionaries	Easy Learning French Complete Grammar, Verbs and Vocabulary	Collins	2016	978-0008141721

Nikita Desai, Samapita Dey Sarkar	Apprenons La Grammaire Ensemble - French	Langers International Pvt. Ltd.	2017	978-8193002681

Punjabi Language and Literature-2

L	T	P	Total Credits
1	0	0	1

Course content and syllabus

Punjabi Language and Literature-2 Subject Code- INL 104	Teaching Hours
Unit I:	**4 h**
ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਕਹਾਣੀ ਦਾ ਅਧਿਐਨ (ਕਥਾ ਕਹਾਣੀ) ਕਹਾਣੀ ਵਿਸ਼ਾ-ਵਸਤੂ/ਸਾਰ,ਪਾਤਰ-ਚਿਤਰਨ ਕਹਾਣੀਕਾਰ ਦੇ ਜੀਵਨ ਅਤੇ ਰਚਨਾ ਬਾਰੇ ਮੁੱਢਲੀ ਜਾਣਕਾਰੀ	
Unit II:	**4 h**
ਦਫ਼ਤਰੀ ਚਿੱਠੀ-ਪੱਤਰ ਰਚਨਾ ਚਿੱਠੀ-ਪੱਤਰ ਲੇਖਣ ਕਲਾ,ਮਹੱਤਤਾ ਅਤੇ ਕਿਸਮਾਂ ਦਫ਼ਤਰੀ ਚਿੱਠੀ-ਪੱਤਰ ਰਚਨਾ ਦੇ ਜ਼ਰੂਰੀ ਅੰਗ ਅਤੇ ਵੱਖ-ਵੱਖ ਵਿਸ਼ਿਆਂ ਅਨੁਸਾਰ ਵਿਹਾਰਕ ਅਭਿਆਸ	
Unit III:	**5 h**
ਵਿਆਕਰਨ ਸਿਧਾਂਤ ਅਤੇ ਵਿਹਾਰ 1. **ਪੰਜਾਬੀ ਅਰਥ ਬੋਧ** ਅਰਥਾਂ ਦੇ ਆਧਾਰ ਦੇ ਸ਼ਬਦਾਂ ਦੀਆਂ ਕਿਸਮਾਂ ਅਤੇ ਉਦਾਹਰਨਾਂ, ਸਮਾਨਰਥਕ ਸ਼ਬਦ, ਬਹੁਅਰਥਕ ਸ਼ਬਦ, ਵਿਰੋਧਾਰਥਕ ਸ਼ਬਦ, ਬਹੁਤੇ ਸ਼ਬਦਾਂ ਦੇ ਸਥਾਨ ਤੇ ਇੱਕ ਸ਼ਬਦ ਮੁਹਾਵਰੇ, ਅਖਾਣ : ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਉਦਾਹਰਨਾਂ 2. **ਪੰਜਾਬੀ ਵਾਕ ਬੋਧ** ਵਾਕ ਪ੍ਰੀਭਾਸ਼ਾ,ਵਾਕ ਦੇ ਤੱਤ, ਪੰਜਾਬੀ ਵਾਕ ਤਰਤੀਬ ਵਾਕ ਵਰਗੀਕਰਨ:ਕਾਰਜ ਦੇ ਅਧਾਰ ਤੇ ਵਾਕਾਂ ਦੀਆਂ ਕਿਸਮਾਂ, ਬਣਤਰ ਦੇ ਅਧਾਰ ਤੇ ਵਾਕਾਂ ਦੀਆਂ ਕਿਸਮਾਂ	
Unit IV:	**5 h**
ਵਿਆਕਰਨ ਸਿਧਾਂਤ ਅਤੇ ਵਿਹਾਰ 1. ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਤੇ ਗੁਰਮੁਖੀ ਲਿੱਪੀ 2. ਭਾਸ਼ਾ, ਉਪਭਾਸ਼ਾ,ਟਕਸਾਲੀ ਭਾਸ਼ਾ ਅਤੇ ਪੰਜਾਬੀ ਦੀਆਂ ਉਪਭਾਸ਼ਾਵਾਂ	

Course Learning Outcomes:

- Understand modern Punjabi Stories.
- Interpret the importance of letter writing
- Analyze the Punjabi language structure and grammar.
- Examine the impact and importance of Punjabi dialects and Gurmukhi script on Punjabi language.

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
ਡਾ. ਧਨਵੰਤ ਕੌਰ (ਸੰਪਾ.),	**ਕਥਾ ਕਹਾਣੀ**	ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ, ਪੰਜਾਬ ਯੂਨੀਵਰਸਿਟੀ ਚੰਡੀਗੜ੍ਹ	**2009**	**-**	**-**

ਸੁਰਿੰਦਰ ਸਿੰਘ ਖਹਿਰਾ (ਸੰਪਾ.),	**ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਆਕਰਨ ਅਤੇ ਬਣਤਰ**	ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ,ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ ਪਟਿਆਲਾ	**2015**	**-**	**-**
ਡਾ.ਹਰਕੀਰਤ ਸਿੰਘ,	**ਕਾਲਜ ਪੰਜਾਬੀ ਵਿਆਕਰਨ ਅਤੇ ਲੇਖ ਰਚਨਾ**	ਪੰਜਾਬ ਸਟੇਟ ਯੂਨੀਵਰਸਿਟੀ ਟੈਕਸਟ ਬੁੱਕ ਬੋਰਡ,ਚੰਡੀਗੜ੍ਹ	**1999**	**-**	**-**
ਡਾ. ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼ ਸਿੰਘ	**ਕਾਲਜ ਪੰਜਾਬੀ ਵਿਆਕਰਨ ਅਤੇ ਲੇਖ ਰਚਨਾ**	ਮਦਾਨ ਪਬਲੀਕੇਸ਼ਨਜ਼, ਪਟਿਆਲਾ	**2002**	**-**	**-**
ਡਾ. ਬੂਟਾ ਸਿੰਘ ਬਰਾੜ	**ਪੰਜਾਬੀ ਵਿਆਕਰਨ ਸਿਧਾਂਤ ਅਤੇ ਵਿਹਾਰ**	ਚੇਤਨਾ ਪ੍ਰਕਾਸ਼ਨ, ਪੰਜਾਬੀ ਭਵਨ,ਲੁਧਿਆਣਾ	**2012**	**-**	**-**
ਡਾ. ਬੂਟਾ ਸਿੰਘ ਬਰਾੜ	**ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਸ੍ਰੋਤ ਅਤੇ ਸਰੂਪ**	, ਵਾਰਿਸ ਸ਼ਾਹ ਫ਼ਾਊਂਡੇਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ	**2012**	**-**	**-**
ਦੁਨੀ ਚੰਦ੍ਰ	**ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦਾ ਵਿਆਕਰਣ**	, ਪੰਜਾਬ ਯੂਨੀਵਰਸਿਟੀ ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ, ਚੰਡੀਗੜ੍ਹ	**1995**	**-**	**-**
ਜੋਗਿੰਦਰ ਸਿੰਘ ਪੁਆਰ ਅਤੇ ਹੋਰ	**ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦਾ ਵਿਆਕਰਨ (ਭਾਗ 1,2,3),**	ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਕਾਦਮੀ ਜਲੰਧਰ	**2003**	**-**	**-**
ਸੁਖਵਿੰਦਰ ਸਿੰਘ ਸੰਘਾ	**ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਗਿਆਨ**	ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਕਾਦਮੀ ਜਲੰਧਰ	**2010**	**--**	**-**
ਅਗਨੀਹੋਤਰੀ,ਵੇਦ	ਪਰਿਚਾਇਕ ਭਾਸ਼ਾ ਵਿਗਿਆਨ	ਦੀਪਕ ਪਬਲਿਸ਼ਰਜ਼ ਜਲੰਧਰ	**1981**	**-**	**-**

History and Culture of Punjab

L	T	P	SW/FW	Total Credit Units
1	0	0	0	1

Course Contents/syllabus:

History and Culture of Punjab	Teaching Hrs
Unit I:	**5 h**
The Mauryan Empire: Social, economic, and religious life Buddhism and Jainism: Impact on Punjab with special reference to 4th Buddhist Council. The Kushans: Impact of Kanishka's rule on Punjab	
Unit II:	**4 h**
Gandhara School of Art: Salient features. The Guptas: Cultural and scientific developments. Position of Women: Under the Mauryas, the Guptas and the Vardhanas.	
Unit III:	**3 h**
Depiction of Punjab in the accounts of Chinese travellers: Fahien and Huen Tsang: Main developments in literature. Education: Significant developments; Taxila	
Unit IV:	**3 h**
Society and Culture on the eve of the Turkish invasion of Punjab. Punjab in the Kitab-ul-Hind of Alberuni.	

Course Learning Outcomes:

- Understand the history of various cultures, religions in Punjab.
- Interpret the importance of Gandhara School of Art, developments under Guptas rule and position of women.
- Compare the depiction of Punjab in the accounts of Chinese travelers.
- Examine the impact of various invasions on socio-cultural life of Punjab.

Text / Reference Books:

1.Joshi, L.M (ed.): **History and Culture of the Punjab, Part-I,** Publication Bureau, Punjabi University, Patiala, 1989 (3rd ed.)
2.Joshi, L.M and Fauja Singh**: History and Culture of the Punjab, Vol. I,** Punjabi University, Singh(eds), Patiala, 1977
3.Prakash**, Buddha: Glimpses of Ancient Punjab,** Punjabi University, Patiala, 1983
4.Thapar, Romila: **A History of India**, Vol. I, Penguin Books, 1966
5.Basham, A.L: **The Wonder That was India**, Rupa Books, Calcutta (18th rep.),1992
6.Sharma, B.N: **Life in Northern India**, Munshi Ram Manohar Lal, Delhi, 1966

Statistics for Biosciences

Course Contents/syllabus:

L	T	P	TOTAL CREDIT UNITS
2	0	0	2

Statistics for Biosciences	Teaching Hours
Unit I:	**9 h**
Data collection and graphical presentation, Descriptive Statistics: Measures of central tendency-Arithmetic, geometric and harmonic mean, median, and mode.	
Unit II:	**9 h**
Measures of dispersion, Skewness and Kurtosis, Correlation, and regression	
Unit III:	**9 h**
Definitions of Probability, Conditional Probability, Bayes' theorem, random variables: discrete and continuous, density and mass functions.	
Unit IV:	**9 h**
Expected values and moment generating functions, Discrete distributions: Uniforı Bernoulli, Binomial, Poisson, Continuous distributions: Uniform and Norm distribution	

Course Learning Outcomes: On the successful completion of this course,

- Students will understand the concept of data collection, representation, and measures of central tendency
- Students will be able to apply the concept of dispersion, skewness, correlation, and regression of the given data
- Students will be having knowledge of probability and random variables.
- Students will be able to apply the concepts of probability and random variables to different distributions

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN
Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying E. Ye	Probability and Statistics for Engineers and Scientists	Pearson; 9th edition	2010	978-0321629111
G Shanker Rao	Probability and Statistics for Science and Engineering	Universities Press	2011	9788173717444
SC Gupta, VK Kapoor	Fundamentals of Mathematical Statistics	Sultan Chand & Sons Private Limited	2000	9788180545283

Semester 3

B.Sc. (H) Nutrition and Dietetics (3 year)									
Semester-wise Distribution of Courses				**3rd Semester**					
S. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**					**Credit Units**
				L	**T**	**P**	**FW**	**SW**	
1		Dietetics	Core Course	4	0	2	0	0	6
2		Food Science-II	Core Course	4	0	2	0	0	6
3		Food Microbiology-I	Core Course	4	0	2	0	0	6
4		Chemistry – II	Allied course	3	0	1	0	0	4
5		Programming with C//MOOCs	Skill Enhancement Course	1	0	1	0	0	2
			Total Credits						**24**
L: lecture; T: training; P: practical; FW: field work; SW: self-work.									

DIETETICS

L	T	P	SW/FW	Total Credits
4	0	2	0	6

Course content and syllabus:

DIETETICS	Teaching Hrs
Unit I: **Introduction and Medical Nutrition Therapy for Enteral and Parenteral Nutrition**	**18 h**
Characteristics and role of dietician, Growth and scope of dietetics, Dietetic care in hospital patients, Assessment of patient's needs, Team approach to health care Type of feeding - Oral and tube feeding Enteral Nutrition - Formula composition, Osmolarity, Complication and monitoring Parenteral Nutrition - Nutrition solutions, Refeeding Syndrome	
Unit II: **Food Allergy and Food Intolerance**	**18 h**
Food Allergy: Definition, types of allergies, common food as allergens. Signs and Symptoms, tests for allergy, Diet recommendations Food intolerance: Definition, causative factors, diagnosis, treatment – elimination diet. Lactose intolerance symptoms, causative foods and stages according to severity, foods included and excluded, nutrition treatment. Gluten intolerance – symptoms, dietary treatment, foods included and excluded, nutritional treatment	
Unit III: **Burns injury and surgery conditions**	**18 h**
Burns- definition, classification, complications, Dietary management, general considerations. Injury/ Trauma- definition. Metabolic, physiological and hormonal response to Injury, dietary management, general considerations Surgery- definition, metabolic, physiological and hormonal response to surgery, dietary management, preoperative and postoperative nutritional care, general considerations	
Unit IV: **Nutrition Therapy for Infection & Febrile Conditions**	**18 h**
HIV/AIDS – Stages of HIV infection, aetiology, diagnosis, dietary management, general consideration Typhoid, tuberculosis, malaria, Hepatitis, influenza - aetiology, diagnosis, dietary management, general consideration	
Word Count (2022-26): 282; Word Count (2023-27): 211	

Lab/ Practical details: **(72 Hours total)**

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

Planning, preparing, and serving the following diets (two case studies)

1. Burns
2. Typhoid
3. Tuberculosis
4. Malaria

5. Hepatitis
6. Influenza

Course Learning Outcomes:

1. Understanding medical nutrition therapy for enteral and parenteral nutrition
2. Acquire knowledge of food allergy and food intolerance
3. Learn about burns injury and surgery conditions.
4. Demonstrate nutrition therapy for infection & febrile conditions.

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Antia FP	Clinical dietetics and nutrition, 2nd Ed.,	Oxford Univ. Press, Delhi	2008	9780195641653	524
Robinson CH, Lawler MR, Chenoweth WL, Garwick AE	Normal and therapeutic nutrition, 17th Ed,	Macmillan Publ. Co.	2006	9780024026057	757
Srilakshmi B	Dietetics, 6th Ed,	New Age International Publ., New Delhi	2011	9788122430660	435

FOOD SCIENCE – II

L	T	P	SW/FW	Total Credits
4	0	2	0	6

Course content and syllabus:

FOOD SCIENCE - II	Teaching Hrs
Unit I: Milk and milk products	**18 h**
Milk and milk products: Composition and nutritive value of milk and milk product, type of milk, physical properties of milk. effect of heat, enzymes, acid, salts on milk and its products, processing of milk	
Unit II: Eggs	**18 h**
Egg: Structure and nutritive value, biological value, pigments in egg, Egg quality, evaluation of egg quality, egg grading and deterioration of egg quality, egg foaming Effects of heat on egg proteins,microorganisms, egg as emulsifying agent, storage of egg	
Unit III: Meat, Fish and Poultry	**18 h**
Meat: Definition and sources, structure, composition, and nutritive value of meat. Classes of meat. Gelatin. Cuts and grades of meat and their selection. Postmortem changes, storage, and changes during cooking. Ageing of meat and curing of meat. Factors affecting tenderness of meat, changes during cooking. **Poultry and fish:** Classification and nutritive value. Processing and preservation. Selection and storage, Spoilage factors	
Unit IV: Water in food	**18 h**
Introduction, Physical properties of water, Structure of water molecule, Types of water, Freezing and ice structure, Water activity, Water activity and food spoilage	
Word Count (2022-26): 297; Word Count (2023-27): 191	

Lab/ Practical details: (72 Hours)

Objective: The laboratory exercises in this section have been so designed that the students learn toverify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

1. Fats and oils - Smoking point, Preparation of common recipes
2. Milk cookery - Experimental cookery on milk, Common preparations with milk, cheese, andcurds
3. Egg cookery - Evaluation of fresh egg. Experimental cookery – boiled egg, poached egg,omelet, and custard. Preparation of selected common recipes with milk various stages of egg foam formation, stability, over run and leavening effect non-enzymatic browning milk.
4. Measurement of specific gravity of milk
5. effect of acid and food enzymes on casein and effect of pH and temperature on the same
6. effect of various sources of starters and temperature on quality of curd (gel strength).

Course Learning Outcomes

- Understand factors to be considered during selection of basic commodities, raw and processed and various aspects of their products and distribution
- Understand the principles underlying changes in food characteristics during cooking.
- Be familiar with evaluation of food products for their quality characteristics

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Manay NS, Shadaksharaswamy M	Foods - Facts and principles	New Age International Publ., New Delhi	2010	9788122422153	490
Roseville LJ, Viera ER	Elementary food science, 3rd Ed.,	Chapman and Hall, New York	1992	9780834216570	423
Potter NN, Hotchkiss JH	Food Science, 5th Ed.,	CBS Publisher and Distributors, Delhi	2013	9781461372639	608

Food Microbiology – I

L	T	P	SW/FW	Total Credit Units
4	0	2	0	6

Course Contents/syllabus:

Food Microbiology – I	Teaching Hrs
Unit I: Introduction to Food Microbiology	**18 h**
History and development in food microbiology – Spontaneous generation Vs biogenesis theory, contributions of Antonie van Leewenhoek, Loius Pasteur, Robert Koch, Joseph Lister, Edward Jenner, Alexander Fleming, Theodore Schwann, Charles Chamberland, Hans Christian Gram, Eile Metchnikoff, Nicholas Appert, Barry Marshall and Robin Warren. Definition and scope of food microbiology. Inter-relationship of microbiology with other sciences.	
Unit II: Instrumentation in microbiology	**18 h**
Instrumentation in microbiology - Construction and working principles of autoclave, hot air oven, pH meter, laminar air flow, incubator, bacterial colony counter, spectrophotometer and membrane filter unit. Sterilization - Physical methods - heat, irradiation, filtration, solarization, ultrasonic vibration. Chemical methods - alcohol, aldehydes, dyes, halogens, phenols, metallic salts, surface active agents, gases	
Unit III: Diversity and Classification of Food Microbes	**18 h**
Bacteria - classification according to Bergey's manual up to levels of section, ultrastructure, reproduction - asexual and sexual methods, importance of bacteria in food. Viruses - structure and classification - plant, animal, bacterial and cyanophycean viruses, life cycle in virus - lytic and lysogenic cycle. Fungi- outlines of classification of yeast and molds.	
Unit IV: Microbial Growth and Reproduction	**18 h**
Culture media used in the isolation and culturing of food microorganisms. The common nutrient requirement for bacteria - macro and micronutrients. Life cycles and reproduction; bacteria, yeast and molds. - asexual and sexual modes, spore formation in food microbes.	
Word Count (2022-2026): 232; Word Count (2023-2027): 239	

Lab/ Practical details: (72 Hours total)

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

1. Introduction –Good laboratory Practices. Study of apparatus used in microbiology lab.
2. Study of compound microscope.
3. Cleaning and sterilization of glassware.
4. Preparation and sterilization of culture media-Nutrient agar, Potato Dextrose Agar
5. Inoculation and subculturing of micro-organisms –point inoculation, streak inoculation, spread plate method, pour plate method and swab method.
6. Preparation of slant, stab and plates using nutrient agar
7. Morphological study of bacteria and fungi using permanent slides

8. Simple staining
9. Gram staining
10. Negative staining

Course Learning Outcomes

- Understand the history, development and scope of food microbiology and its relationship to other sciences.
- Understand the techniques and instrumentation used in food microbiology
- Demonstrate classification and diversity of food microbes
- Perceive knowledge of microbial growth and reproduction in food microbes.

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Frazier WC, Westoff DC	Food Microbiology 4th Ed.	Tata Mc Graw Hill Publ. Co. Ltd.	2014	9781259062513	492
Jay J M	Modern Food microbiology, 3rd Ed.,	Van No Strand Reinhold Co. Inc.	2005	9780387231808	790
Michael J Pelczar; Eddie C S Chan; Noel R Krieg	Microbiology,	McGraw Hill Book Co., New York	2010	9780074623206	918

CHEMISTRY – II

L	T	P	SW/FW	Total Credits
3	0	1	0	4

Course Content

CHEMISTRY – II	Teaching Hrs
Unit I Bioinorganic Chemistry	**14 h**
Biochemical significance and toxicology of essential and trace elements (sodium, potassium, calcium, magnesium, sulfur, selenium, arsenic, mercury, nitrogen and phosphorus) in naturally occurring complex molecules like haemoglobin, myoglobin, cytochromes, chorophyll, vitamin B_{12} and enzymatic nitrogenase molecules in living systems.	
Unit II Colloids and Nuclear Chemistry	**14 h**

Colloids: Frendlich and Langmuir's adsorption isotherms, applications, and indicators of adsorption in precipitation titrations. Colloidal State: types of sols, properties, kinetic optical and electrical, stability of colloids, protective action, Hardy Schulze law, Gold number, preparation and applications of colloids. Nuclear chemistry: Nuclear stability, n/p ratio, natural and induced radioactivity, characteristics of radioactive elements, radioactive decay series, artificial transmutation, disintegration constant, half life. Biological effects and application of radio isotopes in medicine and agriculture.	
Unit III Photochemistry	**13 h**
Laws of photochemistry (Grothus, Draper law), Einstein's law of photochemical equivalence, quantum efficiency, photosensitization, photoinhibition, fluorescence, phosphorescence, chemiluminescence, bioluminescence with examples. Techniques: Lambert's law, Beer's law, Beer-Lambert's law, molar absorption, molar extinction coefficient, transmittance and absorbance, their relationship, colorimeter, Flame photometry and UV-Vis spectroscopy : instrumentation, working and applications.	
Unit IV Chemistry of unsaturated hydrocarbons	**13 h**
Alkenes/dienes : Mechanism of preparation and chemical reactivity of alkenes: oxidation, ozonolysis, hydration, hydroxylation, polymerization and addition reactions. Alkynes: Acidity of alkynes and chemical reaction including ozonolysis and polymerization.	

Lab/ Practical details: (30 Hours total)

Objective: The laboratory exercises in this section have been so designed that the students learn toverify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructionsVolumetric analysis

1. Use of analytical balance and calibration of pipette
2. Preparation of standard Sodium carbonate solution and estimation in the given solution
3. Preparation of standard Oxalic acid solution. Standardization of NaOH and estimation of H_2SO_4 in the given solution (Phenolphthalein)
4. Preparation of standard Oxalic acid solution. Standardization of $KMNO_4$ and estimation of H_2O_2 in the given solution
5. Preparation of $K_2Cr_2O_7$. Standardization of $Na_2S_2C_3$ and estimation of $CuSO_4$ in the givensolution (starch)
6. Preparation of $ZnSO_4$. Standardization of EDTA and estimation of total hardness of waterusing Eriochrome black T indicator
7. Preparation of $K_2Cr_2O_7$ solution. Estimation of Ferrous/Ferric ions in a mixture usingdiphenylamine indicator
8. Preparation of standard potassium bisulphate. Standardization of NaOH and estimation of HClin the given solution (Phenolphthalein)

9. Estimation of alkali content in antacid tablet by using HCl
10. Estimation of Vitamin C
11. Estimation of Glucose
12. Estimation of amino acid

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages
Vogel AI	Textbook of quantitative chemical analysis,	ELBS Ed.	1994	9780582226289	806
Skoog DA, West DM, Holler JF	Fundamentals of Analytical Chemistry,	Boston, MA : Cengage, [2022]	2022	9780357450390	933
Soni PL	A textbook of Organic chemistry,	Sulthan Chand & Sons	2000	9788180547928	3352

Programming with C

L	T	P	SW/FW	TOTAL CREDIT UNITS
1	0	1	0	2

Course Contents/syllabus:

Programming with C	Teaching Hours
Unit I: Introduction of Programming Languages	**5 h**
Introduction: Types of Languages, Evolution of 'C' Language, Structure of a 'C' Program, C' Program development life cycle, Executing and Debugging a 'C' Program. 'C' Tokens: Keywords and Identifiers, Operators, Constants, Variables, Data Types, Precedence of Operators, Scope and Lifetime of Variables.	
Unit II: Control Statement and Looping	**4 h**
Control Statements: Decision Making using if statement, Types of if …else block, Switch case Block, Arithmetic Expressions, Evaluation of Expressions, GOTO statement Looping: Concept of Loop, For loop, While loop, Do while loop, Jumping in Loop, break and continue statement.	
Unit III: Arrays and Strings	**4 h**
Arrays and Strings: Introduction to array, Processing Array Contents, 2D arrays, Array with three or more dimensions. String, string concatenation, Comparing strings, String handling Functions.	
Unit IV: Functions, Structure and Unions	**5 h**
Function: Concept of Function, User defined Function, System Defined Function, Function Calling, Types of parameters passing in function, return type in Function. Structure & Union: Need of Structure, Implementing Structure Variable, Arrays of Structure, Structure within Structure, Introduction of Unions, Difference between Structure and Unions.	

Lab/ Practical details, if applicable:

Objective*:* The aim of this section of Lab is to teach experiments of C programming pertaining to the units being taught in the theory paper specifically related to procedural programming, strings, structures and unions.

1. Write a Program to read radius value from the keyboard and calculate the area of circle and print the result in both floating and exponential notation.
2. Write a Program to convert temperature. (Fahrenheit –Centigrade and vice-versa)
3. Write a program for computing the volume of sphere, cone and cylinder assume that dimensions are integer's use type casting where ever necessary.
4. Write a Program to read marks of a student in six subjects and print whether pass or fail (using if-else).
5. Write a Program to calculate roots of quadratic equation (using if-else).
6. Write a Program to calculate electricity bill. Read starting and ending meter reading. The charges are as follows.

No. of Units Consumed	Rate in (Rs)
1-100	1.50 per unit
101-300	2.00 per unit for excess of 100 units
301-500	2.50 per unit for excess of 300 units
501-above	3.25 per unit for excess of 500 units

Do the Following Programs Using for, while, do-while loops.

7. Write a program to calculate sum of individual digits of a given number.
8. Write a program to check whether given number is palindrome or not.
9. Write a program to check whether a given number is a Fibonacci number or not.
10. Write a program to read 2 numbers x and n then compute the sum of the Geometric Progression. 1+x+ x2+x3+ - - - - - - - +xn
11. Write a program to print the following formats.

```
1                    *
1 2                * * *
1 2 3            * * * * *
1 2 3 4        * * * * * * *
```

12. Write a program to perform matrix addition, matrix subtraction and transpose pf a matrix.
13. Write a program to verify the given string is palindrome or not (without built-in functions, with using built-in functions).
14. Write a program to swap two numbers using a) Call By Value B) Call By Reference.
15. Write a program to create structure for an account holder in a bank with following Fields: name, account number, address, balance and display the details of five account holders.

Course Learning Outcomes: After studying this course students will be able:

1. To understand the fundamentals and tokens of C programming.
2. To develop skills to implement decision making through control structures in C.
3. To Analyze the working and implementation of array in memory.
4. To Optimize the code with the help of functions and structures.

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN
Jeri R. Hanly, Elliot B. Koffman	Problem Solving and Program Design in C	Pearson	2015	978-0134014890
Pradip Dey, Manas Ghosh	Programming In C	Oxford University Press	2018	978-0199491476
E Balagurusamy	Programming in ANSI C	McGraw Hill Education	2019	978-9351343202
Yashwant Kanetkar	Let Us C	BPB Publications	2020	978-9389845686

Semester 4

B.Sc. (H) Nutrition and Dietetics (3 year)									
Semester-wise Distribution of Courses				**4th Semester**					
S. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**					**Credit Units**
				L	**T**	**P**	**FW**	**SW**	
1		Therapeutic Nutrition - I	Core Course	4	0	2	0	0	6
2		Human Physiology - I	Core Course	5	0	1	0	0	6
3		Food Microbiology-II	Core Course	4	0	2	0	0	6
4		Chemistry-III	Allied course	3	0	1	0	0	4
5		Nutritional Assessment Methods and Techniques/ MOOCs	Skill Course	1	0	1	0	0	2
			Total Credits						**24**
L: lecture; T: training; P: practical; FW: field work; SW: self-work.									

Therapeutic Nutrition - I

L	T	P	SW/FW	Total Credits
4	0	2	0	6

Course content and syllabus:

Therapeutic Nutrition - I	Teaching Hrs
Unit I: Nutrition Therapy for GI Disorders	**18 h**
Definition, symptoms, causes, classification, complications and dietary management, general considerations, foods allowed and not allowed for the following: Diarrhoea, Constipation, Gastro Oesophageal Reflux Disease (GERD), Gastritis, Peptic ulcer, Irritable bowel syndrome, Steatorrhoea, Ulcerative colitis, Diverticulosis	
Unit II: Nutrition Therapy for Renal Disorders	**18 h**
Kidney functions Symptoms, causes, dietary management, complications, general considerations, foods allowed and not allowed for the following: Glomerulonephritis, Nephrotic syndrome, Acute and chronic renal failure, Dialysis / Renal transplant, Nephrolithiasis / Renal calculi	
Unit III: **Dietary Management of Liver Disorders**	**18 h**
Liver function: Normal and deranged, Role of diet in liver health Symptoms, causes, dietary management, complications, general considerations, foods allowed and not allowed for the following: Viral hepatitis, Cirrhosis, Alcoholic liver diseases, Cholecystitis, cholelithiasis, cholecystectomy, pancreatitis, Hepatic encephalopathy, Wilson's disease	
Unit IV: **Nutrition Therapy for Skeletal and Joint Disorder**	**18 h**
Bone biology in health and disease Symptoms, causes, dietary management, complications, general considerations, foods allowed and not allowed for the following: Osteoporosis, Osteoarthritis, Rheaumatoid arthritis	
Word Count (2022-26): 215; Word Count (2023-27): 177	

Lab/ Practical details: **(72 Hours)**

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

Planning, preparing, and calculating the major nutrients of the following

1. GI Disorders
2. Renal Disorders
3. Liver Disorders
4. Skeletal and Joint Disorder

Course Learning Outcomes:

- Understand nutrition therapy for GI disorders.
- Learm nutrition therapy for renal disorders
- Demonstrate dietary management of liver disorders
- Perceive knowledge about Nutrition therapy for skeletal and joint disorder

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Mahan K L, Escott-Stump S	Krause's Food and the Nutrition Care Process, 13th Ed.,	Elsevier, Missouri	2017	9780323340755	134
Mclaren DS, Meguid MM	Nutrition and its disorders	Churchhill Livingstone	1998	9780443037825	293
Gopalan C	Recent trends in nutrition,	9th Ed., Oxford Univ. Press	1993	9780195629989	220

Human Physiology – I

L	T	P	SW/FW	Total Credits
5	0	1	0	6

Course content and syllabus:

Human Physiology - I	Teaching Hrs
Unit I	**18 h**
Introduction: Cell – structure and function of organelles, nucleus, chromosomes, genes, cell division, types of cell tissue transport, cell junctions homoeostasis and body fluids. Blood: Red blood cells – Erythropoiesis, stages of differentiation, function, counts, physiological variation. Haemoglobin – structure, function, concentration, physiological variation. White blood cells – production, function, life span, counts, differential counts. Platelets – origin, normal count, morphology, functions. Plasma proteins – production, concentration, types, albumin, globulin, fibrinogen. Haemostasis and blood coagulation. Haemostasis – definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting factors. Blood Bank - Blood groups – ABO system, Blood grouping and typing, cross matching. Rh system – Rh factor, Rh incompatibility. Blood transfusion – Indication, universal donor and recipient concept. Complications of blood transfusion and cross matching. Selection criteria of a blood donor, transfusion reactions. Anticoagulants – examples and uses. Anaemia – classification – morphological and etiological effects of anaemia on body. Blood indices – colour index, MCH, MCV, MCHC. Erythrocyte sedimentation rate (ESR) and packed cell volume. Blood volume – normal value, determination of blood volume and regulation of blood volume. Lymph – composition and function.	
Unit II	**18 h**
Cardiovascular system: Heart – physiological anatomy, nerve supply, properties of cardiac muscle, cardiac cycle – systole, diastole, conduction system. Cardiac output. Heart sounds: Normal heart sounds, areas of auscultation. Blood pressure – Definition, normal value, clinical measurement of blood pressure. Physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension, radial pulse. Heart Sounds – Normal heart sounds, characteristics and signification (significance), heart rate. Electrocardiogram (ECG) – significance, coronary, cerebral circulation and capillary circulation	
Unit III	**18 h**
Digestive System: Physiological anatomy of gastro-intestinal tract, functions of digestive system. Salivary glands – structure and functions, deglutition, mastication – stages and regulation of saliva, functions of saliva. Stomach – structure and functions. Gastric secretion – composition, function, regulation of gastric juice secretion. Pancreas – structure, function, composition and regulation of pancreatic juice. Liver – functions of liver. Bile secretion - composition, function, regulation of bile secretion, bilirubin metabolism, types of bilirubin, jaundice – types, significance. Gall bladder – functions. Intestine – small intestine and large intestine. Small intestine - functions, digestion, absorption, movements. Large intestine – functions, digestion and absorption of carbohydrates, proteins, fats, lipids. Defecation	
Unit IV	**18 h**
Respiratory System: Function of respiratory system - physiological anatomy of respiratory system, respiratory tract, respiratory muscles, respiratory organs – lungs, alveoli, respiratory membrane, stages of respiration. Mechanism of normal and rigorous respiration, intra pulmonary pleural pressure, surface tension. Transportation of respiratory gases: Transportation of O2: direction, pressure gradient, forms of	

transportation, oxygenation of haemoglobin, quantity of O_2 transported. Lung volumes and capacities. Regulation of respiration, mechanisms of regulation, nervous and chemical regulation, respiratory centre. Hypoxia, cyanosis, asphyxia, dyspnoea, dysbarism, artificial respiration, apnoea	

Lab/ Practical details: (36 Hours)

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

1. Record of blood pressure – Sphygmomanometer, palpatory method, auscultatory method, variation of BP
2. Haemoglobin estimation
3. Blood grouping
4. Histology of Cartilage, bone, adipose tissue, skin, muscle

Course Learning Outcomes:

- Understand the homoeostatic status of the human body
- Demonstrate the physiological processes and functions as applicable to human nutrition
- Compare the respiration and transportation of oxygen
- Perceive knowledge of human physiology

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Guyton AC, Hall JE	Textbook of Medical Physiology, 9th Ed.,	Elsevier	2015	9781455770052	1168
Wilson	Anatomy and Physiology in Health and Illness,	Edinburgh : Churchill Livingstone Elsevier, 2007.	2007	9780443101014	490

Food Microbiology – II

L	T	P	SW/FW	Total Credit Units
4	0	2	0	6

Course Contents/syllabus:

Food Microbiology - II	Teaching Hrs
Unit I: General principles underlying spoilage of food	**18 h**
Fitness and unfitness of food for consumption; Causes for spoilage. Microbiology of air borne diseases - bacterial and fungal.	
Unit II: Microbiology of water	**18 h**
Sources, bacteriological examinations, total count, test for *E. coli.* Purification of water – filtration, sedimentation, disinfection. Water borne diseases - bacterial, viral, protozoan. Microbiology of sewage and sewage disposal.	
Unit III: Microorganisms organisms causing spoilage of food Products	**18 h**
Factors affecting kinds and numbers of microorganisms in food. Factors affecting the growth of microorganisms in food. Contamination and kinds of organisms causing spoilage of fruits and vegetables, meat, poultry, fish, eggs, milk and milk products, fats and oils, bottled beverages, spices, and condiments.	
Unit IV: Food poisoning	**18 h**
Food poisoning - Staphylococcal poisoning, Streptococcal poisoning, botulism, salmonellas, Shigellosis. Food borne infections - Clostridium perfringens, Vibrio, EPEC, Bacillus cereus, Campylobacter, Listeria, yersiniosis.	
Word count (2022-26): 154; Word count (2023-27): 213.	

Lab/ Practical details: (72 Hours) Objective:

The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

1) Estimation of lactic acid in milk
2) Quality tests for milk-Methylene Blue Reduction Test, Resazurin test.
3) Isolation and morphological identification of micro-organisms from spoiled food samples
4) Sampling of water- membrane filtration technique and CC agar
5) Standard Plate Count for raw and pasteurized milk samples.
6) Coliform count in water using MPN method.
7) Sampling of food handlers.

Course Learning Outcomes

- Understand the principles of various methods used in the prevention and control of microorganisms in foods
- Understanding of interactions between microorganisms and the food environment, and factors influencing their growth and survival

- Understanding the role of water as a carrier of microorganisms and methods of treating the waste sewage water.
- Understand the spoilage patterns of different foods and enumeration of spoilage-causing microorganisms.
- Understand the disease-causing potential of food-pathogens and related pathophysiology in human systems.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages
Frazier WC, Westoff DC	Food Microbiology 4th Ed.,	Tata Mc Graw Hill Publ. Co. Ltd	2014	9781259062513	492
Jay JM	Modern Food microbiology, 3rd Ed.,	Van No Strand Reinhold Co. Inc.	2005	9780387231808	790
Pelezer ML, Reid RD	Microbiology	McGraw Hill Book Co., New	2010	9780074623206	918
York Brown A, Smith H	Benson's Microbiological applications	McGraw Hill Publ.	2005	9780072823974	413
K R Aneja	Experiments in Microbiology, Plant Pathology, Tissue Culture and Microbial Biotechnology, 5th Edition	New Age International Publishers, London, New Delhi, Nairobi	2018	978-93-86418-30-2	580
Lansing M. Prescott John P. Harley Donald A. Klein	Microbiology, 5th Edition	The McGraw−Hill Companies,	2002	978-0697168887	1147

CHEMISTRY – III

L	T	P	SW/FW	Total Credits
3	0	1	0	4

Course Content

Chemistry – III	Teaching Hrs
Unit I Co-ordination Chemistry	**14 h**
Transition metals, properties (colour, oxidation states, magnetic properties, catalytic properties, complexation tendency). Double and complex salts Werner's theory, hapticity of ligands, coordination number and stability of complexes, Valence bond theory, structure, and magnetic properties of some complexes. Applications of complex formation, metal complexes as therapeutic agents - Platinum, gold, copper complexes. Organometallic Chemistry - Definition, nomenclature and classification, preparation, properties, bonding and applications of alkyls and aryls of Li, Hg, and Al, metal carbonyls and nature of bonding	
Unit II Dilute solutions	**14 h**
Dilute solutions and colligative properties. Ideal and non-ideal solutions, methods of expressing concentrations of solutions. Colligative properties, osmotic pressure and its measurement by Berkley and Hartley's method. Laws of osmotic pressure. Importance of osmotic pressure on living cells - hypotonic, hypertonic, isotonic solutions. Donnan membrane equilibrium, Raoult's law, relative lowering of vapour pressure. Molecular weight determination from osmotic pressure and relative lowering of vapour pressure. Elevation of boiling point, depression in freezing point, experimental methods for determining various colligative properties. Vant Hoff's factor. Abnormal molecular weight.	
Unit III Chemistry of functional groups	**13 h**
Alcohols: Classification, monohydric alcohols – general reactions, distinguishing reaction for 1,2 and 3 alcohols. Dihydric alcohols – Glycol preparation reactions and uses. Trihydric alcohols: Glycerol, synthesis, reactions, uses. Phenols: Acidity of phenols, effects of substituents on acidity on phenols. Reactivity of phenols towards electrophiles, uses. Carbonyl compounds: Synthesis of aldehydes and ketones. Structure, reactivity and properties of carbonyl group, nucleophilic addition reactions, aldol condensation, Perkins reaction, Cannizzaro reaction. **Carboxylic acids:** Synthesis of monocarboxylic acids, acidity of carboxylic acids, effect of substituents on acidity of carboxylic acids - Hydroxy acids and dicarboxylic acids: Structure, preparation and properties of lactic acid, tartaric acid,citric acid, Succinic acid, maleic acid, fumaric acid, Pyruvic acid, alpha ketoglutaric acid, oxaloacetic acid. Effects of heat and dehydrating agents on hydroxy acids. Amines: Classification, properties, synthesis of aliphatic and aromatic amines, separation of primary, secondary and tertiary amines and structural features affecting basicity of amines. Reactions, acylation with HNO_2 and Schiff's base formation. Distinguishing reactions of primary, secondary and tertiary amines	
Unit IV Environmental Chemistry:	**13 h**
Air pollution – air pollutants, their sources, effects and control. Water pollution: Types of water pollutants, biodegradation, dissolved oxygen level of water, Biochemical Oxygen Demand (BOD) of water, Chemical Oxygen Demand (COD)of water. Determination of DO, BOD and COD of waste water, industrial effluents,	

their effects, treatment of polluted water and sewage treatment. Soil pollution: pollutants, agricultural animal manures, crop harvesting. Pesticides. Use of fertilizers. Radioactive wastes. Control of soil pollution. Chromatography: General principles, adsorption and partition techniques.Paper chromatography, ascending and circular. Rf values. TLC, Column chromatography, Principles of gel chromatography, ion exchange chromatography and their applications.	

Lab/ Practical details: ***(36 Hours)***

Objective: The laboratory exercises in this section have been so designed that the students learn toverify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

1. Organic preparations of the following:
   - Acetanilide from aniline
   - M-dinitro benzene
   - Parabromo acetanilide
2. Determination of density of a liquid using specific gravity bottle
3. Viscosity using Ostwald's method
4. Rate constant of decomposition of H2O2 using KmNO4
5. Density of a liquid using specific gravity bottle and surface tension
6. Enthalpy of ionization of weak acid

Course Learning Outcomes

- ▶ Enrich the knowledge about the basic principles, fundamental concepts and uniquemechanistic steps involved in chemical and biochemical reactions
- ▶ Provide an introduction to key concepts of modern analytical methods and to equip thestudents to handle the modern analytical instruments
- ▶ Expose the students to the rapid development and enormous expansion of every phase ofchemistry

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages
Soni PL	A textbook of Inorganic chemistry	Sulthan Chand & Sons	1988	9788180547928	3352
Lee JD	A new concise inorganic chemistry	Chapman andHall, 1991.	1991	9780412402906	
Skoog DA, West DM, Holler JF	Fundamentals of Analytical Chemistry	New YorkCBS Publ.	1993	9780357450390	933
Vogel AI	Textbook of quantitative chemical analysis,	ELBS Ed.	1994	9780582226289	806
Madan RL, Tuli GD	Physical Chemistry	Sulthan Chand & Sons	2001	9788121918817	687

Nutritional Assessment Methods and Techniques

L	T	P	Total Credits
1	0	1	2

Course Contents/syllabus:

Nutritional Assessment Methods and Techniques	Teaching Hours
Unit I: Definition of nutritional assessment	**5 h**
Introduction to different methods of nutritional assessment methods, Direct parameters- anthropometry, dietary assessment and biochemical parameters Indirect parameters - morbidity, mortality and socio-demographic indicators Body composition, Anthropometry: Length, Height, Weight, Head circumference, Converting measurements to indices, Body mass index, Weight-for-age, Measuring fat-free mass (muscle mass), Mid Upper Arm Circumference (MUAC)	
Unit II: Biochemical methods	**4 h**
Biochemical or laboratory methods for the assessment include measuring anutrient or its metabolite in the blood, feces, urine Biochemical Indicators for assessing - Iron deficiency anemia, Vitamin A deficiency, Iodine deficiency disorder, Calcium and Vitamin D deficiency, Diabetes, Cardiovascular disease	
Unit III: Clinical methods	**5 h**
Checking signs of deficiency: bilateral pitting oedema, Visible severe wasting, Undernutrition in children using new WHO growth standards for wasting, stunting and underweight, inspection of skin, eyes, tongue, ears, mouth, hair, nails, and gums.	
Unit IV: Dietary methods	**4 h**
Types of Diet Surveys- Qualitative and Quantitative Food inventory, 24 hour dietary recall, Weighment (Raw and Cooked Food), Expenditure pattern, Diet history, Food frequency questionnaire, Semi quantitative food frequency, Food diary, Telephonic diet survey, Food balance sheet	

PRACTICALS

1. Data Collection and report writing for nutritional assessment in community

a. Socio economic status

b. Knowledge, Attitude and Practices

c. Dietary Assessment: Food Frequency and 24 Hour Dietary Recall

d. Anthropometry

Course Learning Outcomes:

- Understand fundamentals of nutritional assessment
- Learning methods of nutritional assessment methods
- Demonstrate application of different methods of nutritional assessment methods for different age groups.
- Perceive knowledge modern methods of nutritional assessment using different recourses.

Text / Reference Books:

Author	Title	Publisher	Ed/year	ISBN No	Pages
Catherine Geissler,	Human Nutrition	Oxford University	2017	9780198768029	704

Hilary Powers		Press, New York			
Gibson, R. S.	Principles of Nutritional Assessment	Oxford University Press, New York	1990	9780195058383	691

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Nutritional Assessment Methods and Techniques

L	T	P	Total Credits
1	0	1	2

Course Contents/syllabus:

Nutritional Assessment Methods and Techniques	Teaching Hours
Unit I: Definition of nutritional assessment	**9 h**
Introduction to different methods of nutritional assessment methods, Direct parameters- anthropometry, dietary assessment and biochemical parameters; Indirect parameters - morbidity, mortality and socio-demographic indicators; Body composition, Anthropometry: Length, Height, Weight, Head circumference, Converting measurements to indices, Body mass index, Weight-for-age, Measuring fat-free mass (muscle mass), Mid Upper Arm Circumference (MUAC)	
Unit II: Biochemical methods	**9 h**
Biochemical or laboratory methods for the assessment include measuring anutrient or its metabolite in the blood, feces, urine Biochemical Indicators for assessing - Iron deficiency anemia, Vitamin A deficiency, Iodine deficiency disorder, Calcium and Vitamin D deficiency, Diabetes, Cardiovascular disease	
Unit III: Clinical methods	**9 h**
Checking signs of deficiency: bilateral pitting oedema, Visible severe wasting, Undernutrition in children using new WHO growth standards for wasting, stunting and underweight, inspection of skin, eyes, tongue, ears, mouth, hair, nails, and gums.	
Unit IV: Dietary methods	**9 h**
Types of Diet Surveys- Qualitative and Quantitative Food inventory, 24 hour dietary recall, Weighment (Raw and Cooked Food), Expenditure pattern, Diet history, Food frequency questionnaire, Semi quantitative food frequency, Food diary, Telephonic diet survey, Food balance sheet	

PRACTICALS

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Hilary Powers		Press, New York			
Gibson, R. S.	Principles of Nutritional Assessment	Oxford University Press, New York	1990	9780195058383	691

Semester 5

B.Sc. (H) Nutrition and Dietetics (3 year)									
Semester-wise Distribution of Courses				**5th Semester**					
S. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**					**Credit Units**
				L	**T**	**P**	**FW**	**SW**	
1		Nutritional Biochemistry–I	Core Course	4	0	2	0	0	6
2		Human Physiology–II	Core Course	4	0	2	0	0	6
4		Public Health Nutrition-I	Specialization Elective Courses	3	0	1	0	0	8 (Any two)
5		Quality Control-I	Specialization Elective Courses	4	0	0	0	0	
6		Nutritional Assessment and Surveillance	Specialization Elective Courses	4	0	0	0	0	
7		Food Sanitation and Hygiene	Specialization Elective Courses	4	0	0	0	0	
8		Programming in Python Lab/MOOCs	Skill Enhancement Course	2	0	0	0	0	2
9		Bioentrepreneurship/ MOOCs	Skill Enhancement Course	0	0	2	0	0	2
			Total Credits						**24**
L: lecture; T: training; P: practical; FW: field work; SW: self-work.									

Nutritional Biochemistry-I

L	T	P	SW/FW	Total Credits
4	0	2	0	6

Course content and syllabus:

Nutritional Biochemistry-I	Teaching Hrs
Unit I: **Carbohydrates**	**18 h**
Carbohydrates: Nomenclature, Classification of carbohydrates – monosaccharides, oligosaccharides, polysaccharides – examples and structure. Metabolism – Glycolysis, TCA cycle, HMP Shunt, Glycogenesis, Glycogenolysis. Carbohydrate digestion and absorption. Importance of carbohydrates.	
Unit II: **Lipids**	**18 h**
Lipids: Nomenclature, Classification of simple lipids – fats, oils, waxes. Complex lipids – phospholipids, glycolipids. Derived lipids – steroids, terpenes, carotenoids with examples, structure and function. Digestion and absorption. Fatty acids – classification – essential and non-essential fatty acids, examples, properties, functions. Metabolism – β-oxidation of saturated fatty acids. Biosynthesis and catabolism of cholesterol	
Unit III: **Biological oxidation and enzymes**	**18 h**
Biological oxidation and enzymes: Compounds of ETC, mechanism, oxidative phosphorylation, high energy phosphate – ATP-ADP cycle and energy conservation.	
Unit IV: **Enzymes**	**18 h**
Enzymes: Definition, nomenclature, types and classification of enzymes. Active site. Definition, types of coenzymes, specificity of enzymes. Isoenzymes, enzyme kinetics, factors affecting velocity of enzymes catalysed reactions. Regulation of enzyme activity, enzyme inhibition	

Lab/ Practical details: **(72 Hours total)**

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

1. Qualitative analysis for carbohydrates - Glucose, Fructose, Maltose, Lactose, Sucrose, Starch and Galactose
2. Quantitative analysis in blood and serum - Blood glucose, cholesterol, urea
3. Enzymes – effect of pH on human salivary α-amylase activity

Course learning outcomes

- Understand the principles of biochemistry (as applicable to human nutrition).
- Obtain an insight into the chemistry of major nutrients and physiologically important compounds.
- Understand the biological processes and systems as applicable to human nutrition.
- Apply the knowledge acquired to human nutrition and dietetics

Author	Title	Publisher	Year of publication	ISBN	Pages
Devlin TM	Textbook of Biochemistry with clinical correlations 2nd Ed.,	John Wiley & Sons.	2013	9781478472612	530
Stryer L	Biochemistry	New York: Macmillan International Higher Education	2019	9781319114657	1096
Lehninger AL, Nelson DL, Cox MM	Principles of Biochemistry, 2nd Ed.,	CBS Publ., and distributors	1993	9781429234146	1198

Human Physiology–II

L	T	P	SW/FW	Total Credits
4	0	2	0	6

Course content and syllabus:

Human Physiology-II	Teaching Hrs
Unit I: **Endocrine System**	**18 h**
Endocrine System: Definition, classification of endocrine glands and their hormones, properties of hormones. Thyroid gland hormones – regulation of secretion. Disorders – hypo and hypersecretion of hormone. Adrenal gland - physiological anatomy. Adrenal cortex, cortical hormones – functions and regulation. Adrenal medulla – hormones, regulation and secretion. Functions of adrenaline and nor-adrenalin. Pituitary hormones – anterior and posterior pituitary hormones, secretion, function. Pancreas – hormones of pancreas. Insulin – secretion, regulation, function and action. Diabetes mellitus – regulation of blood glucose level. Parathyroid gland – function, action, regulation of secretion of parathyroid hormone. Calcitonin – function, action, Ca metabolism and hormone regulating Ca metabolism	
Unit II: **Neuro-muscular system**	**18 h**
Neuro-muscular system: Vision – function of different parts of eye, light reflex, refractive errors, colour blindness, night blindness, accommodation. Hearing – function of ear, deafness, vestibular apparatus. Taste buds – functions, smell physiology, receptors. Nervous system: Functions of nervous system, neuron structure, classification and properties, neuroglia. Nerve fibre, classification, conduction of impulses, factors affecting conduction. Synapse - structure, types, properties. Receptors - definition, classification, properties. Reflex action - reflex arc, properties of reflex action. Spinal cord nerve tracts - function. Functions of medulla, pons, hypothalamus. Cerebral cortex, lobes and functions, sensory cortex, motor cortex. Cerebellum - functions. Basal ganglia - functions, EEG, Parkinson's disease. Cerebro Spinal Fluid (CSF) - formation, circulation, properties, composition and functions, lumbar puncture, sleep, types of sleep. Muscle nerve physiology: Classification of muscle, structure of skeletal muscle, sarcomere, contractile proteins. Neuromuscular junction, transmission across neuromuscular junction, excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue. Rigor mortis, isometric and isotonic concentration. Autonomic nervous system: Sympathetic and parasympathetic distribution and functions.	
Unit III: **Excretory system**	**18 h**
Excretory system: Excretory organs - Kidney: function, structural and functional unit - nephrons, vasarecta, cortical and juxtamedullary nephrons - comparison, juxtaglomerular apparatus - structure and function. Renal circulation peculiarities. Mechanism of urine formation – ultrafiltration, criteria for filtration, GFR, plasma fraction, determination of GFR. Selective reabsorption - sites of reabsorption, substance reabsorbed, mechanisms of reabsorption. Tubular secretion, properties and composition of normal urine output. Abnormal constituents of urine. Counter-current mechanisms: micturition, innervations of bladder, cystourethrogram. Diuretics: water, diuretics, osmotic diuretics, artificial kidney, renal function tests.	
Unit IV: **Skin**	**18 h**
Skin - function. Body temperature measurement, physiological variation, regulation of body temperature by physical, chemical and nervous mechanisms. Hypothermia and fever. Reproductive system and puberty. Male	

reproductive system - functions of testis, spermatogenesis, spermiogenesis - stages, factors influencing semen, endocrine functions of testis. Androgens - Testosterone - structure and functions. Female reproductive system - ovulation, menstrual cycle, physiological changes during pregnancy, pregnancy test. Lactation: Composition of milk factors controlling lactation. Contraception	

Lab/ Practical details: (72 Hours)

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

1. Bleeding time
2. Clotting time
3. Total leucocyte count,
4. RBC count
5. Differential WBC count
6. Instruments used in haematology

Course learning outcomes

- Understand about human physiology
- Compare roles of different organs
- Demonstrate functioning of functioning of human organs
- Perceive knowledge of disease related to human organs

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Guyton AC, Hall JE	Textbook of Medical Physiology, 9th Ed.,	Prism Books Pvt Ltd., Bangalore	1996	9781455770052	1168
Wilson	Anatomy and Physiology in Health and Illness,	Edinburgh Churchill Livingstone	1989	9780443101014	490

Public Health Nutrition-I

L	T	P	SW/FW	Total Credits
3	0	1	0	4

Course content and syllabus:

Public Health Nutrition I	Teaching Hrs
Unit I: Nutritional Deficiency Disorders in India	**14 h**
Epidemiology, Etiology Functional effects, Prevention and Control: Under-nutrition, Iron deficiency Anemia, Vitamin A Deficiency, Iodine Deficiency, Other Deficiencies- Fluorine, Zinc Immunization: Importance and Immunization schedule for children	
Unit II: National Nutrition Programs	**13 h**
Objectives, Target Groups, Monitoring Systems, Mode of Implementation, Administrative Setup, Coverage Compliance, Impact, Operational Hurdles, Successes: Integrated Child Development Services Scheme, Mid-Day Meal Program, National Iron Plus Initiative, Program for control of Iodine Deficiency Disorder, Zinc deficiency and its management	
Unit III: Key Programs in Health and Other Sectors	**14 h**
Contribution to nutrition, Objectives and key Strategies: NUHM, NRHM, RCH, ICDS, IMNCI – National programs and guidelines for controlling in India with emphasis on IYCF, Women's Development Programs, Food Security and Agriculture Interventions, Livelihood and poverty Alleviation Programs (eg. NREGA), Water and Sanitation Programs, Public Distribution System (PDS), Anthyodaya Anna Yojana; National Food Security Act; National Food for Work Program	
Unit IV: Health agencies	**13 h**
National and international agencies in combating malnutrition : Aims, functions, programmes and policies: International - WHO, FAO, UNICEF National - ICAR, ICMR, NIN, NFI, FNB, CFTRI, NNMB, NSI, DFRL	

PRACTICALS (Total Hours = 36)

1. Data Collection and report writing for nutritional assessment in community
   a. Socio economic status
   b. Knowledge, Attitude and Practices
   c. Dietary Assessment: Food Frequency and 24-Hour Dietary Recall
   d. Anthropometry
   e. Questionnaire formulation – data collection on immunization in field, health programmes and services availed by community
   f. Assessing nutritional status of community

Course learning outcomes

- Be aware of nutritional deficiency disorders in India.
- Understand national nutrition programs
- Recognize key programs in health and other sectors
- Perceive knowledge of Indian and international health agencies

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages
Gibney MJ, Margetts BM, Kearney JM, Arab L	Public healthnutrition	Blackwell.	2005	9781299158528	378
Lawrence M, Worsley T	Public health nutrition fromprinciples to practice,	Chennai microprint (P) Ltd., Chennai.	2007	9780335223206	496
SrilakshmiB	Nutrition science,5th Ed.,	New age international (P) limited.	2016	9788195175574	526
Park K	Textbook of preventive and social medicine	Banarsidas Bhanot Publ.,, Jabalpur.	1997	9789382219125	976
Lawrence M, Worsley T	Public health nutrition fromprinciples to practice,	Chennai microprint (P) Ltd., Chennai.	2007	9780335223206	496
SrilakshmiB	Nutrition science,5th Ed.,	New age international (P) limited.	2016	9788195175574	526
Park K	Textbook of preventive and social medicine	Banarsidas Bhanot Publ.,, Jabalpur.	1997	9789382219125	976

Quality Control – I

L	T	P	SW/FW	Total Credits
4	0	0	0	4

Course content and syllabus:

Quality Control - I	Teaching Hrs
Unit I: **Food Laws**	**18 h**
Food Laws: PFA - Mode of work and duties of food inspectors. Essential commodities act: fruit product order, milk and milk product order, meat product order, cold storage order, the vegetable oil product order, standard and weight measurement act, the infant milk substitute, feeding bottles and infant food act.	
Unit II: **Food standards**	**18 h**
Food standards: ISI, AGMARK, Export inspection council, consumer protection act, CODEX Alimentarius, FSSAI. HACCP - Importance. Principles. Determination of CCP. Problems in implementing HACCP. Importance of TQM, GMP and GLP.	
Unit III: **Adulteration of food**	**18 h**
Adulteration of food: Definition. Types. Contamination of food by incidental adulteration by microorganisms, packing materials and other sources. Tests to detect common adulterants.	
Unit IV: **Food technology**	**18 h**
Food technology: Biotechnology in food: Application, GM foods. Nutraceuticals. Organic foods. Packaging of foods: Classification, types of packaging materials – paper, plastics, glass, tins and metals, packaging of different food products – bakery, dairy, dehydrated, fresh fruits and vegetables, fats and oils, frozen food products.	

Course Learning Outcomes

- Understand Food Laws
- Acquire knowledge of Food standards
- Compare different adulterants by different methods
- Perceive knowledge of nutraceuticals and functional foods.

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Keister DC	Food and beverage control	Prentice Hall Inc, New Jersey	1990	9780133232394	450
Coltman MM	Food and beverage cost control,	Prentice Hall Inc, New Jersey	1985	13980984	228

Nutritional Assessment and Surveillance

L	T	P	SW/FW	Total Credits
4	0	0	0	4

Course content and syllabus:

Nutritional Assessment and Surveillance	Teaching Hrs
Unit I: Nutritional status assessment and surveillance	**18 h**
Nutritional status assessment and surveillance - Meaning, need, objectives and importance. Community, regional, national, and international surveillance systems. Rapid assessment procedures - Need, importance, techniques, interpretation and steps in RAP. Sources of secondary health data - sources of relevant vital statistics, importance of infant, child, maternal mortality rates, and epidemiology of nutrition related disease.	
Unit II: Growth chart	**18 h**
Growth chart - Meaning, WHO Chart, and charts used in India, uses, use of growth charts for various age groups. meaning of reference curve and growth curve. Anthropometry: Need, importance, standards for reference, techniques of measuring height, weight, head circumference, chest circumference, mid-arm circumference, skin fold thickness, waist hip ratio, calculation of BMI, interpretation of the measurements	
Unit III: Nutritional assessment	**18 h**
Nutritional assessment - Diet Surveys: need, importance, methods, interpretation, concept of conception unit, intra inter individual distribution in the family, verifying the adequacy of the diet with respect to RDA, concept of family food security. Clinical signs, biochemical and biophysical methods: need, importance, identifying signs of deficiency diseases, interpretation of the clinical signs, biochemical and biophysical values in major diseases.	
Unit IV: Nutritional care process	**18 h**
Nutritional care process - Medical History assessment. Assessment of patient needs. Dietary counselling - Evaluation of the effectiveness of counselling. Education of the patient and follow up. Role of Dietitian – Professional code and ethics of a dietitian. Problems in feeding children at the hospitals. Psychology of feeding the patient.	

Course learning outcomes

- Assess nutritional status
- Compare growth charts
- Demonstrate nutritional assessment of different foods
- Perceive knowledge of nutritional care process

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Mahan LK, Escott-Stump S	Krause's Food Nutrition and Diet Therapy 10th Ed.,	W.B. Saunders Ltd.	2008	9781416034018	1352
Zeeman FJ	Applications of clinical nutrition. Englewood cliffs	Prentice Hall International Inc.	1998	707619489	454
Thomas B	Blackwell Manual of Dietetic	Oxford: New York	2019	9781119235927	

	practice, 2nd Ed.,				
Mudambi SR, Rajagopal MV	Fundamental of food, nutrition and diet therapy	New age International Publ., New Delhi,	2015	9788122433494	400

Food Sanitation and Hygiene

L	T	P	SW/FW	Total Credits
4	0	0	0	4

Course content and syllabus:

Food Sanitation and Hygiene	Teaching Hrs
Unit I: Personal Hygiene & Importance of Water	**18 h**
Personal Hygiene & Importance of Water: General principles of food hygiene. Necessity for personal health and Hygiene (Hands and skin, hair, nose, mouth and ears, cuts, boils etc), medical check-up. Habits, Importance of Rest, Exercise and Recreation. Protective Clothing. GMP & GLP and Sanitary aspects of building and equipment. Equipment for personal hygiene.	
Unit II: Methods of Purification of Water	**18 h**
Sources of water, contamination of water. Importance of water and Purification of Water, Different methods of purification, potable water. Water quality standards, Criteria for judging water quality. Sanitary aspects of water supply, water sewage treatment	
Unit III: Food Contamination	**18 h**
Food Contamination, Poisonings Food borne diseases: Different Types of contamination - Bacterial, Physical, Chemical. Food Poisoning - common types and its symptoms (Salmonella, Clostridium perfringens, Botulism, Staphylococcus).	
Unit IV: Prevention of food poisoning	**18 h**
Prevention of food poisoning. Cross contamination in food plants. Food Borne Diseases/ Illness - Amoebiasis, Acute diarrhoea /dysentery, Typhoid	

Course Learning Outcome

- Obtain an insight into various aspects of hygiene and sanitation
- Gain knowledge on purification of water
- Understand food contamination and poisoning

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Johns N	Managing Food Hygiene	Palgrave Macmillan	1997	9780333651179	357
Park K	Park's textbook of preventive and social medicine	India : Bhanot Publishers,	2017	9789382219125	976
Roday S	Food Hygiene and Sanitation with case studies, 2nd Ed.,	TATA McGraw Hill Education Pvt. Ltd. New Delhi.	2011	9780070700208	425
Sprenger RA	The Food Hygiene Handbook	High Field Publication	2000	9781871912005	40

Bioentrepreneurship

L	T	P	Total Credits
2	**0**	**0**	**2**

Course Objectives: To help students gain understanding of the basic concepts of entrepreneurship, diagnose new business opportunities, formulate business plans, and identify different institutional support available to the entrepreneurs.

Course Content/ Syllabus

	Weightage (%)	**Teaching Hours**
Unit I: Basic Concepts of Entrepreneurship	**25**	**9**
Introduction to Entrepreneurship: Meaning, Background, Importance, The Benefits of Entrepreneurship, The Potential Drawbacks of Entrepreneurship, Factors that Influence Entrepreneurship, How to Avoid the Pitfalls, Factors Responsible for Entrepreneurship Growth; Entrepreneur Background and Characteristics; Entrepreneurial Potential in a Prospective Entrepreneur; Entrepreneurial Skills and Competencies; Types of entrepreneurs and entrepreneurship, Myths and Realities about Entrepreneurs; New Trends in Entrepreneurship Development; Economic Development through Entrepreneurship; Role of Entrepreneurship in the Economic Development of India		
Unit II: Environmental Monitoring and Importance of Business Idea	**25**	**9**
Creativity and innovation, Role of Creativity & Innovation in Entrepreneurship, Sources of New Ideas – Consumers, Existing Products and Services, Distribution Channels, Federal Government, Research and Development; Methods of Generating Ideas – Focus Groups, Brainstorming, Brainwriting, Problem Inventory Analysis; Creative Problem Solving – Brainstorming, Reverse Brainstorming, Brainwriting, Gordon Method, Checklist Method, Free Association, Forced Relationships, Collective Notebook Method, Attribute Listing Method, Big-dream Approach, Parameter Analysis, Mind Mapping, Force-Field Analysis, TRIZ, Rapid Prototyping; Innovation, Types of Innovation – Breakthrough, Technological, and Ordinary Innovation; Opportunity Recognition; Product Planning and Development Process – Idea Stage, Concept Stage, Product Development Stage, Test Marketing Stage, and Commercialization Stage; Technology Readiness Levels; Intellectual Property Rights		
Unit III: Scanning the Environment & Business Plan Development	**25**	**9**

Identifying the business opportunity: SWOT and PESTEL analysis, Viability Screening/Feasibility Analysis: Market Feasibility, Production Feasibility, Organisational Feasibility, Financial Feasibility; Business Plan Development: Introduction, Business Plan, Various Business Models – The Business Model Canvas, The Lean Canvas, Types of Business Plans, Structure of a Basic Business Plan, Creating a Business Plan – Executive Summary, General Company Description, The Opportunity or Competitive Analyses, Market Research and Industry Analysis, Strategy, The Team, Marketing Plan, Operational Plan, Financial Plan, and An Appendix		
Unit IV: Sources of Capital and Institutional Support for Entrepreneurs	**25**	**9**
Sources of Funding for Entrepreneurs: Bootstrapping, Friends and Family Members, Crowdfunding, Angel Investment, Venture Capital, Financial Institutions, Bank Loans, Trade Credit, Initial Public Offerings/Issue of Shares, Debentures; Role of Government in Promoting Entrepreneurship: Atal Innovation Mission, Biotechnology Industry Research Assistance Council, Department of Science and Technology, Digital India, Jan Dhan-Aadhaar-Mobile, Make in India, National Skill Development Mission, Pradhan Mantri Kaushal Vikas Yojana, Science for Equity Empowerment and Development, Stand-Up India, Start-Up India, Support to Training and Employment Programme for women, Trade-Related Entrepreneurship Assistance and Development, USAID		

Course Learning Outcomes: On completion of the course, the student shall be able to:

- Understand the concept of entrepreneurship, its emergence and its need for society.
- Formulate a business idea and diagnose for a new business opportunity.
- Identify various business gaps and develop a business plan
- Evaluate and identify different institutional support available to the entrepreneur.

List of Professional Skill Development Activities (PSDA):

- Research on growth profile of an entrepreneur
- Identify opportunity, generate idea and conduct feasibility Analysis
- Design a Business Plan
- Develop an Entrepreneur Journal where reflection and personal experiences will be recorded
- Write personal insights, lessons learned, other readings, and the video clips you watch in this semester
- Interview one entrepreneur mentor and come up with five good business questions you would like to ask him or her
- Comparative study of startups in the field of Biopharmaceuticals, Bioagriculture, Bioindustry, and Bioservices.

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Evan J. Douglas	Entrepreneurial Intention: Past, Present, and Future Research	Edward Elgar Publishing	2020	978-1-78897-522-3	216
Justin G. Longenecker, J. William Petty, Leslie E. Palich, and Frank Hoy	Small Business Management: Launching & Growing Entrepreneurial Ventures (20th Edition)	Cengage	2023	978-0-3577-1880-3	712
Mike Kennard	Innovation and Entrepreneurship	Routledge	2021	978-0-367-51057-2	114
Debasish Biswas and Chanchal Dey	Entrepreneurship Development in India	Routledge	2021	978-0-367-76219-3	117
Robert D. Hisrich, Micheal P. Peters, Dean A. Shepherd, Sabyasachi Sinha	Entrepreneurship (11th Edition)	McGraw Hill	2020	978-9390113309	696
Donald F. Kuratko and Jeffrey S. Hornsby	New Venture Management: The Entrepreneur's Roadmap for Development, Management, and Growth (3rd Edition)	Routledge	2020	978-0367466725	356
Bruce R. Barringer and R. Duane Ireland	Entrepreneurship: Successfully Launching New Ventures (6th Edition)	Pearson	2019	978-1-292-25533-0	617
Norman M. Scarborough and Jeffrey R. Cornwall	Essentials of Entrepreneurship and Small Business Management (9th Edition)	Pearson	2019	978-1-292-26602-2	827
Mary Jane Byrd and Leon Megginson	Small Business Management: An Entrepreneur's	McGraw Hill	2017	978-1259538988	496

	Guidebook (8th Edition)				
Robert D. Hisrich and Veland Ramadani	Effective Entrepreneurial Management: Strategy, Planning, Risk Management, and Organization	Springer	2017	978-3-319-50465-0	230
Stephen Spinelli, Jr. and Robert J. Adams, Jr.	New Venture Creation: Entrepreneurship for the 21st Century (10th Edition)	McGraw-Hill Education	2016	978-0-07-786248-8	484
David H. Holt	Entrepreneurship: New Venture Creation	Pearson	2016	978-9332568730	584
Peter F. Drucker	Innovation and Entrepreneurship	Harper Business	2006	978-0060851132	288
Robert J. Calvin	Entrepreneurial Management	McGraw-Hill	2005	9780071450928	295
Steve Mariotti	Entrepreneurship and Small Business Management	Pearson publishers	2014	978-0133767186	

Programming in Python Lab

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
0	0	4	0	2

Course Contents/syllabus:
List of Experiments **(Total:36 Hours)**

1. Compute sum, subtraction, multiplication, division and exponent of given variables input by the user.
2. Compute area of following shapes: circle, rectangle, triangle, square, trapezoid and parallelogram.
3. Compute volume of following 3D shapes: cube, cylinder, cone and sphere.
4. Compute and print roots of quadratic equation ax2+bx+c=0, where the values of a, b, and c are input by the user.
5. Print numbers up to N which are not divisible by 3, 6, 9,, e.g., 1, 2, 4, 5, 7,….
6. Write a program to determine whether a triangle is isosceles or not?
7. Print multiplication table of a number input by the user.
8. Compute sum of natural numbers from one to n number.
9. Print Fibonacci series up to n numbers e.g. 0 1 1 2 3 5 8 13…..n
10. Compute factorial of a given number.
11. Count occurrence of a digit 5 in a given integer number input by the user.
12. Print Geometric and Harmonic means of a series input by the user.
13. Evaluate the Arithmetic expressions.
14. Print all possible combinations of 4, 5, and 6.
15. Determine prime numbers within a specific range.
16. Count number of persons of age above 60 and below 90.
17. Compute transpose of a matrix.
18. Perform following operations on two matrices.
    1) Addition 2) Subtraction 3) Multiplication
19. Count occurrence of vowels.
20. Count total number of vowels in a word.
21. Determine whether a string is palindrome or not.
22. Perform following operations on a list of numbers:
    1) Insert an element 2) delete an element 3) sort the list 4) delete entire list
23. Display word after Sorting in alphabetical order.
24. Perform sequential search on a list of given numbers.
25. Perform sequential search on ordered list of given numbers.
26. Maintain practical note book as per their serial numbers in library using Python dictionary.
27. Perform following operations on dictionary
    1) Insert 2) delete 3) change
28. Check whether a number is in a given range using functions.
29. Write a Python function that accepts a string and calculates number of upper case letters and lower case letters available in that string.

30. To find the Max of three numbers using functions.
31. Multiply all the numbers in a list using functions.
32. Solve the Fibonacci sequence using recursion.
33. Get the factorial of a non-negative integer using recursion.
34. Write a program to create a module of factorial in Python**.**

Course Learning Outcomes: After studying this course students will be able to:

1. Explain environment, data types, operators used in Python.
2. Compare Python with other programming languages.
3. Outline the use of control structures and numerous native data types with their methods.
4. Design user defined functions, modules, files, and packages and exception handling methods.
5. Learn to handle exceptions in Python.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Programming in Python	Programming in Python	BPB	2017	978-9386551276
R. Nageswara Rao	Core Python Programming	Dreamtech Press	2021	978-9390457151
Martin C. Brown	Python, The complete Reference	Tata Mc. Graw Hill	2018	978-9387572942
A. Martelli, A. Ravenscroft, S. Holden	Python in a Nutshell	Shroff/O'Reilly	2017	978-9352135400

Semester 6

B.Sc. (H) Nutrition and Dietetics (3 year)									
Semester-wise Distribution of Courses				**6th Semester**					
S. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**					**Credit Units**
				L	**T**	**P**	**FW**	**SW**	
1		Nutritional Biochemistry–II	Core Course	4	0	2	0	0	6
2		Therapeutic Nutrition – II	Core Course	4	0	2	0	0	6
3		Public Health Nutrition-II	Specialization Elective Courses	4	0	0	0	0	8 (Any Two)
4		Food Sanitation and Hygiene	Specialization Elective Courses	4	0	0	0	0	
5		Advancements in Clinical and Therapeutic Nutrition	Specialization Elective Courses	4	0	0	0	0	
6		Quality Control – II	Specialization Elective Courses	4	0	0	0	0	
7		Research Methodology/MOOCs	Skill Enhancement Course	2	0	0	0	0	2
		Biosensors/MOOCs	Skill Enhancement Course	2	0	0	0	0	2
			Total Credits						**24**
L: lecture; T: training; P: practical; FW: field work; SW: self-work.									

Therapeutic Nutrition – II

L	T	P	SW/FW	Total Credits
4	0	2	0	6

Course content and syllabus:

Therapeutic Nutrition - II	Teaching Hrs
Unit I: **Diet in Obesity and overweight**	**18 h**
Obesity - Epidemiology, Etiology, Prevention, Assessment, Type, Regional distribution of fat in body, Metabolic changes, Dietary management, Bariatric surgery	
Unit II: **Diet in Diabetes Mellitus**	**18 h**
Pathophysiology of diabetes mellitus, complications of diabetes mellitus, causes, Type, Diagnostic and screening criteria, dietary management of diabetes mellitus Role of alternate sweeteners Hypoglycemia-Classification, symptoms, postprandial or reactive hypoglycemia, early alimentary and late reactive hypoglycemia, idiopathic hypoglycaemia	
Unit III: **Nutrition in Cardiovascular Diseases**	**18 h**
Introduction, Risk Factors, Causes, Symptoms, Diet Therapy in following: Atherosclerosis, Hyperlipidemia, Coronary heart disease, Myocardial infraction, Hypertension	
Unit IV: **Medical Nutrition Therapy for Cancer**	**18 h**
Cancer, types of etiological factors, Role of diet in prevention of all types of cancers, Nutritional management of cancer patients undergoing radio therapy, chemotherapy, Diet to be followed after treatment, Cachexia	

Lab/ Practical details: **(72 Hours total)**

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

Planning, preparing diets and calculating the major nutrients of following:

1) Obesity and overweight
2) Diabetes Mellitus,
3) Cardiovascular Diseases
4) Cancer

Course learning outcomes

- Understand role of Diet in Obesity and overweight
- Learn about the selection of diet for diabetes mellitus.
- Get familiar with nutritional needs for Diet in Diabetes Mellitus
- Perceive knowledge about the significance of medical nutrition therapy for cancer.

Textbooks

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages
Shanti Ghosh	The feeding and care of infants and youngchildren,	New Delhi : Voluntary Health Association of India, 1992.	1992	3205275 2	225
Mclaren DS, Meguid MM	Nutrition and its disorders,	Churchhill Livingstone	1988	9780443 037825	293
Srilakshmi B	Dietetics, 6th Ed., New Age	International Publ., New Delhi	2011	9788122 430660	435

Nutritional Biochemistry – II

L	T	P	SW/FW	Total Credits
4	0	2	0	6

Course content and syllabus:

Nutritional Biochemistry - II	Teaching Hrs
Unit I: Proteins	**18 h**
Proteins – Amino acids, chemical bonds (peptide, ionic, hydrogen bonds, van der Waal's forces and hydrophobic interactions) involved in protein structure, Protein configuration – primary, secondary, tertiary and quaternary structures with suitable examples, biological role of proteins. Classification of proteins – simple, conjugated proteins, derived proteins with examples. Biosynthesis, protein digestion and absorption, protein malnutrition.	
Unit II: Nucleic acids	**18 h**
Nucleic acids: Introduction, components, nucleosides, nucleotides - DNA, base composition, double helical structure, DNA – Denaturation, DNA replication mechanism, DNA Repair Mechanisms, Transcription – requirements and mechanism. RNA – Types, structure and functions	
Unit III: Hormones	**18 h**
Hormones: Biological role of hormones of pituitary, adrenal Cortex and Medulla, Thyroid Parathyroid and Pancreas.	
Unit IV: Vitamins	**18 h**
Vitamins: Chemistry and biochemical role of fat-soluble vitamins – A, D, E and K. Water soluble vitamins B1, B2, B3, B6 and C. Storage of vitamins in the body, daily human requirements, deficiency disorders. Minerals: Biochemical role of inorganic elements, deficiency disorders**.**	

Lab/ Practical details: **(72 Hours total)**

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments -with basic instructions

1. Qualitative analysis for proteins - Egg albumin, Gelatin, Peptone and Casein
2. Quantitative analysis - Serum inorganic phosphate, Serum protein, Creatinine in urine,
3. Estimation of Ascorbic acid content of foods by colorimetric method, Estimation of DNA and A/G ratio

Course Learning Outcomes

- Understand the principles of biochemistry (as applicable to human nutrition).
- Obtain an insight into the chemistry of major nutrients and physiologically important compounds.
- Understand the biological processes and systems as applicable to human nutrition.
- Apply the knowledge acquired to human nutrition and dietetics

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
West ES, Todd WR, Mason HS, Van Bruggen JT	Textbook of Biochemistry, 4th Ed.,	Amerind Publ. Co. Pvt. Ltd.,	1995	772507887	1595

Devlin TM	Textbook of Biochemistry with clinical correlations, 2nd Ed.,	Wiley and sons.	1986	9781478472612	530

Public Health Nutrition-II

L	T	P	SW/FW	Total Credits
4	0	0	0	4

Course content and syllabus:

Public Health Nutrition-II	Teaching Hrs
Unit I: **Community nutrition and malnutrition**	**18 h**
Concept of community nutrition and malnutrition. Indicators of malnutrition -Infant mortality rate, Child Mortality. Maternal mortality rate, Birth rate, Death rate, Census Identification of vulnerable groups - Pregnant women, Nursing mother, Infants, Children with Special emphasis to girl child (including adolescents).	
Unit II: **Introduction to the millennium development goals**	**18 h**
Core themes of the United Nations Millennium Development Goals, Introduction to the specific MDGs, MDG global targets and indicators, Institutional framework for implementing MDG in India, National & State progress on health & nutrition related goals, Possible required/alternative strategies for accelerating achieving specific MDG's	
Unit III: Introduction to the state development goals	**18 h**
Introduction, SDG list, SDG goal and framework for implementation, SDG index, National & State progress on health & nutrition related goals, Possible required/alternative strategies for accelerating achieving specific SDG's	
Unit IV: Development and Management concepts	**18 h**
Human Development Index (HDI): Goals of Human Development and indicators used, Human Development Index (HDI): Asia and India, Hunger Index: Indicators and interpretation, Copenhagen consensus: Highlights and recommendations	

Course learning outcomes

- Understand the Concept of community nutrition and malnutrition
- Differentiate between state development goals and millennium development goals
- Understand concept of human development index
- Perceive knowledge of Hunger Index and Copenhagen consensus

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Mahan LM, Sylvia ES	Krause's Food Nutrition and Diet Therapy, 11th Ed.,	Saunders, Elsevier	2004	9781416034018	1352
Srilakshmi B	Dietetics, 6th Ed.,	New Age International Ltd., New Delhi	2011	9788122430660	435
Robinson CH, Lawler	Normal and therapeutic	Macmillan Publ. Co.	2006	9780024026057	757

MR, Chenoweth WL, Garwick AE	nutrition, 17th Ed.,				

Food Sanitation and Hygiene

L	T	P	SW/FW	Total Credits
4	0	0	0	4

Course content and syllabus:

Food Sanitation and Hygiene	Teaching Hrs
Unit I: Personal Hygiene & Importance of Water	**18 h**
Personal Hygiene & Importance of Water: General principles of food hygiene. Necessity for personal health and Hygiene (Hands and skin, hair, nose, mouth and ears, cuts, boils etc), medical check-up. Habits, Importance of Rest, Exercise and Recreation. Protective Clothing. GMP & GLP and Sanitary aspects of building and equipment. Equipment for personal hygiene.	
Unit II: Methods of Purification of Water	**18 h**
Sources of water, contamination of water. Importance of water and Purification of Water, Different methods of purification, potable water. Water quality standards, Criteria for judging water quality. Sanitary aspects of water supply, water sewage treatment	
Unit III: Food Contamination	**18 h**
Food Contamination, Poisonings Food borne diseases: Different Types of contamination - Bacterial, Physical, Chemical. Food Poisoning - common types and its symptoms (Salmonella, Clostridium perfringens, Botulism, Staphylococcus).	
Unit IV: Prevention of food poisoning	**18 h**
Prevention of food poisoning. Cross contamination in food plants. Food Borne Diseases/ Illness - Amoebiasis, Acute diarrhoea /dysentery, Typhoid	

Course Learning Outcome

- Obtain an insight into various aspects of hygiene and sanitation
- Gain knowledge on purification of water
- Understand food contamination and poisoning

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Johns N	Managing Food Hygiene	Palgrave Macmillan	1997	9780333651179	357
Park K	Park's textbook of preventive and social medicine	India : Bhanot Publishers,	2017	9789382219125	976
Roday S	Food Hygiene and Sanitation with case studies, 2nd Ed.,	TATA McGraw Hill Education Pvt. Ltd. New Delhi.	2011	9780070700208	425
Sprenger RA	The Food Hygiene Handbook	High Field Publication	2000	9781871912005	40

Advancements in Clinical and Therapeutic Nutrition

L	T	P	SW/FW	Total Credits
4	0	0	0	4

Course content and syllabus:

Advancements in Clinical and Therapeutic Nutrition	Teaching Hrs
Unit I: Functional Foods and Nutraceuticals	**18 h**
Functional Foods / Nutraceuticals – Definition, Importance and criteria, Dietary supplements drivers for functional foods and nutraceuticals, Claims about functional foods, Nutraceuticals, and supplements, Food product development for therapeutic purposes	
Unit II: Antioxidants in Health and Disease	**18 h**
Antioxidants – Definition, Oxidative stress, Effects of oxidants on macromolecules (CHO, proteins, lipids, nucleic acids), Antioxidant defence system (Enzymatic and Nonenzymatic), Location of action of various antioxidants, Food sources of antioxidant nutrients, Antioxidants role in maintaining good health	
Unit III: Probiotics and Prebiotics	**18 h**
Probiotics – Definition, Probiotic products, Selection criteria, Probiotics and the gut Prebiotics – Definition, Types of prebiotics, Emerging prebiotics, Recent research	
Unit IV: Drug–Nutrient Interactions	**18 h**
Classification, Factors affecting drug–nutrient interactions, Mechanism, Effect of meal intake on drug and nutrient absorption, Drug–nutrient interactions involving alteration of physiologic functions, Drug–nutrient interactions associated with dietary supplements	

Course Learning outcomes

- Know the role of functional foods in health.
- Understand the role of antioxidant in health and disease preventions.
- Acquire the knowledge of probiotic and prebiotic in health.
- Perceive the knowledge of drug-nutrient interaction and their health implications.

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages
Mudambi SR, Rao SM, Rajagopal MV	Food Science, 2nd Ed.,	New Age International Pvt. Ltd. Publ., New Delhi	2006	9788122417791	224
Srilakshmi B	Food Science,	New Age International Pvt. Ltd, New Delhi, Reprint	2015	9788122438093	490

Manay SN, Shadaksharaswamy M	Foods - Facts and Principles . 2nd Ed.,	New Age International (P) Ltd, New Delhi	2005	9788122422153	490

Quality Control – II

L	T	P	SW/FW	Total Credits
4	0	0	0	4

Course content and syllabus:

Quality Control - II	Teaching Hrs
Unit I: Food quality and quality control	**18 h**
Food quality and quality control: Definitions. Principles of quality control. Food quality. Sample and sampling methods. Industrial quality control: Raw material control, Process control, Finished. Product control and inspection.	
Unit II: Food additives, fortification, and enrichment	**18 h**
Food additives, fortification, and enrichment: Definitions. Principles and objectives. Classification and uses. Colouring agents: Natural, Synthetic and non-certified colours. Leavening agents: Classification and uses. Flavouring agents: Natural and Synthetic flavours.	
Unit III: Food fortification and enrichment	**18 h**
Food fortification and enrichment: Definition and importance. Principles. Commonly fortified and enriched foods. Non-nutritional constituents and food safety: naturally occurring toxicants, microbial toxins, bacterial food poisoning and contamination arising from processing	
Unit IV: Sensory evaluation of food quality	**18 h**
Sensory evaluation of food quality: Sensory characteristics of food, Types of tests. Objective evaluation: Types of tests, Texture evaluation. Conducting sensory tests and preparation of evaluation card	

Course Learning Outcomes

- Gain an insight into quality of food
- Know the importance and uses of food additives
- Know how food is fortified and enriched with certain nutrients
- Be familiar with the sensory evaluation of various quality parameters of food.

Text / Reference Books:

Author	Title	Publisher	Year of publication	ISBN	Pages
Keister DC	Food and beverage control	Prentice Hall Inc, New Jersey	1990	9780133232394	450
Coltman MM	Food and beverage cost control,	Prentice Hall Inc, New Jersey	1985	13980984	228