CHOICE BASED CREDIT SYSTEM

RAJA NARENDRA LAL KHAN WOMEN'S COLLEGE (AUTONOMOUS)

UNDERGRADUATE PROGRAMME FOR NUTRITION
(Courses effective from Academic Year 2018-19)

SYLLABUS OF COURSES TO BE OFFERED
Core Courses, Elective Courses & Ability Enhancement Courses

Background/ Preamble & Guideline

Graduates of the B.Sc. (Honours) Nutrition programme was started from 2006. Nutrition has been recognized and given a special role in national development. This curriculum aims at training students to take up leadership roles in extension and community outreach programs. The students are encouraged to develop a scientific temper. Familiarizing them with the use of newer technologies, methods in family and community linkages, and sustainable use of resources for human development are the hall mark of this course. This course aims at enriching the minds of the students who have interest in learning finer points of nutrition. Nutrition generates lot of concerns, issues and is very close to individual heart. Nutrition is the key to facilitate the study and enhance the quality of human life. Its approach is therefore inherently interdisciplinary. Its curriculum that engages the student through teaching, research and extension. This course aims to develop a holistic and multidimensional understanding of the various topics .Syllabus covers basic aspects of nutrients, food science , nutrition concerns in various stages of life cycle, food safety , food security as well as open a vast understanding of the current spectrum of malnutrition. This course equips the students for skill development, academic understanding, entrepreneurship, community role and employment in various fields of food industry, health clinics, NGOs, etc.

The course in Choice Based Credit System would be of 3 year duration having 6 semesters, divided into 14 Core papers, 4 Discipline Specific Elective courses, 2 Skill Enhancement Elective Courses and 4 Generic Elective Courses. Each Year would consist of 2 semesters. These core course papers (C1 to C14)are compulsory to be studied by a student to complete the requirement of B.Sc. (Hons) Nutrition programme. The students will study two core papers per semester in first year, three core papers per semester in the second year and two core papers per semester in the third year. The core papers (6 credits each) will comprise of theory (4 credits) and practical (2 credits). Elective courses can be chosen from a pool of papers. There are two kinds of electives: (a) Discipline Specific Elective (DSE): There are nine such papers, out of which Nutrition student will choose any two in fifth and sixth semester each. The Discipline specific elective papers (6 credits each) will comprise of theory (4 credits) and practical (2 credits) like the core papers. (b) Generic Elective (GE): Different generic elective papers will be offered to students of other departments of the college and the student will have the option to choose one generic elective paper each in the first four semesters. The generic elective will be of six credits each. The Department of Nutrition is offering generic elective papers for students of other departments. These generic elective papers (6 credits each) will comprise of theory (4 credits) and practical (2 credits). Besides the core and elective courses, there are two ability enhancement compulsory courses, AECC-2 (Environmental Studies) and AECC-1 (English communication) of two credits each. The student is supposed to take one in each semester of the first year. The students will also undertake two Skill Enhancement Course (SEC) courses of two credits each in III and IV semester of second year which they can choose from the list of SECoffered by the college. In the CBCS system, a credit is unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week. A minimum of 140 credits are required to obtain degree in B.Sc. Nutrition (Hons.).

Program Learning Outcomes (PLO)

1. Students of the B.Sc. (Honours) Nutrition programme will learn to use scientific logic as they explore a wide range of contemporary subjects spanning various aspects of basic Nutrition such as Food Biochemistry, Human Nutrition, NutritionalBiophysicsandBiochemistry, HumanPhysiology, FoodMicrobiology, FoodScienceandfoodcommodities, Foodprocessing,preservation,spoilageandadulteration, Foodsafetyandfoodstandard, CommunityNutrition, Familymealmanagementandmealplanning, DietTherapy, Research Methodology, Health Statistics and Computer and many more.
2. Students will be able to demonstrate critical thinking skills and analytical abilities to identify and solve problems in the nutritional sciences.
3. Students will be able to assess nutritional status of individuals in various life-cycle stages and determine nutrition-related conditions and diseases by applying knowledge of metabolism and nutrient functions, food sources, and physiologic systems.
4. Students will be able to use critical, reflective and creative thinking skills in applying basic nutrition knowledge to meal preparation, general health, and disease prevention.
5. Students will be able to describe social, multiethnic, and environmental dimensions within nutrition and the life sciences.
6. Students will develop strong oral and written communication skills through the effective to presentation of experimental results as well as through seminars.

Raja N. L. Khan Women's College (Autonomous)
Curriculum for B.Sc. Honours in Nutrition
[Choice Based Credit System]

Semester-I

Sl.No.	Name of the Subject	Nature	Code	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
C1	C1T: BasicNutrition	Core Course-1		4	0	0	6	75
	C1P: BasicNutrition(Practical)	Core Course1 [Practical]		0	0	4	2	
C2	C2T: FoodBiochemistry	Core Course-2		4	0	0	6	75
	C2P: NutritionalBiochemistry (Practical)	Core Course-2 [Practical]		0	0	4	2	
GE-1	GE-1: BasicHumanNutrition	GE					4/5	75
	GE-1: BasicHumanNutrition (Practical)	GE (Practical)					2/1	
AECC	English	AECC					2	50
				Total Credits=20				

L=Lecture, T=Tutorial, P=Practical
AECC-Ability Enhancement Compulsory Course: English/ Modern Indian Language.

FIRST SEMESTER

CORECOURSE(CC)

[TotalCredits:6(Theory-4,Practical-2)]

C1:BasicNutrition

Courseobjectives and expected outcome
The students will enrich their knowledge on the nutrition and its development though out the globe. To familiarize students with fundamentals of food, nutrients and their relationship to health. The students get the idea about the requirement of the different nutrients in different stages of life cycle.

C1T1:BasicNutrition(theory) (Credits:4)

1. ScientistsandtheircontributiontonutritionScience:Baumann,Takaki,Hippocrates,Lavoisier,Coindet, MC&Davis,Dubois,Jameslindandothers.
2. BriefaboutnutritionpioneerPatwardhan,C.Gopalan,RajammalP.DevdasandSwaminathan,M.S.o ndevelopmentof NutritionandResearch.
3. BasicConceptofnutrition–Basicdefinition, function,Classification anddietary sources of food,Nutritionanddietetics.
4. BalanceDiet,AdequateNutrition,OptimalNutrition,conceptofgoodnutritionandmalnutrition.
5. Basicconceptofhealth,Interrelationshipbetweenfood,nutrition&health,visiblesymptomsofgoodh ealth.
6. Foodguide–Basicfivefoodgroups,Howtousefoodguide(accordingtoRDA).
7. DietaryGuidelinesaccordingtoNIN.
8. MinimumnutritionalrequirementsandRDA:FormationofRDAanddietaryguidelines:ReferenceM anandReferenceWoman.
9. BriefaboutDietaryReferenceIntake(DRIs):EstimatedAverageRequirement(EAR),RDA,Adequat eIntake(AI),TolerableUpperIntakeLevel,EstimatedEnergyRequirement(EER).
10. EnergyinHumanNutrition:Ideaenergyanditsunit,energybalance,assessmentofenergyrequirement s, deficiency and Excess, Determination of energy in food, B.M.R & influencing factors,S.D.A.
11. Energyandothernutritionalrequirementofadultmaleandfemaleengagedindifferenttypesofwork(se dentary,moderate,heavy).
12. Processedsupplementaryfoods.
13. Foodsanitationinhygiene.
14. Dieteticsanditsscope.
15. Foodhabitsandcustoms.
16. MethodsofassessingnutrientRequirement.
17. Foodchoices:FactorsregardingBiological,Environmental,Cultural,Personal.

Booksfor**RecommendedReading:**

1. Srilakshmi,B.2000.Dietetics.WileyEasternLtd.4835/24,AnsariRoad,Daryaganj.NewDelhi.
2. Swaminathan,H.1995,EssentialsofFoodandNutritionVolI&Vol.IIBappco.Bangalore.
3. Mahan,L.K.andEscott-Stump,S.(2000):Krause'sFoodNutritionandDiet-Therapy,10thEdition,W-13SaundersLtd.
4. NutritionAlifecycleapproachRavindenchadheandpulkitmathur,publishedbyOrientBlackSwar.
5. NutritionandDieteticsShubaginiAjoshi,McwrawHill
6. TextbookofHumannutritionAgarwalofUdopd,Jaypee

C1P1:BasicNutrition(Practical) (Credits:2)

1. Identificationandcharacterization ofvariousfoodswith localname,English nameand scientificnamefroma market/field.
2. Measurementofvolume(unit/unit&mm^3)andweightofvariousfoods(whole).

3. Measurementofvolume(unit/unit&mm^3)ofvarious/differentsizeoffoodpreparedinhouseholdfordailycooking.
4. Measurementofweightandvolumeofdifferentcookingfoodpreparedinhouseholdfordailycooking.
5. PrepareafoodnutritionalchartusingICMR-NINproposedportionsize.(Note:usingstaplefood(s)guidebyfoodgui depyramid)[Anyplate].
6. Foodpreparationandclarifyingrecipesagood,poor,sourcesofspecificnutrients,amountofingredient stobe usedinstandardrecipe.
7. Analysisandcompareofnutrients(asperGopalon/USDAReference)ofacerealbasedfoodrecipes.(No te:Nutritionalrepresentationmustbemaintainedbefore&aftercookingoffoods).
8. Calculationofameal(breakfast/lunch/dinner).

C2:FoodBiochemistry(Theory)
[TotalCredits:6(Theory-4,Practical-2)]

Courseobjectives and expected outcome
The students will be able to demonstrate a sound knowledge of the chemical properties of food components (carbohydrates, proteins, lipids, vitamins, minerals etc.). They relate the properties and structures of chemical components and ingredients to the functional and chemical properties of foods. The students can describe details of the physical and chemical interactions between food components and their impact on quality.

C2T2:FoodBiochemistry(Theory) (Credit-4)

1. **Carbohydrates chemistry:** Definition and function, Classification, Isomerism of monosaccharide,Properties of monosaccharide, Structure and functions of Modified monosaccharide, Disaccharides,Oligosaccharides,Polysaccharides&Mucopolysaccharides.
2. **Carbohydrates nutrition:** Sources, Functions, Daily requirement, Effect of too high and too lowcarbohydratedietonhealth,Glycemicindex.
3. **Lipids chemistry** – Definition and function, Classification, Classification of fatty acids (straight chainfatty acid, Substituted fatty acids, cyclic fatty acids), Isomerism of fatty acids, Properties of fatty acids,Glycerol,Propertiesoffats,Characterizationoffats,Phospholipids,Micelle,Bilayer,Liposome ,Glycolipids,SteroidsandSterols,StructureandProperties,
4. **Lipids nutrition**: Sources, functions of lipids. Daily requirement. Fatty acids: Role and nutritionalsignificancesofPUFA,MUFA,SFA,USFA,Omega-3fattyacid.
5. **Proteinschemistry** – Definition and Functions,Classification, Amino acids and their functions,Isomerism of amino acids, Classification of amino acids, Properties of amino acids,Properties ofprotein, Structureof proteins (Primary, Higher orders, Bonds stabilizing higher structures, secondary(alfa helix, beta pleated sheet, beta bend and omega loop and Triple helix supercoil, and tertiarysupersecondarymotifs withdomain).
6. **Proteinsnutrition:**Sources,functions,DailyrequirementProteinquality(BV,PER,NPU).
7. **Nucleicacid**-Nucleotidesandtheirbases,Deoxyribonucleicacid,Ribonucleicacid,Geneticcodes.
8. **Dietaryfibers**–Sources,Classification,Properties,Nutritionalsignificance.
9. **Functionalfoods**:foodasmedicine:Therapeuticeffectsoffoodcomponentotherthannutrients.
10. **NutraceuticalsandPhotochemicals**:Naturalsourcesandfunction.
11. **VitaminsandMinerals:**Briefsources,Dailyrequirement,deficiencydiseasesandfunctionof**Vitamin**A, D, E, K,B1, B2, B3, B5, B6, B9, B12,C &**Minerals** Calcium, Iron, Iodine, Magnesium, Zinc,Sodium,Potassium,Phosphorus,Copper,ManganeseandSelenium.

RecommendedReading:

1. Nelson,D.L.andCox,M.M.(2000):31'dEd.Lehningcl"sPrinciplesofBiochemistry,MacmillanWorthPublishers.
2. Devlin,T.M.(1997):4thEd.TextbookofBiochemistrywithClinicalCorrelations,WileyLissInc
3. Stryer,L.(1998):4thEd.Biochemistry,WHFreemanandCo.
4. Conn,E.E.,Stump:P.K.,Bruening,G.andDoi,R.H.(2001):5thEd.OutlinesofBiochemistry,JohnWileyandSons.
5. Voet,D.Voet,J.G.andPratt,C.W.(1999).FundamentalsofBiochemistry.
6. D.Das.Biochemistry,AcademicPublishers.

C2P2:NutritionalBiochemistry(Practical) (Credits:2)

A. QualitativeAnalysis

1.Identificationofunknownnutrientsfromanunknownsample.

(Note:Anyonenutrientlike:Cholesterol,Albumin,Gelatin,Peptone,Starch,Dextrin,Glucose/galactose,fructose,lactose/maltose,sucrose,glyceroletc).

2. Identificationofunknownfunctionalcomponentsinfunctionalfoodsfromanunknownsample.
(Note:Identifypresence(+)orabsence(-)offunctionalcomponentsfrom suppliedsolventextractionofafunctionalfood.
[Functionalcomponentsinclude:Alkaloid,Glycosides,Flavonoids,Taninsetc.]

3. Identificationofantioxidantpotentialofafoodorfoodmixture.(Extractionoffood(s)byvarioussolventsbyDPPHorotheranynewmethod).

4. Identification of quality offats/oils(rancidity) by quantity theacid number.(Note:supplyvarioustypeofoil/fatbyfoodtogroupsoffood)

5. Identificationoffats/oilsaccordinglyShortchain-Mediumchain-Longchainfattyacidpresentonfats/oilsbysaponificationnumber.
(Note:supplyvarioustypesofoils/fatbyfoodstogroupsofstudents).

B. Quantitativeanalysis

6. Estimationofcarbohydratecontentinfoodintermsoftotalcontentofglucosebybenedictquantativereagentsusingtitrationmethod.
(Note:Usingvarioustypeofcereals/milletsetc)

7. Estimationofproteincontentinfoodbybiuretmethod.
(Note:Usingvarioustypesoffoodslike–Milk,Legumesorotherproteinrichfoods)

8. Estimationoffatpercentageinfood.(Note:Fishes,nuts,oils)

9. QuantifythetotalAshcontentinfoods.

10. Quantifythetotalmoisturecontentinfood.

11. Extractionmethodoffoodsbyvarioussolvents.

GenericElective

GE-1/3[Interdisciplinaryforotherdepartment]

GE-1/3:BASICHUMANNUTRITIONCredits06

Courseobjectives and expected outcome
The students will enrich their knowledge on the nutrition. To familiarize students with fundamentals of food, nutrients and their relationship to health. The students get the idea about the requirement of the different nutrients in different stages of life cycle. The students can learn about the National Nutrition Policy. They also gain the knowledge about the classification of food.

GE-1/3T:BASICHUMANNUTRITION (Credits:4)

1. Conceptanddefinitionofterms-
Nutrition,MalnutritionandHealth.Briefhistoryofnutritionscience.ScopeofNutrition.
2. DietaryguidelinesforIndians.Foodexchangelist,Factorsaffectingmealplanningandfoodrelatedbe
havior
3. MinimumNutritionalRequirementandRDA.ReferenceManandReferenceWoman.
3. Energyanditsunit,Energyassessmentandbalance,BMRanditsregulation,SDAoffood**.**
4. IntegratedChildDevelopmentServices(ICDS),MidDayMealProgramme(MDMP),VitAprophylaxisPr
ophylaxisprogramme,Anemiaprophylaxisprogramme,Iodinedeficiencydisorderscontrolprogramme.
5. Functionofnutrients-Carbohydrate,dietaryfibre,protein,fat,vitamins,minerals,anti-oxidants,water.
6. Effectofcookingandheatprocessingonthenutritivevalueoffoods.

GE-1/3P:BASICHUMANNUTRITION (Credits:2)

1. Measurementofbodyweight,bodyheight,MUAC,Wais-hipratioandBMI.
2. Calculationofenergyrequirementbyfactorialand24hrsrecallmethods.
3. Qualitativeanalysisofcookedfoods.

Raja N. L. Khan Women's College
(Autonomous)Curriculum for B.Sc. Honours in Nutrition
[Choice Based Credit System]

Semester-II

Sl.No.	NameoftheSubject	Nature	Code	TeachingSchemeinhourperweek			Credit	Marks
				L	T	P		
C3	**C3T:**NutritionalBiophysicsAndBiochemistry	CoreCourse-3		4	0	0	6	75
	C3P: NutritionalBiophysicsAndBiochemistry (Practical)	CoreCourse3[Practical]		0	0	4		
C4	**C4T:** HumanPhysiology	CoreCourse-4		4	0	0	6	75
	C4P: HumanPhysiology (Practical)	Core Course-4[Practic al]		0	0	4		
GE-2	GE-2: Nutrition:LifeCycleApproach	GE					4/5	75
	GE-2: Nutrition:LifeCycleApproach (Practical)	GE (Practical)					2/1	
AECC-2	EnvironmentalStudies	AECC						

L=Lecture,T=Tutorial,P=Practical

SECONDSEMESTER

C3:NUTRITIONALBIOPHYSICSANDBIOCHEMISTRY [TOTALCREDITS:6(THEORY-4,PRACTICAL-2)]

Courseobjectives and expected outcome
The student will be capable to prove knowledge of the fundamental concepts in physics and chemistry that underlie biological processes and describe the principles that govern biomolecular interactions and appreciate how conventional methods of research and examination are employed to analyze the different features of these interactions. The students will also get the chance to get the sound knowledge into molecular aspect of transport, biological oxidation & genetic control of metabolism. The students will also capable of using selected biochemical techniques that are relevant for the investigation of the nutrient metabolism.

CT3:NUTRITIONALBIOPHYSICSANDBIOCHEMISTRY4CREDITS

1. Diffusion,absorption,osmosis,viscosity,surfacetension,colloids– Physiochemicalpropertiesandtheirbiological(Nutritional)importance.
2. Principlesandusesofcolorimetry,chromatography,photometryandelectrophoresis.
3. Biologicalimportanceofacid,base,buffer,pHandacid-basebalance
4. Enzymes:Definition,classification,specificityofenzymes,enzymekineticsincludingfactorsaffecting enzymeactivity,enzymeinhibition,andcoenzymeinmetabolism,isoenzyme.
5. Biological Oxidation: Role of oxygenases, oxidases, hydroperoxidases and dehydrogenases on oxidationandremovingreducingequivalents.Redoxpotential,mitochondrialrespiratorychain.Electrontransportchain(ETC)anditsmechanism.Oxidativephosphorylationanditsmechanism.Oxidative phosphorylationanditsmechanismandsubstratelevelphosphorylation.
6. Carbohydratemetabolism:Glycolysis,TCACycle,gluconeogenesis,glycogenolysisandpentosephosphatepathway.EnergygenerationinglycolysisandTCAcycle.
7. ProteinMetabolism:Transamination,deamination,transmethylation,aminoacidderivatives,ureacycle.
8. Lipidmetabolism:Biosynthesisofpalmiticacid,ketonebodies.Beta,omegaandalfaoxidationoffatty acids.
9. Nucleic acid: Genetic code-its characteristics, function. Purine and pyrimidine synthesis. Structure ofpurineandpyrimidine.

CP3:NUTRITIONALBIOPHYSICSANDBIOCHEMISTRY(PRACTICAL)2CREDITS

1. **DeterminationofpH:**inacids,alkalisandbuffersusingpHmeterandindicators.
2. **Colorimeters:**UseofcolorimeterinUVandvisualrange,(principletobeexplainedanddemonstrated withone exampleforeach).
3. **Separationtechniques**:Chromatography-
4. ThinlayerChromatography.(**AminoacidsorFattyacids-** Oneexampleforeachmaybedemonstratedfromextractionofanyfooditem).
5. **EnzymeAssays:**Serum**A**lkalinephosphatase(ALP),SerumGlutamateOxaloacetateTransaminase (SGOT),SerumGlutamatePyruvateTransaminase(SGPT).
6. Estimationofcreatinineandureainplasma.
7. EstimationofSerumcholesterolandtriglyceride.
8. Estimationofplasmaglucose.
9. EstimationofSerumprotein.

C4:HUMANPHYSIOLOGY

Courseobjectives and expected outcome
To enables the students to gain of knowledge on the molecular and cellular mechanisms that underlie the normalphysiological processes of all human organ systems. The students can brush up their knowledge about functions of different parts of the human body, how the body maintains homeostasis, how different organs participate in it and many more.The students can understand the physiological processes and their role in health and disease. The students also get the practical experience of health assessment through different physiological methods.

CT4:HUMANPHYSIOLOGY 4CREDITS

1. **Cellular system:** Cell and sub cellular components prokaryotic cells, eukaryotic cells, comparison offeatures of prokaryotic and eukaryotic cells, structure outside the cell membrane, cell membranetransportsystem,
2. **Digestive system: S**tructure and function - secretory, digestive and absorptive functions – stomach,intestine,liver,pancreasandgallbladder.Hormonesofgastrointestinaltract.Digestionanda bsorptionofcarbohydrate,protein,lipidandnucleicacids.
3. **NervousSystem:**Structure and function of neuron and synapses. Conduction of nerve impulse.Neurotransmitters and its role. Organization of central and peripheral nervous system. Hypothalamus,cerebellum, cerebral cortex, thalamus, midbrain and its role in various body functions. Neuromuscularjunction-itsrole.ANS.
4. **Endocrine system**:Structure and function of endocrine glands (pituitary gland, thyroid, parathyroid,islets of langerhans, adrenals, ovary and testis, thymus, pineal gland). Role of hormones, regulation ofhormonalsecretion,stresshormones.Excessanddeficiencysymptomsofhormones.
5. **Reproductivesystem**:Structureofmaleandfemalereproductivesystem.Spermatogenesis,oogenes is,folleculogenesis.Hypothalamo-hypophysis-godalaxis.Fertilizationandimplantation.
6. **Respiratory system: S**tructure and function respiratory tract. Role of lungs in the exchange of gases.Transportofoxygenandcarbondioxide.Lungsvolumeandcapacity.Lungscompliances.Regul ationofrespiration.
7. **Circulatory and Cardio Vascular system:** Blood - formation, composition, clotting and haemostasis.Formationandfunctionofplasmaproteins.Erythropoiesis.Bloodgroupsandhistocomp atibility.Bloodindices - use of blood for investigation and diagnosis of specific disorders, Structure and function ofheartandbloodvessels-Regulationofcardiacoutputandbloodpressure.
8. **Excretory system:** Structure of kidney and nephron. Urine formation. Non-excretory function ofkidney.
9. **Skin:**Structureandfunctionofskin.Regulationofsweatsecretion.
10. **Musculoskeletalsystem:**Structureandfunctionofskeletal,smoothandcardiacmuscles.Propertiesa ndcontractionofskeletalmuscle.
11. **Immune system:** Cell mediated and humoral Immunity. Structure and function of immunoglobulin.Complement system. Role of macropages in immunity. Cytokines and lymphokines. Hypersensitivityreactions.Vaccines.

RecommendedReading:

1. Guyton,A.C.andHall,J.E.(1999):TextbookofMedicalPhysiology,9thEdition,
2. W.B.SaundersCo.StuartIraFox,HumanPhysiology11thEd.WilliamFGanong,ReviewofMedicalP hysiology
3. TextBookofMedicalPhysiology,InduKhurana,Elsevier(2016).

CP4:NUTRITIONALPHYSIOLOGY (PRACTICAL) 2CREDITS

1. Studyonmicroscopes.
2. Identificationofpreparedslides:a)Lungs,b)Thyroid,c)Pancreas,d)Testis,e)Ovary,f)Kidney,g)Liv er,h)Duodenum,i)Jejunum,j)Iliumk)Spinalcord,l)cerebellum.

3. PreparationofbloodfilmandidentificationofWBCs.
4. Estimationofhaemoglobinbycyanomethoglobintest.
5. Bloodgrouping.
6. Measurementofbloodpressurebydifferentpostures.
7. Measurementofpulseratebydifferentpostures.

GenericElective

GE-2/4[Interdisciplinaryforotherdepartment]

GE-2/4:NUTRITION:LIFECYCLEAPPROACH **Credits:06**

Courseobjectives and expected outcome
To enable students to understand the nutritional demands in various stages of life cycle. They can acquire skills in planning adequate meals in different stages of life cycle to maintain health

GE-2/4T :NUTRITION:LIFECYCLEAPPROACH **Credits:04**

1. **Nutrition during infancy:** Breast feeding, Formula feeding, Weaning, Supplementary foods, NutritionalmanagementofPretermbaby.
2. **Nutritionforchildren:**Dietinearlychildhood,elementaryschoolage,highschoolage.
3. **Nutritionduring pregnancyandlactation:**NutritionaldemandsofPregnancy,FoodselectionduringPregnancy,Complicationsofpregnancyanddietarymanagement,DietduringLactation.
4. **Nutrition to athletes:** Nutritional requirements and dietary management in sports man and athletes,Mealplanningforathletes.
5. **Geriatric nutrition:** Planning of meals for older people, Nutrition of aged persons, Physiologicalcomplicationsingeriatricgroupanddietarymodificationsrequired,Oxidativestressandagingandroleofantioxidativenutrientsforpreventingaging.

GE-2/4P: **Credit:2**

1. 1.Preparationofnormaldietchartforinfant(6-12months).
2. Preparationofnormaldietchartforpreschoolchildren.
3. Preparationofnormaldietchartforcollegestudent.
4. Preparationofnormaldietchartforpregnantladyandlactatingmother.

Note: Inlaboratorynotebook,calculationofnutritivevalueshouldberecordedaccordingtoportionsizeofspecificdietforparticularindividual.

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CurriculumforB.Sc.HonoursinNutrition

[ChoiceBasedCredit System]

Semester-III

Course	CourseCode	NameoftheSubjects	Course Type/ Nature	Teaching Schemein Hourperweek			Credit	Marks
				L	T	P		
CC-5		**C5T:**FoodMicrobiology	CoreCourse-5	4	0	0	6	75
		C5P: FoodMicrobiology (Practical)		0	0	4		
CC-6		**C6T:** FoodScienceandfoodcommodities	CoreCourse-6	4	0	0	6	75
		C6P: FoodScienceandfoodcommodities(Practical)		0	0	4		
CC-7		**C7T:**Foodprocessing,preservation,spoilageandadulteration	CoreCourse-7	4	0	0	6	75
		C7P: Foodprocessing,preservation,spoilageandadulteration(Practical)		0	0	4		
GE-3		GE-3: BasicHumanNutrition	GE-3				4/5	75
		GE-3: BasicHumanNutrition (Practical)	GE-3 (Practical)				2/1	
SEC-1		**SEC-1T:** Foodsafetyandfoodstandard	SkillEnhancementCourse-1	1	0	0	2	50
		SEC-1P: Foodsafetyandfoodstandard (Practical)	SkillEnhancementCourse-1	0	0	1		
SemesterTotal							**26**	**350**

L=Lecture, **T=** Tutorial, **P=**Practical, **CC =** Core Course, **GE**= Generic Elective, **SEC** =SkillEnhancementCourse, **TBD=** to bedecided

THIRDSEMESTER
CoreCourse(CC)
C5:FoodMicrobiology
[TOTALCREDITS:6(THEORY-4,PRACTICAL-2)]

Courseobjectives and expected outcome
To enable students to understand about morphological characteristics of different microorganism associated to food. The student will able to get an overall idea about the spoilage and factors affecting the growth of microorganisms in food. They will also impart the knowledge about the role of micro-organisms in fermentation of foods. They will aware about hygiene and sanitation in food industry. To enable students to develop skills in performing various microbiological tests and update the knowledge in identifying the important microorganism present in food.

C5T:FoodMicrobiology(Theory)

Credits04

CourseContents:

1. HistoryofMicrobiology:

Generalcharacteristicsofbacteria,fungi,virus,protozoaandalgae.Bacterialstructure:CellwallsofGram positive and Gram negative, Bacteria capsule, Flagella-composition, structure and types, Cell membrane-structure,compositionandProperties,Bacterialspore.
Generalcharacteristicsofviruses,conceptofviroidsandprions.

2. Foodcontamination:

Primaryandsecondarysourcesoffoodcontamination.

3. Nutritionandcultureofmicroorganisms:

Bacterial growth-Extrinsic and intrinsic factors affecting growth. Binary fission of bacterial growth,Bacterialgrowthcurve,Typesofculturemedia,Methodsofisolation.Physicalandchemicalmethodsu sedinsterilizationanddisinfection.

4. Fermented Foods: Bacterial cultures, Yeast cultures, Mold cultures. Beneficial effect of microorganisms-concept of probiotics and related factors. Dietary different fermented products, importance of fermentedfoods.

5. MedicalMicrobiologyandPathology:

Hostpathogeninteraction:Definitions-
Infection,Invasion,Pathogen,Pathogenicity,Virulence,Toxigenicity, Carriers and their types, Opportunistic infections, Nosocomial infections. Transmission ofinfection.
PredominantnormalmicrobialfloraofhumanbodySkin,RespiratoryTract,gastrointestinalTract,Urino genitalTract.
Bacterial Diseases: Name of pathogen, symptoms, pathogenesis, mode of action & preventive measures offollowingdiseases:Typhoid,CholeraandTuberculosis,Tetanus.

6. Antibiotic and chemotherapeutic agents: Sulfur drugs, Antibiotics and their classification, Mode ofaction,antibioticassayandsensitivitytest.

C5P:FoodMicrobiology(Practical) **Credits02**

1. Studyofequipmentsinamicrobiologylab.
2. Generalproceduresforasepticwork.
3. Stainingofbacteria(gramstaining).
4. Preparationofnutrientbrothandmediawithagar,
5. Preparationofbacterialsmears.
6. Culturetransfertechniques
7. Techniqueforisolationofpureculture,platingbypourplateandstreakplatemethods.
8. Bacteriologicalexaminationofwater,milk,driedfishandfishmealandcannedfoods.

CoreCourse(CC)

C6:FoodScienceandfoodcommodities

[TOTALCREDITS:6(THEORY-4,PRACTICAL-2)]

Courseobjectives and expected outcome
Students will gain the knowledge regarding nutritional classification of food, their composition and role in diet. To enable students obtain knowledge on the method and media of cooking, nutritive value and processing, storage of different plant and animalderived foods.

C6T:FoodScienceandfoodcommodities(Theory) **Credits 04CourseContents:**

1. Conceptanddefinitionofterms:

Foodinrelationtohealth.

2. Cereals,Millets,**Pulsesandlegumes:**

Productsofwheat,Riceproducts,
Nutritionalaspectsofwheat,rice,oats,rye,barley,millets,maizeorcorn,jowar,ragiandbajra.Fermentedproducts,unfermentedproducts,
Typesofpulsesandlegumes,uses,andnutritionalaspects.
Pulseincookery(effectsofcookingofpulse,factorsaffectingcookingquality)

3. MilkandmilkProducts:

Nutritivevalueandcompositionofmilk,
Typesofprocessedmilk,milkproducts(butter,curd,paneerandcheese).Role of milkproductsincookery,
Milkincookery(effectofheatinvariousmilkcomponent).

4. Egg,**Fishandmeat:**

Nutritionalaspectsanduses,
Nutritionalaspectsofediblefishandmeat,conceptofredandwhitemeat,
Cookeryofegg,fishandmeat(effectofheatinvariouscomponentofegg,changesduringcookingofmeat),roleofeggincookery.

5. Vegetablesandfruits:

Usesandnutritionalaspectofcommonlyavailablevegetables.Fresh fruitsanddryfruits–rawandprocessedproduct.
Vegetablecookery(preliminarypreparation,changesduringcooking,lossofnutrientduringcooking,effectsofcookingonpigment)

6. Salts:

Usesandnutritionalaspectsofvarioussalts.

7.Fatsandoils:

Types,sources,useandnutritionalaspectsoffatsandoils.
Specificfatsandoils(lard,butter,margarine,cottonseedoil,groundnutoil,coconutoil,soyabeanoil,oliveoil,ricebranoil,sesameoil,rapeseedoilandmustardoil,palmoil),Effectof heatingonfat(smokepoint,flashpointandfirepoint,changesinfatonheating)Roleoffat/oilincookery(fatoroilusedasmediumofcooking,fatimprovesthetextureoffoods,fatimprovespalatability,improvesqualityoftheproduct).

8.NutsandoilSeeds:

Specificnutsandoilseeds(almonds,coconut,flaxseed,gardencressseeds,groundnut,soyabean,sunflowerseeds,walnuts,oilseedcakes)

9. Beverages:

Commontypes(tea,coffeeandwines)andtheiruses,nutritionalaspect.

10.RaisingandLeaveningagents:

Types,Constituents,Usesincookeryandbakery,Storage.

11. Newfood:

fastfood,junkfood,GMfood,Freefood.

C6P:FoodScienceandfoodcommodities(Practical) **Credits02**

1. Preparationandanalysisofnutritivevalue:

i)Breakfastcereals

ii) Milkandmilkproducts

iii)Poultry

productsiv)Vegetables

v)Fruits

2. Determinationofcolourforvariousfoodgrains,fruits,vegetables,spicesandprocessedfoods.3. VisittolocalFoodprocessingplantslike,floormill,dalmill,ricemill,oilextractionmilletc.

CoreCourse(CC)

C7Foodprocessing,preservation,spoilageandadulteration

[TOTALCREDITS:6(THEORY-4,PRACTICAL-2)]

Courseobjectives and expected outcome
Student will learn different methods of cooking and also know the which methods of cooking responsible for minimum and maximum amount nutrient loss. They learn about the different methods of preserve foods and prevent them from spoiling the food production chain. Student will learn the ecology to determine how the microorganisms get into foods, what can be done to control microbial growth in foods or why pathogenic microorganisms are a problem in particular foods.

C7TFoodprocessing,preservation,spoilageandadulteration

Credits04

CourseContents:

1. Methodsofcooking:

Dry,moist,fryingandmicrowavecooking.

Effectofvariousmethodsofcookingonfoods,nutrientlossesincooking.

Objectivesofcooking,preliminarypreparation(cleaning,peelingandstraining,cuttingandgrating,sieving,soaking, processing, blanching, marinating, sprouting or germination, fermentation, drying, filtering,grinding,roasting).

2. Foodprocessing:

Significance, principles of different methods of food processing: thermal processing- Cooking (moist heat,dry heat, combination method of cooking), blanching, pasteurization, sterilization, canning. Principles ofmicrowavecookingandsolarcooking.

3. FoodpreservationandfoodSpoilage:

General principles of food preservation, Food preservation by use of high and low temperature includefreezingandfreezedrying,dehydration,foodadditives,useofpreservativesandirradiation.Contamination ofmicroorganismsinthespoilageofdifferentkindsoffoods,suchascerealandcerealproducts,vegetableand fruits, fish and other sea foods, meat and meat products, eggs and poultry, milk and milk products,cannedfoods.

4. Foodinfections:

Bacterialfoodinfections-Salmonellosis,ShigellosisandListeriosis.

Foodpoisoning(StaphylococcalandBotulism)-

Symptoms,modeoftransmissionandmethodsofprevention,Conceptofaflatoxinintoxication.

5. Foodadditive:

Foodadditives-varioustypesandtheireffectsonhealth.

6. Foodadjunctsandpreservedproducts:

Spices(Chilies,Turmeric,GarlicandGinger),useandnutritionalaspect.J

ams,Jellies,Pickles,Syrup,Squashes–usesandnutritionalaspects.

7. Foodadulterants:

PFAdefinitionoffoodadulteration,adulterantsincommonlyconsumedfooditems.Com

monadulterantsinfoodandtheireffectsonhealth.

Commonhouseholdmethodstodetectadulterantsinfood

C7PFoodprocessing,preservation,spoilageandadulteration(Practical) **Credits02**

1.Detection of adulterants in

food:i)Detectionofvanaspatiin

Ghee.

ii) DetectionofvanaspatiinButter.

iii) DetectionofKhesariflourinBesan.

iv) DetectionofArgemoneoilinEdibleoil.

v) DetectionofMetanilyellowinTurmeric.2

.Postharvestingfoodprocessforlateruse

i)Foodsincludevegetablesandfruits(Beans,Radish,cabbage,potato,cauliflower,leafyvegetablesandpickle,squash.)driedbysundryingandmechanicaldrying.

ii)Todeterminethemoisturecontentinfreshandprocessedproducts.

iii) Todeterminetheashcontentinfreshandprocessedproducts.iv) TodeterminethepHoffoodsamples.

v)Toestimatethesaltcontentsingivensamplesbyusing Mohrmethod.vi)Estimationo fsodiumBenzoateinFoodSample.

vii)EstimationofSulphurDioxide.

SkillEnhancementCourse(SEC)
[TOTALCREDITS:4(THEORY-2,PRACTICAL-2)]

SEC-1:Foodsafetyandfoodstandard **Credits04**

Courseobjectives and expected outcome
To enable the students to gain knowledge about food laws and standards for food quality. They can get the idea about the regulatory authorities. They can acquire skills in food sanitation and safety. They have to be trained in foodsafetyandfoodstandardfromauthorizedtrainers.

SEC1T:Foodsafetyandfoodstandard

Credits02

CourseContents:

1.Foodsafety

Conceptoffoodsafety,factorsaffectingfoodsafety.

Foodsafetymeasures:basicconceptofHACCP,Safefoodhandlingpracticesandstoringfoodsafely.

2.**Foodlawsandregulatoryauthority:**

PreventionofFoodAdulteration(PFA)Act.

Regulatingauthority-

CodexAlimentarius,ISI,Agmark,FruitProductsOrder(FPO),MeatProductsOrder(MPO),BureauofIndianStandards(BIS),MMPO,FSSAI**.**

3.Evaluationoffoodquality

Sensorycharacteristicoffood,Sensorytests,

SEC1P:Foodsafetyandfoodstandard(Practical) **Credits02**

AReporttobesubmittedonatrainingprogramme(Foodsafetyandfoodstandard)fromauthorizedtrainers.

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Semester-IV

Course	Course Code	Name of theSubjects	Course Type/ Nature	TeachingScheme in hourperweek			Credit	Marks
				L	T	P		
CC-8		**C8T:**NutritionalAssessmentAndNutritionProgramme	CoreCourse-8	4	0	0	6	75
		C8P: NutritionalAssessmentAndNutritionProgramme(Practical)		0	0	4		
CC-9		**C9T:** Familymealmanagementandmealplanning	CoreCourse-9	4	0	0	6	75
		C9P: Familymealmanagementandmealplanning(practical)		0	0	4		
CC-10		**C10T:Dietatherapy-1**	CoreCourse-10	4	0	0	6	75
		C10P: Dietatherapy-1 (Practical)		0	0	4		
GE-4		GE-4: Nutrition:LifeCycleApproach	GE-4				4/5	75
		GE-4: Nutrition:LifeCycleApproach (Practical)					2/1	
SEC-2		**SEC2T:**Community Nutrition	Skill Enhancement Course-2	1	0	0	2	50
		SEC2 P: CommunityNutrition:(Practical)		0	0	1		
SemesterTotal							**26**	**350**

L=Lecture, **T=** Tutorial, **P=**Practical, **CC =** Core Course, **GE**= Generic Elective, **SEC** = SkillEnhancementCourse,**TBD =** to be decided

FOURTHSEMESTER
CoreCourse(CC)

CC8:NutritionalAssessmentAndNutritionProgramme[TotalCredits:6(Theory-4,Practical-2)]

Courseobjectives and expected outcome
The students can learn the concept of malnutrition; factors influencing nutritional status; relationships between nutrition, health and mortality; indicators of nutritional status and the causes of malnutrition.

C8T:NutritionalAssessmentAndNutritionProgramme(Theory)Credits:4

1. AssessmentofNutritionalStatus:

DirectNutritionalstatusassessmentofhumangroups-Biochemical,Biophysicalandanthropometricmethods.Indirectassessment:Secondarysourcesofcommunityhealthdata.

2. ConceptofSurveillancesystems:

Roleofinternationalandnationalorganizationsandagencies(WHO,FAO,UNICEF,CARE,NIN,CFTRI,ICMR).

3. CommunicationinNutritionandHealthEducation:

Type, process and media of communication. Interpersonal, Group and Mass communication.Importanceand relevance of Information, Education and communication (IEC) in Nutrition and Public Health. Impact ofEducationonKnowledge,AttitudeandPracticedevelopmentinthefieldofNutritionandHealth.Approaches and Strategies of Nutrition Education in Community – Women to women strategy, child toparentstrategy.

4. NationalNutritionalInterventionProgrammes:

Objective, Target group, Scheme details - Integrated Child Development Services (ICDS), Mid Day MealProgramme(MDMP),VitAprophylaxisProphylaxisprogramme,Anemiaprophylaxisprogramme,Iodinedeficiency disorders control programme. ANP, SNP, CNP, BFP – Aims and Objectives, Target group,Serviceprovided,Advantages,Limitation,Conceptonpublicdistributionsystem.

5. ImmunizationProgramme:

Preliminaryconceptofimmunity-innate,acquired,activeandpassiveimmunity.
Immunization:NationalImmunizationscheduleforchildrenandadults,Immunizationforforeigntravelers.

C8T:NutritionalAssessmentAndNutritionProgramme(Practical):Credits:2

1. AnthropometricmeasurementofWeight,heightanditscomparisonwithreferencevalue.
2. DeterminationofBMIandcommentsonresults.
3. Measurementofcircumferenceofchest,upperarm,waist-hipratio.
4. Measurementsoffatusingskinfoldthickness.
5. Weightforage,Heightforage,Weightforheight,anditscomparisonwithreferencevalue
6. Growthchartpreparation(WHO,NCHS&ICMR).

CC-9:Familymealmanagementandmealplanning Credits 06

Courseobjectives and expected outcome
To enable students to understand the nutritional demands in various stages of life cycle. They can acquire skills in planning adequate meals in different stages of life cycle to maintain health

C9T:Familymealmanagementandmealplanning(Theory) Credits 04CourseContents:

1. Nutrition during Pregnancy: Physiology of pregnancy, factors (non-nutritional) affecting pregnancyoutcome, importance of adequate weight gain during pregnancy, antenatal care and its schedule,Nutritional requirements during pregnancy and dietary management. Deficiency of nutrients and impact-energy,iron,folicacid,protein,calcium,iodine.Commonproblemsofpregnancyandtheirmanagements- nausea, vomiting, pica, food aversions in pregnancy, pregnancy induced hypertension,gestationaldiabetes.
2. Nutrition during Lactation: Physiology of Lactation, nutritional requirements during lactation, dietarymanagement,foodsupplements,galactogogues.Careandpreparationofnipplesduringbreastfeeding.
3. Nutritionduringinfancy:Infantphysiologyrelevanttofeedingandcare.Breastfeeding-colostrums,itscomposition and importance in feeding. Initiation of breast-feeding and duration of breast-feeding,Advantagesofexclusivebreast-feeding,Nutritionalandotheradvantagesofbreast-feeding.Introductionofcomplementary foods,initiation ofmanagement ofweaning,breastfeeding etc. Bottlefeedingcircumstancesunderwhichbottle-feedingistobegiven.Careandsterilizationofbottles.Preparationofformula.Mixedfeeding,breastfeedingandartificialfeeding.Teethingandmanagementofproblems.
4. Nutritiontotoddlers/preschool/schoolgoingchildrenoradolescent.
5. Managementofpretermandlowbirthweightchildren–theirspecialneeds.
6. Geriatricnutrition–Dietaryrequirement,Geriatrichealthproblems,Nutritionalcare.
7. SportsNutrition-nutritionaldemandondifferentsportsanddietaryrecommendations.

C9P:Familymealmanagementandmealplanning(practical) Credits02

1. Planningandpreparationofbalanceddietforapregnantwomen
2. Dietduringcomplicationofpregnancy
3. Planningandpreparationofbalanceddietforalactatingwomen
4. Preparationofweaningfood
5. Planningandpreparationofbalanceddietforapre-schoolchildren
6. Planningandpreparationofbalanceddietforschoolgoingchild.Preparationofpackedlunch
8. Planningandpreparationofbalanceddietforadolescents
9. Planningandpreparationofbalanceddietforadultmenandwomenofdifferent Physicalactivityandeconomic status.
10. Planningandpreparationofbalanceddietforseniorcitizen.

CC-10:Dietatherapy-1 **Credits06**

Courseobjectives and expected outcome
Students able to understand principles of diet therapy, modification of normal diet for therapeutic purposes and the role of dietitian. They gain knowledge of different plant and animal derived foods and their nutritive values and properties. Explains diet for various gastrointestinal disease conditions, liver diseases/disorders and malabsorption syndrome.

CC10T:Diet therapy-1 **Credits04**

Course Contents:

1. BasicConceptsofdiettherapy:Transformationofnormaldiettotherapeuticdiet,classificationofthera peuticdiets.
2. Teamapproachtohealthcare:Assessmentofpatients'needs.
3. RoutineHospitalDiets:Regular,light,soft,fluid,parenteralandeternalfeeding
4. Inborn error ofmetabolism– Lactose Intolerance, Galactosamia, Phenylketonuria and its dietarymanagement.
5. Etiology,symptoms,diagnostictestsanddietarymanagementofintestinaldiseases:Diarrhea,Steator rhoea,Diverticulardisease,Inflammatoryboweldisease,UlcerativeColitis,Flatulence,Constipation ,IrritableBowelSyndrome,Haemorrhoids.
6. Etiology, symptoms, diagnostic tests and dietary management of Malabsorption syndrome, Celiac sprue,tropical sprue, Intestinal brush border deficiencies (Acquired disaccharide intolerance), Protein losingenteropathy.
7. Disease of the liver, Exocrine Pancreas and Biliary System. Liver function tests, application of diettherapy and nutritional care in liver disease. Dietary care and management in Viral Hepatitis, Cirrhosisof liver, Wilson's diseases. Dietary care and management in diseases of Gall Bladder and PancreasCholelithiasis,Cholecystitis,Cholecystectomy,Pancreatitis.
8. Anaemias:Pathogenesis anddietarymanagement-NutritionalAnaemias,SickleCellAnaemias,Thalassemia,AnaemiaresultingfromAcuteHaemorrh age.
9. Arthritisandgout:Etiology,symptoms,diagnostictestsanddietarymanagement.

C10P:Dietatherapy-1 (Practical)
Credits02Practical:

1. Planningandpreparationofclearfluid/fullfluiddietfordiarrhoeapatient.
2. Planningandpreparationofsoft/semisoliddietforSteatorrhoeapatient.
3. PlanningandpreparationofdietforDiverticulardiseasepatient.
4. PlanningandpreparationofdietforUlcerativeColitispatient.
5. PlanningandpreparationofdietforFlatulencepatient.
6. PlanningandpreparationofdietforConstipationpatient.
7. PlanningandpreparationofdietforIrritableBowelSyndromepatient.
8. PlanningandpreparationofdietforHaemorrhoidspatient.
9. PlanningandpreparationofdietforCeliacspruepatient.
10. PlanningandpreparationofdietforAnaemiapatient.
11. PlanningandpreparationofdietforArthritisandgoutpatient.

Skill Enhancement Course (SEC)-2: CommunityNutrition[TOTALCREDITS:4]

Courseobjectives and expected outcome
Extensive study of role of nutrition in community health and national development, nutritional problems faced by the developing countries, methods of assessment of nutritional status at community level, various methods of nutrition education in community, role of various national and international agencies in community nutrition and recent advances in community nutrition research.To enable students to identify and contribute to the prevention of public health/ social health problems in the country. To equip students with workable knowledge to identify the common illnesses at community.

SEC-2:Community Nutrition:(Theory) Credits 02

Basicknowledgeontypesofcommunitysurvey.Dietsurvey-Needandimportance, methodsofdietarysurveywithmeritanddemerits.Conceptofconsumptionunit.ClinicalSigns-Need&Importance's,identifyingsignsofPEM,vitaminAdeficiencyandiodinedeficiency,Interpretationofdescriptivelistofclinicalsigns.

SEC-2:Community Nutrition:(Practical) Credits02

a. ClinicalassessmentandsignsofnutrientdeficiencesspeciallyPEM(Kwashiorkor,marasmus)IvitaminAdeficiencies,Anaemia,Rickets,B-Complexdeficiencies.
b. Estimationoffoodandnutrientintake-Householdfoodconsumptiondata,adultconsumptionunit,24hoursdietaryrecall,24hoursrecord.Weighmentmethod,fooddiaries,foodfrequencydata,useofeachoftheabove,informationavailablethroughteachindividual,collectionofdata,estimationofintakes.
c. Communityfieldsurvey-Areportsubmissiononaandbseparately.

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SEMESTER-V

Course	Course Code	Name of theSubjects	Course Type/ Nature	Teaching Scheme in hourperweek			Credit	Marks
				L	T	P		
CC-11		**C11T**: PublicHealthandHygiene	CoreCourse-11	4	0	0	6	75
		C11P: PublicHealthandHygiene (Practical)		0	0	4		
CC-12		**C12T:** DietTherapy-2	CoreCourse-12	4	0	0	6	75
		C12T: DietTherapy-2 (Practical)		0	0	4		
DSE-1		TBD	Discipline SpecificElective -1	4	0	0	6	75
				0	0	4		
DSE-2		TBD	Discipline SpecificElective -2	4	0	0	6	75
				0	0	4		
SemesterTotal							**24**	**300**

L=Lecture,**T=**Tutorial,**P=**Practical, **CC -**CoreCourse, **TBD -**Tobedecided,**DSE:** DisciplineSpecificElective.

FIFTHSEMESTER
CoreCourse(CC)

CC11:PublicHealthandHygiene[TotalCredits:6(Theory-4,Practical-2)]

Courseobjectives and expected outcome
Students will be able to understand the principles and methods of epidemiologic research in order to enable them to design, conduct, analyze, and interpret epidemiologic research. They can get the chance to visit the researchhospital/nutritionresearchrelatedhigherlearningcenter for acquiring knowledge on nutrition.

C11T:PublicHealthandHygiene(Theory) **Credits:4**

1. **Community:** Concept of community, types of community, factors affecting health ofCommunity.
2. **Community Water and Waste Management**: Importance of water to the community,etiologyandeffectsoftoxicagents,waterborne infectiousagents,sourcesofwater,safedrinkingwater/portabilityandtestsforportability,sewagedisposal,solidwastedisposal,liquidwastedisposalandtreatment.
3. **Demography & Population Control**: Introduction, Definition, Demographic cycle,PopulationPyramid,Fertility,Factorsaffectingfertility,Indicatorsoffertility,Populationexplosion as a public health problem, Approaches for population control, Family planningmethods.
4. **Principles of Epidemiology:** Concept of disease, rate of a disease in a population(attackrate,morbidityrate,mortalityrate,incidenceandprevalencerate).
5. **Studyoftheepidemiologicapproach**:Time,place,persondistribution.Determinantsofdisease.Vitalstatisticsandtheirsignificance.
6. **Malnutrition and Infection vicious cycle**: Nutritional problem in the community,UNICEFconceptualmodelof Malnutrition

C11P:PublicHealthandHygiene(Lab)Credits02Listo fPractical

1. Assignmentprogrammeonpublichealth,nutritionanddisease– coveringanyoneofthefollowingfieldsamongstudentsgroupwise(Note:Don’trepeatsamefield)
    a) Proteinundernutritionanditsrecovery.
    b) VitaminorMineralundernutritionanditsrecovery.
    c) Dietarymanagementofnon-communicabledisease.
    d) Dietarymanagementofgrowingchild.
    e) Impactofnutritioneducationonawarenessdevelopmentinthefieldofpersonalhealth.
2. Educationalexcursioninresearchhospital/nutritionresearchrelatedhigherlearningcenter **(Compulsoryfor10marks)**:
    a.Submittedatypedreportconsideringminimumfollowing.
    b.DescriptionoftheInstitute.
    Principleofdifferentinstrumentswithuses.
    d. Overallideaaboutexcursion.

CC-12:DietTherapy-2Credits06[TotalCredits:6(Theory-4,Practical-2)]

Courseobjectives and expected outcome
To enable students to apply the principles of diet for the management of endocrine pancreas, cardiovascular system. The students will learn the use the nutrition care process for special conditions like allergy, febrile conditions, infections and surgical conditions. The students can develop the dietary models for patients suffering from cancer and immune system dysfunction. To enable students to acquire skills to plan a diet for renal diseases based on the dietary modification. They can evaluate the related food source for the special conditions. The students get the chance to visit the hospital to enable students to evaluate the patient's medical records and interpret their medical history related to the conditions. They analyze the food habits and bring about the dietary changes. They gain experience to plan and calculate the modified diet. They acquire skill to supervise and handle the food preparation and service in the dietary department of the hospital.

C12T:DietTherapy-2Credits04

1. **Dietindiseaseoftheendocrinepancreas**:DiabetesMellitus-Classification,symptoms,diagnosis, management - Insulin therapy, oral hypoglycemic agents, glucose monitoring athome, dietary care and nutritional therapy, meal plan (with and without insulin), specialdiabeticfoods,sweetenersandsugarsubstitute.
2. **Diseasesofthecardiovascularsystem**:Etiologyandriskfactorsofvarioustypesofheartdiseases-dietarymanagement.Hyerlipidemias-causeandnutritionalaspects.Hypertension-etiology,prevalence,nutritionalmanagement.EmphasisonDASHdietandNCEP.
3. **RenalDiseases**:Typesofrenaldiseases(Acute,chronicandESRD)-dietarymanagement.
4. **Allergies**:Definitions,symptoms,diagnosisanddietarymanagementandfoodselection.
5. Dietsforfebrileconditions,infectionsandsurgicalconditions.
6. NutritionincancerandImmunesystemdysfunction.
7. Gastricandduodenalulcersanddietarymanagement.

C12P:DietTherapy-2(Practical)Credits02

1. Planningandpreparationofdietsfordiabetesmellitus
2. Planningandpreparationofdietforhypertensionandatherosclerosis
3. Planningthepreparationofdietsfornephritisandnephroticsyndrome
4. PlanningandpreparationofdietsforPepticUlcers.

Internship(Compulsoryfor10marks)

A report on the basis of internship in a hospital dietary department or diet clinic to besubmitted.Aspectstobecoveredforgeneralknowledgeto:

a.Establishrapportwithpatients-assessthenutritionalstatusanddiethistoryofpatients.b.Plan diet sheets after careful study of patients' case sheets - prepare and provide guidance inthe production of therapeutic diets. c. Supervise preparation of diets, assist and guide in traysetting with special emphasis on portion control and therapeutic modifications. d. Supervisedelivery of trays to patients. e.Get feedback frompatients regarding diets.f.Themodification of diet through consultationdoctors. g.Undertake case study at hospitalsituations. h.Visits to different dietary departments of various hospitals. i.Updatingknowledgeofpresentationandparticipationthroughseminarsandprojects.j.Gainexperience in the administrative set up of a dietary department. k.The role of dietician inhospitalmanagement.

DisciplineSpecificElectives(DSE)

Courseobjectives and expected outcome
The students can learn about food contaminants and various methods of maintenance of food hygiene.
The students can acquire knowledge in the maintenance of good quality standard of food items.
The students can get the idea about the different quality control and regulatory authorities.

DSE-1:FoodSanitationandHygieneTotalCredits:6(Theory-4,Practical-2)]DSE1T:FoodSanitationandHygiene Credits 04CourseContents:

1. Therelationshipof microorganismstosanitation.Role ofmicrobiology–Environmentaleffects of microbial growth. Effects of micro- organisms on food degradation and foodborneillnesses-bacteria,virus,molds,yeasts,andparasites.
2. Other food hazards – chemicals, antibiotics, hormones, metal contamination poisonousfoods.
3. Food contamination- sources and transmissions. Water, air, sewage and soil as reservoirsof infection and ways of spread. Other agents of contamination - Humans, domesticanimals,vermins,birds.
4. Importanceofpersonalhygieneoffoodhandler-habits-clothes,illness.Educationoffoodhandlerinhandlingandservingfood.
5. Safety in food procurement, storage, handling and preparation – control of spoilage – safetyofleftoverfoods.
6. Cleaningmethods–sterilization,anddisinfection–productsandmethods–useofdetergents,heat,chemicals,andtestsforsanitizerstrength.
7. Controlofinfestation:rodentcontrol-rats,mice;vectorcontrol-useofpesticides
8. Food sanitation, control and inspection-planning and implementation of trainingprogrammeforhealthpersonnel.

DSE1P:FoodSanitationandHygiene(Lab)Credits02Practical:

1. Studyofpersonalandenvironmentalhygienehabitsofstreetfoodhandlers.Interventionandresultanalysis.Projectsubmissionandpresentation.
2. Preservationoffruitsandvegetablesforlateruse-peas,carrots,cauliflower,chutney,soup,pickle,jam,jelly,marmalade,squash.

or

DSE-1: Quality Assurancein Food SectorsCredits 06
DSE1T:QualityAssuranceinFoodSectorsCredits 04Course Contents:

1. 1.Food laboratories : need for food analysis, accreditation of food laboratory, referrallaboratories, functions of food analysts, hierarchy of food safety authorities, analysis offoodsamplesandreports,otherregulatoryprovisionspertainingtoanalysisoffood.
2. 2.Validation of analytical methods: Good Laboratory Practices (GLP)- history of GLP,areas of application, facilities, test systems, test and reference items, Standard OperatingProcedure(SOP),studyperformanceandreporting.
3. 3.Analyticalmethodusedforqualitydetermination:chemicalandphysical,microbiological,biochemicalandsensoryanalysis.
4. 4.Analytical methods of determination of basic food components: protein, saccharides,lipids, vitamins, water, minerals and trace elements, sensory active compounds, anti-nutritiveandnaturaltoxiccompounds,foodadditivesandfoodcontaminants.
5. 5.Advanced laboratory techniques: principle, working and application of GC, HPLC,HPTLC, LC/MS, inductively coupled Plasma Mass Spectroscopy and PCR, real timePCR,ELISA.

DSE1P:QualityAssuranceinFoodSectorsCredits02

PreparationofStandardOperatingProcedure(SOP)ofanyonelaboratoryinstruction(Separategroupofstudents)

Or

DSE-1:QualityControlandFoodStandardsCredits06
DSE1T:QualityControlandFoodStandardsCredits04
CourseContents:

1. Principalaspectsofsamplingoffood:Importanceofsamplecollection,samplingtoolsandcontainers, sample collection techniques, sampling for microbiological analysis of food,routine versus investigational sampling, quantity of sample to be collected, packaging andsealing of sample, dispatch of sample, documentation and commodity specific samplingprocedure.
2. Codex Alimentarius Commission (CODEX): Introduction, standards, codex of practice,guidelines and recommendations, applying codex standards, Codex India, core functions ofNationalCodexContactPoint,NationalCodexCommitteeofIndia
3. International Organization of Standardization (ISO): Overview, structure, interpretation andcase studies of food safety and Quality management including ISO-22000, ISO-9001:2000,ISO22000:2005, ISO 17025/CODES/GLP, Retailers standards: BRC food and BRC IOPstandards,IFS,SQF:1000,SQF:2000.
4. HazardAnalysisCriticalControlPoint(HACCP):History,structure,pre-requitesandprinciples,HACCPapplications,HACCPbasedSOPs.
5. GoodManufacturingPractices(GMP),GoodHygienicPractices(GHP),GoodAgriculturalPractice(GAP),Good Veterinary Practice(GVP),Storage anddistribution offood,sanitationandsafetyinfoodservices.

DSE1P:QualityControlandFoodStandardsCredits02

PreparationofStandardOperatingProcedure(SOP)ofHACCP(Separategroupofstudents)

DSE-2 [Total credits: 06]

Courseobjectives and expected outcome
The students can learn about the nutritional knowledge. They can understand about nutrition education. They can get the chance to experience about the nutrition knowledge level in the community and also try to spread the nutrition education.

DSE-2:Nutritional Knowledge for management and Consumer Issues Credits 06
DSE-T2:NutritionalKnowledgeformanagementandConsumerIssuesCredits04

1. **Nutritional Knowledge for management:** concept, approaches, management of time,energy,money,space,motivatingfactors,motivationtheories,decisionmaking.
2. **Resources and nutritional issues**: classification, characteristics, factors affecting use,resourceconservation,timemanagement,worksimplificationtechniques,classesofchange,fatigueanditsmanagement.
3. **Money management and nutritional issues**: family income, types, supplementation,budgeting,householdaccounts,familysavingsandinvestment.
4. **Consumer**-definition, role, rights and responsibilities, consumer behavior, consumerproblems,nutritioneducationandempowerment.
5. **Consumerprotection**-consumerorganization,cooperatives,alternativeredressal,standardization,standardmarks,qualitycontrol,buyingaids,consumerlegislation.
6. Effectofnutritionalissuesonfamilybudget.

DSE-P2:NutritionalKnowledgeformanagementandConsumerIssuesCredits02

Prepare a report on income and expenditure of a family (various socioeconomic aspects)followed nutritional issues of every family members (budget allocation for nutrition andhealth).

or

DSE-2:FamilyStudiesandnutritionconcept Credits 06
DSE-T2:FamilyStudiesandnutritionconcept Credits04

1. Affectofmarriageandfamilyrelationshipsondietandnutritionalaspects.
2. Domesticviolence,maritaldisharmony,conflict,resolutionofconflictandaffectonhealthandnutrition.
3. Parenteducation,positiveparenting,communityeducationandnutritionalissues.
4. Familystudies-familyincrisis,familytherapy,initiativesforchilddevelopmentandnutritionalissues.
5. Humanrights,rightsofchildren,rightsofwomen,statusofwomen,genderroleseffectonnutritionalintakeandnutritionalstatus.
6. Healthandwellbeingacrosslifespandevelopment-vitalroleofnutrition.

DSE-P2:FamilyStudiesandnutritionconcept Credits02

Preparereportonafamily(varioussocioeconomicaspects)followednutritionalissuesofeveryfamilymembers(specialemphasisonfamilyincrisis/Parenteducation/marriageandmaritaldisharmony/rightsofwomen).

or

DSE-2:NutritionEducationandCommunicationForDevelopmentCredits06DSE-T2:NutritionEducationandCommunicationForDevelopment04

1. Basics of communication- nature, characteristics, functions, process, models, elements,principles,barriers,perception,persuasionandempathy,typesofcommunication,levels(settings)ofcommunicationtransactions,processoflistening.
2. Communication systems and communication theories- human interaction theories, masscommunication theories, message design theories, communication systems, culture andcommunication.
3. Conceptofdevelopment-theories,models,measurementandindicatorsofdevelopment.
4. Conceptofdevelopment-communicationmodelsandapproaches,diffusionandinnovation,massmedia,socialmarketing.
5. Role of communication in development- need and importance, development journalism,writingfordevelopment-print,radio,televisionandinternet.
6. Concerns of development communication- gender, health, environment, sustainability,humanrights,population,literacy,ruralandtribaldevelopment.
7. Advocacy and behavior change communication- concept, theories, models, approaches,applicationandchallenges.
8. Traditional, modern and new media for development - folk forms of songs, art, dance,theatre,puppetry,advertisement,cinema,ICTsfordevelopment-communityradio,participatoryvideo,socialmediaandmobilephones.

DSE-P2:NutritionEducationandCommunicationForDevelopmentCredits02

Preparationofvisualaidstohighlightcommunitynutrition,nutritionalawareness,nutritionalsurveillance

Raja N. L. Khan Women's College (Autonomous)
Curriculum for B.Sc. Honours in Nutrition
[Choice Based Credit System]

Semester-VI

Course	Course Code	Name of theSubjects	Course Type/ Nature	Teaching Scheme in hourperweek			Credit	Marks
				L	T	P		
CC-13		**C13T**: Research Methodology	CoreCourse-13	4	0	0	6	75
		C13P: Research Methodology (Practical)		0	0	4		
CC-14		**C14T:**Health Statistics and Computer	CoreCourse-14	4	0	0	6	75
		C14 P: Health Statistics and Computer (Practical)		0	0	4		
DSE-3		TBD	Discipline SpecificElective -3	4	0	0	6	75
				0	0	4		
DSE-4		TBD	Discipline SpecificElective -4	4	0	0	6	75
				0	0	4		
SemesterTotal							**24**	**300**

L=Lecture,**T=**Tutorial,**P=**Practical, **CC -**CoreCourse,**TBD** -Tobedecided,**DSE:** DisciplineSpecificElective.

Semester-VICoreCourse(CC)

CC13: Research Methodology [Total Credits: 6 (Theory-4, Practical-2)]

Courseobjectives and expected outcome
The students will learn about of the scientific methods, purpose and approaches to research. They can compare and contrast quantitative and qualitative research. The student can be familiar with data handling. The students also get the chance to design and conduct an original and ethical research. They should be able to write a dissertation. The research done can either be empirical/data based (quantitative, qualitative, or mixed-methods) or it can be in the form of a critical review of research and theory.

C13T:ResearchMethodology(Theory)Credits:4

1. **Fundamentalsofresearch**
   Meaning and objective of research, types of research (basic, applied and patent oriented),defining research problem, research process and steps involved in research process,researchproposalorsynopsis.
2. **Literaturesurveyanddocumentation**
   Methods of literature survey, use of library, books, journals, e-journals, thesis, chemicalabstracts and patent database, importance of documentation, documentation techniques, useof computer programs/packages (online resources such as-scientific search engines andonlineservers)inliteraturesurveyanddocumentation.
3. **Datacollection,analysisandhypothesis**
   Classification of data, methods of data collection, sample size, sampling procedure andmethods. Data processing and graphical representation of data. Hypothesis: Types ofhypothesis (experimental and nonexperimental). Hypothesis testing (parametric and non-parametrictests),typesof errorsandtheircontrol.
4. **Researchethics,plagiarismandimpactofresearch**
   Researchethics,responsibilityandaccountabilityoftheresearchers,Plagiarism
5. **Technicalwritingandreportingofresearch**
   Types of research report: Dissertation and thesis, research paper, review article, shortcommunication,conferencepresentation,meetingreportetc.Structureandorganization ofresearchreports:Title,abstract,keywords,introduction,methodology,results,discussion,conclusion,acknowledgement,references,footnotes,tablesandillustrations. Useofreference managing software (such as MENDELEY, ENDNOTE). Impact factor, rating,indexingandcitationofjournals.

C13P:ResearchMethodologyPracticalCredits02

Review/Project/FieldSurveyReport–Undertheguidanceofrespectiveteachers.
(FormatofReview-
Title,abstract,keywords,introduction,methodology,results,discussion, conclusion, acknowledgement, references, footnotes, tables and illustrations)General outline about how to conduct research work on a particular topic and formulate aresearch design with a strong hypothesis and mention the gap in the chosen research areaandpreparereportasperastandardSJRjournal(PreparationofManuscript).Presenty ourresearchoutputbyppt.

CC-14: Health Statistics and Computer -2 Credits 06 [Total Credits: 6 (Theory-4,Practical-2)]

Courseobjectives and expected outcome
The students will be able to understand the role of biostatistics in public health. They can use descriptive tools to summarize and display data from public health studies and can understand the principles of various study designs, and explain the advantages and limitations of the tools and techniques. They can identify appropriate tests to perform hypothesis testing, and interpret the outputs adequately. They can differentiate between quantitative problems from public health or nutritional studies that can be addressed by statistical tools, choose the appropriate statistical procedures, and interpret the statistical results in a public health or nutritional context. The students can gain knowledge about the basic functioning of various parts of computer system fromhardware point of view and interfacing of various peripheral devices used with the system. They can able to represent data using various Frequency table and Graphs and can apply various operations/ formulas using any software/package to solve statistical problems.

C14T:HealthStatisticsandComputer-2 Credits04

1. Definition,MeaningofimportanceofStatistics,Bio-statistics,DescriptiveandInferentialStatistics,Hypothesisandtheirtypes,Levelofsignificance,Criticalregionandacceptingregion,Variableandtheirtypes.
2. Tabulation of data – Frequency distribution and its types, Cumulative, Bivariate andMultivariate frequency distribution, Graphical presentation of frequency distribution –Histogram,Bardiagram,Polygram,Piediagram.
3. Measurement of central tendency, standard deviation and standard error – Definition,Calculation,Kurtosis,Skewness.
4. Testofsignificance–Nullhypothesis,Alternativehypothesis,degreeoffreedom,t-test– one tail-t test, two tail-t test, pair observation, standard mean of observation, test ofsignificance,

C. Computer

1. Computerfundamental– Basicanatomyofcomputer,generationofcomputer,applicationofcomputer.
2. HardwareandSoftwareconcept– Storagedevices,systemsoftware,multiprogrammingoperatingsystem,multitaskingoperatingsystem.
3. Computerviruses:Computerviruses,workingofviruses,networkviruses,antivirus,commonantivirussoftware.
4. DataProcessing– Typesofdata,typesofdataprocessing,stepindataprocessing,applicationofdata processing.
5. BasicknowledgeonGoogleandgoogledrive,Pubmed,Wikipedia,E-mail,Researchgate,LinkedIn,OrcID.

C14P:HealthStatisticsandComputer-2(Practical)Credits02

1. Graphicalpresentationofdata.
2. ComputationofMean,Median,Mode,SD&SE.
3. Significanceoftestingby‘t’testwithinterpretation– Pairedobservation,standard/populationmean.
4. Tabularformofdatapresentationincomputer.
5. UseofMicrosoftWordandExcelwithspecificproblem.
6. OpenanemailID.

DisciplineSpecificElectives(DSE)

Courseobjectives and expected outcome
The student should be able to correlate the requirement of Management and Extension education techniques with that of Food and Nutrition. Inculcating an entrepreneur mindset to be able to have one's own established business in future.

DSE-3:DieteticsandCounselling[TotalCredits:6(Theory-4,Practical-2)]

DSE3T:DieteticsandCounselling Credits 04CourseContents:

1. Introductiontopsychology–Definition,NatureandScope.
2. Attentionandperception– Typesofattentionandfactorsinfluencingattention,principlesofperceptualorganizatio nandabnormalitiesinperception.
3. Learningandmemory-Typesoflearning,Typesofmemory,Forgettinganditscauses.
4. Motivationandemotion-Typesofmotives,typesofemotions,emotionalexpression.
5. Personality-natureanddefinition,factorsinfluencingpersonality,Psychoanalytictheoryof personality.
6. Nature and goals of counselling. Principles of counselling. Characteristics of a goodcounsellor. Ethical principles of counselling. Special areas of counselling: Educational,family,health,communityandcounsellingofalcoholic,anddrugaddicts.
7. DietCounselling- meaning,significance,process,types.Goalsofcounselling,individuals, group and family counselling. Basic sequence in counselling. Materialsneededforcounselling– models,charts,posters,AVaids,Handoutsetc.Communicationprocessincounsellinga ndlinguisticsinclinicaldietarypractices,problemsincommunication. Role of Counsellor & Counselee. Techniques of obtaining relevantinformation-24HourDietaryrecall,Listoffoodlikesanddislikes,Lifestyle.Dieticianasapartofmedi calteamandresearchteam.

DSE3P:DieteticsandCounselling(Practical)Credits02Practical

1. Computerapplicationforcollectionofdataofdifferentdiseases.Submittingcomputedd ata.
2. Preparationsofteachingaidsinthefieldofnutrition.
3. Understandingtheuseofconventionalandnon-conventionalmethodsofcounseling
   i. Faceto facecounseling.**ii.**Useofsoftwareforcounseling e.g Dietcal.**iii.**UseofanyoneDietAppforcounselingandassessingfoodintake.
4. PlanningNutritioncounselingsessionsandidentifyingwaystoadheretodietarychanges forthefollowingconditions: Lactation counseling, SAM. Eating disorders. Overweight / Obesity in School children,adolescentandadults.Metabolicsyndrome.Diabetes-GestationalDiabetes.Renaldisease,Liverdisorders.
5. Organizinghealthcampsandpatientfeedback– bothathospitallevelandcommunitylevel.
6. Projectplanningforanyonedisease.

or

DSE-3:EntrepreneurshipandsmallcateringunitsCredits06
DSE3T:EntrepreneurshipandsmallcateringunitsCredits04

CourseContents:

1. **Entrepreneurshipdevelopment**-Entrepreneurship-concept,definition,needandsignificance of entrepreneurship development in India, entrepreneurship growth process,barriers,entrepreneurshipeducationmodel.
2. Entrepreneur- their characteristics, types, gender issues, role demands and challenges.Entrepreneurialmotivation.ChallengesfacedbyWomenEntrepreneurs.
3. **EnterprisePlanningandLaunching**-Typesofenterprisesclassificationbasedoncapital,product,location,ownershippatternandprocess.Sensingbusinessopportunitiesand assessing market potential; market research. Appraising of project and feasibility.Role of MSMEs, Role of banks and other financing institutions in enterprise building. E-commerce(onlinemarketing).
4. **Personnel management**-Functions of a personnel manager, Factors to consider whileplanning the kind and number of personnel: Menu, type of operations, Type of service, Jobdescriptionandjobspecification.
5. **Foodserviceunits**-OriginofFoodServiceunits.Kindsoffoodserviceunits.
6. **FoodProductionProcess**-Foodpurchaseandreceiving,Storage.Quantityfoodproduction:Standardizationofrecipes,Recipeadjustmentsandportioncontrol,Quantityfoodproductiontechniques.Foodservice.Foodhygieneandsanitation.
7. **SpaceandEquipment:**Typesofkitchenareas,Flowofworkandworkarearelationship. Equipmenta)Factorsaffectingselectionof equipment,b)Equipmentneedsfor differentsituations
8. **Planning of a small food service unit**-Survey of types of units, identifying clientele,menu,operationsanddelivery.

DSE3P:Entrepreneurshipandsmallcateringunits(Practical)Credits02Practical

1. SWOTanalysiswithrespecttoentrepreneurialcompetenciesthroughcaseprofilingofsuccessfulentrepreneursandenterprises.
2. AchievementMotivationlab-developmentofentrepreneurialcompetencies.
3. Surveyofaninstitutionfacilitatingentrepreneurshipdevelopmentin India.
4. Preparationofbusinessplan.
5. Marketsurveyforfooditemsbothrawandprocessed.Surveyoffoodserviceunits.
6. Planningmenusforthefollowing:
   a. Packedmealsforofficeemployees.
   b. NutritiousTiffinforschoolchildren.
   c. School/collegecanteens.
7. Developachecklistforgoodhygienepractices.

Or

DSE-3: Bakeryand Mushroom ProductsCredits06DSE3T:BakeryandMushroomProductsCredits04CourseContents:

1. Bakeryindustry:Currentstatus,growthrate,andeconomicimportanceofBakeryIndustry in India. Product types, nutritional quality and safety of products, pertinentstandards&regulations.
2. Bread, Buns and Pizza base - Ingredients & processes for breads, buns, pizza base,Equipmentsused,productqualitycharacteristics,faultsandcorrectivemeasures
3. Cakes-Ingredients&processesforcakes,Equipmentsused,productqualitycharacteristics,faultsandcorrectivemeasures.Differenttypesoficings.

4. Biscuits, Cookies & Crackers - Ingredients & processes, Equipments used, productqualitycharacteristics,faultsandcorrectivemeasures.
5. Modified Bakery Products - Modification of bakery products for people with specialnutritional requirements e.g. high fibre, low sugar,low fat, and gluten free bakeryproducts.
6. BreakfastCereals,MacaroniProductsandMalt-Productionandqualityofbreakfastcereals,macaroniproductsandmalt.
7. **Mushroom Products: a.** Definition and characteristics of mushroom. **b.** Morphology andlife cycle of Mushroom**. c.** Identification and classification of mushroom **d.** Nutritionaland medicinal value of edible mushrooms; poisonous mushrooms. **e.** Types of ediblemushrooms available in India- Volvariella volvacea, Pleurotus citrinopileatus, Agaricusbisporus. **f.** Process of mushroom cultivation. **g.** Storage and nutrition: short term storage(Refrigeration- upto 24 hours), long term storage (canning, pickles, papads), drying,storageinsaltsolutions.

DSE3P:BakeryandMushroomProducts(Practical)Credits02ListofPractical:

1. Preparationofpizzabaseandassessmentofitsquality
2. Preparationofbreadandassessmentofitsquality
3. Preparationofbunsandassessmentofquality
4. Preparationofbuttercakeandassessmentofitsquality.
5. Preparationofspongecakewithicingandassessmentofitsquality.
6. Preparationofcookiesandassessmentofquality.
7. Preparationofbiscuitsandassessmentofquality.
8. VisittoMushroomCultureCentres/Farmsfor: ProcessinvolvedinmushroomcultivationTypesandvarietiesofmushroom.VisualIdentificationofedibleandpoisonousmushroomMarketing.
9. DifferentFoodpreparationfrommushroom.

DSE-4: [Total Credits 06]

Courseobjectives and expected outcome
To develop young entrepreneurs for self-employment through sea food or dairy technology and associated activities. The students will apprehend the need of innovation in food packaging and industrial application of food packaging in different industry. The students can learn about the nutrition communication for health promotion and can engage in positive behavioural changes for better future.

DSE-4:SeafoodandDairyProductsCredits06DSE4T:SeafoodandDairyProductsCredits04CourseContents:

1. Chilling and Freezing of fish. Relationship between chilling and storage life, MAP,generalaspectsoffreezing,freezingsystems(airblastfreezing,plate orcontactfreezingsprayorimmersionfreezing,freezingonboard,onshoreprocessing,changesinqualityinchilledandfrozenstorage,thawing.
2. Fish Curing and Smoking - Drying and salting of fish, water activity and shelf-life ,salting process, salting methods (brining, pickling, kench curing, gaspe curing), types ofsalts, dried and salted fish products- pindang, fishwood, dried shrimp. Preservation bysmoking, smoke production, smoke components, quality, safety and nutritive value ofsmoked fish, processing and equipment, pre-smoking processes, smoking process control.Traditional chimney kiln, modern mechanical fish smoking kiln, examples of smoked anddriedproducts.
3. **Canning of fish:** Principles of canning, classification based on pH groupings, effect ofheat processing on fish, storage of canned fish, pre-process operations, post processoperations,canneryoperationsforspecificcannedproducts.(Tuna,Mackerel,Sardine).
4. **Fishery by-products -** Surimi- Introduction, fish muscle proteins, the surimi process,traditional and modern surimi production lines, quality of surimi products, comparision ofsurimi and fish mince products. Fish protein concentrates (FPC), fish protein extracts(FPE),fishproteinhydrolysis(FPH)
5. **Fermentedfish-**FlowchartofIndigenousproducts-FishsauceandPaste
6. **ConceptofotherSeafoods-**Crabs,lobsters,prawns,shrimps,shell-fish.
7. **Physical properties of milk** : Color, taste, pH and buffering capacity, refractive index,viscosity,surfacetension,freezing,boilingpoint,specificheat,OR,electricalconductivity.
8. **Lactose-** Lactose(alphaandbetaformsandtheirdifferences)Significancesoflactoseindairyindustry.
9. **Milk fat:** Composition and structure, factors affecting melting point, boiling point,solubility and Refractive Index, fat constants (saponification value, iodine value, RMvalue, Polenske value, peroxide value). Chemical reactions of fat (hydrolysis, auto-oxidation),conditionfavouringautooxidation,prevention,measurementofauto-oxidation.
10. **Protein and Enzymes -** General structure, amphoteric nature, difference between caseinandserumprotein,differenttypesofcasein(acidandrennet),usesofcasein,fractionationofprotein.Enzymes-catalase,alkalinephosphatase,lipasesandproteases.
11. **Market milk industry and milk products:** Systems of collection of milk

Reception,Platform testing- Various stages of processing, Filtration, Clarification • Homogenization •Pasteurization • Description and working of clarifier, cream separator, homogenizer andplate heat exchanger. Flow diagram of following milk products - Butter, ghee, flavoredmilk,yoghurt,dahi,shrikhand,ice-cream,condensedmilk,milkpowder,channa,paneer,cheese(cheddar).

DSE4P:SeafoodandDairyTechnology(Practical)Credits02ListofPractical:

1. Performplatformtestsinmilk.(Acidity,COB,MBRT,specificgravity,SNF)
2. EstimatemilkproteinbyFolinmethod.
3. EstimatemilkfatbyGerbermethod.
4. Preparationofflavouredmilk.Pasteurizationofmilk.
5. Preparecaseinandcalculateitsyield.
6. Qualityevaluationoffish/prawn.
7. SubjectiveevaluationofFreshFish.

8. Cutoutexaminationofcannedfish.(Sardine,Mackerel,Tuna)
9. Fishproductformulation/canning.

Or

DSE-4: Food packaging Credits 06
DSE4T: Food packaging Credits 04CourseContents:

1. Introduction to Food Packaging -Packaging Functions and Requirements,, Printing ofpackages.Barcodes&othermarking,LabelingLaws
2. Food Packaging Materials -Paper and paper-based materials, corrugated fiber board(CFB).Plastics,formation-Injectionmolding,Blowmolding,Typesofplastics,Lamination, Biodegradable plastics, Edible packaging and Bio-composites. EnvironmentalConcerns recycling and disposal of plastic waste Metal packaging- Metals: Tinplate,tinning process, components of tinplate, tin free can (TFC) types of can, metallic films,lacquersGlass:Composition,Properties,Methodsofbottlemaking,Typesofclosures.
3. PackageDesigningforFoods-Packagedesignforfreshhorticulturalproduceandanimalfoods, dry and moisture sensitive foods, frozen foods, fats and oils, thermally processedfoodsandbeverages.
4. Testing and Regulatory Aspects of Food Packaging- Testing Procedures for PackagingMaterials-thickness,tensilestrength,punctureresistance,burstingstrength,sealstrength,water vapor permeability, CO permeability, oxygen permeability, grease resistance,TestingProceduresforPackagedFoods-Compatibilityandshelflifestudies,evaluationoftransportworthinessoffilledpackages.FoodPackagingLawsandRegulations.
5. Packaging Machinery and Systems - Bottling machines, Cartoning systems, Seal andShrink packaging machine;Form,Fill andSealing machine(FFS).Vacuum,ControlledandModifiedatmospherepackagingsystems;Aseptic packagingsystems;Retortpackaging,ActiveandIntelligentpackagingsystems

DSE4P:FoodPackaging(Practical)Credits02List ofPractical:

1. Testingofphysical/mechanicalpropertiesoffoodpackagingmaterial.
2. Testingofthermalshockresistanceofglass.
3. Gas/Vacuumpackagingoffoodsandshelflifestudies.
5. EdiblepackagingofFoodSamples.
6. Packagedfoodcut-outanalysis.

Demonstration:

1. StudyofSorptionIsothermforFoodPackageDesign**(Demonstration)**.
2. DeterminationofWaterVaporTransmissionrateofPackagingMaterial**(Demonstration)**.
3. StudytheoperationofFFSmachine**(Demonstration**).

Or

DSE4T: Nutrition communication for Health promotion Credits 06
DSE4T: Nutrition communication for Healthpromotion Credits 04
CourseContents:

1. **Dietaryguidelinesfornutritionandhealthrelatedconcerns-**Nationalandinternational guidelines and their role in nutrition promotion. Critical appraisal of thecurrentguidelines.
2. **Nutritionandbehaviourinter-relationship-**

Foodandhealthbehaviour,models/theories of health behaviour, food choices, strategies for intervention at the ecological andindividuallevel.

3. **SocialandBehaviourChangeCommunicationfornutritionandhealthpromotion-**
   a. Conceptandobjectivesofcommunicationforbehaviourchange
   b. Planningofcommunicationstrategiesforsocialandbehaviourchangeprogramme,
   c. Communicationneedsanalysis,stakeholdersinnutritionpromotion,developingnutritioneducationplan,identifyingcommunicationstrategies/approachesfornutrition andhealthpromotion(e.g.socialmarketing),designingnutrition andhealth messages, selecting communication channels, developing and field testing ofcommunication materials, designing training strategies for trainers and their capacitybuilding.
   d. Implementingsocialandbehaviourchangecommunicationintervention:anoverview
   e. Evaluationofsocialandbehaviourchangecommunicationprogrammes.
4. **Ethicsinnutritionandhealthcommunication-**
   a. Significanceofethicsinnutritionandhealthcommunication.
   b. EthicalPrinciplesandconcerns

DSE4P:NutritioncommunicationforHealthpromotion(Practical)Credits02

1. Planning of communication strategies for public health nutrition problems amongvulnerablegroupsinthecommunity-fieldtestingofmessages,materialsandmethods.
2. Reviewofcommunicationstrategies beingused inanyonepublichealthnutritionprogrammeinthecommunity.