Study & Evaluation Scheme
of
Masters of Science in Nutrition and Dietetics

[Applicable for 2019-21]

Version 2019

[As per CBCS guidelines given by UGC]

Approved in BOS	Approved in BOF	Approved in Academic Council
13/04/2019	18/06/2019	13/07/2019 vide agenda No. 2.4

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Quantum University, Roorkee

Study & Evaluation Scheme

Study Summary

Name of the Faculty	Faculty of Health Sciences
Name of the School	Quantum School of Health Sciences
Name of the Department	Department of Applied Medical sciences
Program Name	Master of Science in Nutrition and Dietetics
Duration	2Years
Medium	English

Evaluation Scheme

Type of Papers	**Internal Evaluation (%)**	**End Semester Evaluation (%)**	**Total (%)**
Theory	40	60	100
Practical/ Dissertations/Project Report/ Viva-Voce	40	60	100
Internal Evaluation Components (Theory Papers)			
Sessional Examination I	50 Marks		
Sessional Examination II	50 Marks		
Assignment –I	25 Marks		
Assignment-II	25 Marks		
Attendance	50 Marks		
Internal Evaluation Components (Practical Papers)			
Quiz One	25 Marks		
Quiz Two	25 Marks		
Quiz Three	25 Marks		
Lab Records/ Mini Project	75 Marks		
Attendance	50 Marks		
End Semester Evaluation (Practical Papers)			
ESE Quiz	30 Marks		
ESE Practical Examination	50 Marks		
Viva- Voce	20 Marks		

Structure of Question Paper (ESE Theory Paper)

The question paper will consist of 3 questions, one from each unit. Student has to Attempt all questions. All questions carry 20 marks each. Parts a), c) and c) of Q1 to Q5 Carry 10 marks each and the student may attempt any 2 parts.

Important Note:

1. *The purpose of examination should be to assess the Course Outcomes (CO) that will ultimately lead to attainment of Programme Outcomes (PO). A question paper must assess the following aspects of learning Planned for specific course that is Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy). The standard of question paper will be based on mapped BL level complexity of the unit of the syllabus, which is thebasis of CO attainment model adopted in the university.*
2. *Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.*
3. *There shall be continuous evaluation of the student and there will be a provision of real time reporting on QUMS. All the assignments will evaluate through module available on ERP for time and access management of the class.*

Introduction

Master of Science in Nutrition and Dietetics syllabus is broad and multidisciplinary consists of various courses in Human Physiology, Nutritional biochemistry, Food Science, Fundamentals of Foods & Nutrition, Food Microbiology, Dietetics, Sports Nutrition, Food technology, Food Preservation & Bakery etc.

The B.Sc Nutrition & Dietetics subjects are designed in such a way that students grasp all the knowledge related to foods and nutrition science. Towards enhancing employability and entrepreneurial ability of the graduates the Quantum University increase the practical content in the courses wherever necessary. The total number of credit hours in 4 semesters including Student READY programmed will range is 98. In order to harness regional specialties and to meet region-specific needs the Quantum University modify the content of syllabus as per the regional demands and needs. The Quantum University offering the specializations like majoring in Food science, Sports Nutrition , Nutraceuticals, Research etc.

HOSPITAL INTERNSHIP

This is offered in 4th Semester to the students to gain the practical exposure of the work that is carried out in hospital like formation of RT Feed, preparation of Therapeutic Diets, Counseling sessions in OPD patients and Counseling of critical patients etc.

The students would be required to record their observations in the hospital on daily basis and will prepare their internship report based on these observations and will do 1-2 case studies also.

FOOD INDUSTRY INTERNSHIP

This is offered in 4th Semester to the students to gain the practical exposure of the work that is carried out in food industry as food analyzer, sensory evaluator, processing techniques, Food product development etc.

The students would be required to record their observations in the food industry and will prepare their internship report based on the observations in the food industry.

DISSERTATION

This is offered in 4th Semester to the students to gain the practical exposure of the work related to research.

Constitutes a original research project that helps to obtain the masters degree.

Curriculum (19-21) Version 2019

Quantum School of Health Sciences

Department of Applied Sciences
Master of Science in Nutrition and Dietetics – **PC:** –06-4-01

BREAKUP OF COURSES

Sr. No	CATEGORY	CREDITS
1	Program Core(PC)	73
2	Program Elective(PE)	06
3	Seminar	04
4	Internship	10
5	General Proficiency(GP)	03
6	Value Added Programs(VAP)	02
	TOTAL NO. OF CREDITS	**98**

DOMAIN SPECIFIC BREAK UP OF CATEGORY

	Program Core	Program Elective	Sub Total	%
Sciences	73	6	79	79
Seminar			04	4.00
Internship			10	10.00
VAPs			02	2.00
GP			03	3.00
Grand Total	68	09	**98**	98

SEMESTER-WISE BREAKUP OF CREDITS

Sr.No	CATEGORY	SEM 1	SEM 2	SEM 3	SEM4	TOTAL
1	Program Core	24	15	24	10	73
2	Program Elective	-	03	03	-	06
4	Seminar	-	02	02	-	04
5	Internships	-	-	-	10	10
6	VAPs	1	1	-	-	02
7	GP	1	1	1	-	03
	TOTAL	26	22	30	20	**98**

***Non-Credit Audit Course**

SEMESTER 1

Course Code	Category	COURSE TITLE	L	T	P	C	Version
ND4101	PC	Advanced Nutritional Biochemistry	4	0	0	4	1.0
ND4102	PC	Clinical and Therapeutic Nutrition I	3	0	0	3	1.0
ND4103	PC	Public Health Nutrition	4	0	0	4	1.0
ND4104	PC	Human Nutrition	3	0	0	3	1.0
ND4105	PC	Advanced Human Physiology	3	0	0	3	1.0
ND4106	PC	Scientific Writing & Nutrition Communication	2	0	0	2	1.0
ND4140	PC	Advance Nutritional Biochemistry Lab	0	0	2	1	1.0
ND4141	PC	Clinical and Therapeutic Nutrition Lab I	0	0	3	2	1.0
ND4142	PC	Public Health Nutrition Lab	0	0	2	1	1.0
ND4143	PC	Scientific Writing & Nutrition Communication Lab	0	0	2	1	1.0
VP4102	VP	Personality Development Program-I	0	0	2	1	1.0
GP4101	GP	General Proficiency	0	0	0	1	1.0
		TOTAL	19	0	11	26	

Contact Hrs: 30

SEMESTER 2

Course Code	Category	COURSE TITLE	L	T	P	C	Version
ND4201	PC	Biochemical Food analysis and Instrumentation	2	0	0	2	1.0
ND4202	PC	Clinical and Therapeutic Nutrition II	3	0	0	3	1.0
ND4203	PC	Advances in Nutrition	3	0	0	3	1.0
ND4204	PC	Nutrition for Fitness and Sports	2	0	0	2	1.0
ND4240	PC	Biochemical Food Analysis and Instrumentation Lab	0	0	3	2	1.0
ND4241	PC	Clinical and Therapeutic Nutrition Lab II	0	0	3	2	1.0
ND4242	PC	Computer Application in Foods Lab	0	0	2	1	1.0
--	PE	Program Elective I	3	0	0	3	1.0
ND4243	FW	Seminar I	2	0	0	2	1.0
VP4202	VP	Personality Development Program II	0	0	2	1	1.0
GP4202	GP	General Proficiency	0	0	0	1	1.0
		TOTAL	16	0	10	22	

Contact Hrs: 25

SEMESTER 3

Course Code	Category	COURSE TITLE	L	T	P	C	Version
ND4301	PC	Advance Food Science	4	0	0	4	1.0
ND4302	PC	Advanced Food Microbiology	3	0	0	3	1.0
ND4303	PC	Advance Food Service Management	3	0	0	3	1.0
ME4307	PC	Research Methodology	2	0	0	2	1.0
ND4304	PC	Food Product Development, Safety and Quality Control	3	0	0	3	1.0
ND4340	PC	Advance Food Science Lab	0	0	3	2	1.0
ND4341	PC	Advanced Food Microbiology Lab	0	0	3	2	1.0
ND4342	PC	Advance Food Service Management Lab	0	0	4	2	1.0
ND4343	PC	Food Product Development, Safety and Quality Control Lab	0	0	3	2	1.0
ME4340	PC	Research Methodology Lab	0	0	2	1	1.0
--	PE	Program Elective II	3	0	0	3	1.0
ND4344	S	Seminar II	2	0	0	2	1.0
GP4301	GP	General Proficiency	0	0	0	1	1.0
		TOTAL	**20**	**0**	**15**	**30**	

Contact hrs-35

SEMESTER 4

Course Code	Category	COURSE TITLE	L	T	P	C	Version
ND4441	FW	Hospital Internship	0	0	0	8	8
ND4401	PC	Dissertation	0	0	0	10	1.0
ND4442	FW	Food Industry Internship	0	0	0	2	2
		Total	0	0	0	20	

*Student has to attend Hospital/Industry Internship for a period of 12-16 weeks and having at least 2 case studies in-case of hospital internship

Program Electives

S. No	Course Code	Category	COURSE TITLE	L	T	P	C	Version
Program Elective I	ND4216	PE	Nutritional Epidemiology, Pediatric and Geriatric Nutrition	2	0	0	2	1.0
	ND4217	PE	Food Processing Technology	3	0	0	3	1.0
Program Elective II	ND4317	PE	Functional Food and Nutraceuticals	3	0	0	3	1.0
	ND4318	PE	Food Toxicology	3	0	0	3	1.0
	ND4319	PE	Food Anthropology	3	0	0	3	1.0

Contact Hrs-33

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our university.

The following is the course module designed for the M.Sc. Nutrition and dietetics program:

Core competency: Students will acquire core competency in M.Sc. Nutrition and dietetics Studies and in Applied subject areas.

Program/Discipline Specific Elective Course (DSEC):

Skilled communicator: The course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation.

Critical thinker and problem solver: The course curriculum also includes components that can be helpful to graduate students to develop critical thinking ability by way of solving problems/numerical using basic &advance knowledge and concepts of M.Sc. Nutrition and dietetics Studies.

Sense of inquiry: It is expected that the course curriculum will develop an inquisitive characteristic among the students through appropriate questions, planning and reporting experimental investigation.

Skilled project manager: The course curriculum has been designed in such a manner as to enabling a graduate student to become a skilled project manager by acquiring knowledge about mathematical project management, writing, planning, study of ethical standards and rules and regulations pertaining to scientific project operation.

Ethical awareness/reasoning: A graduate student requires understanding and developing ethical awareness/reasoning which the course curriculums adequately provide.

Lifelong learner: The course curriculum is designed to inculcate a habit of learning continuously through use of advanced ICT technique and other available techniques/books/ journals for personal academic growth as well as for increasing employability opportunity.

Value Added Course (VAC): A value added audit course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be four courses of Aptitude in Semester I, II, III&IV semesters and two courses of Soft Skills in III&IV Semesters and will carry no credit, however, it will be compulsory for every student to pass these courses with minimum

45% marks to be eligible for the certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in the specific course of the respective semesters.

Skill Enhancement Course: This course may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

Generic/Open Elective Course (OE): Open Elective is an interdisciplinary additional subject that is compulsory in a program. The score of Open Elective is counted in the overall aggregate marks under Choice Based Credit System (CBCS). Each Open Elective paper will be of 3 Credits in II, III and IV semesters. Each student has to take Open/Generic Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Open Electives.

Non CGPA Audit Course (NCAC): This is a compulsory course but not included in CGPA calculations and will be of 2 credits.

C. Program Outcomes of Masters in Nutrition & Dietetics

PO-01	**Nutrition Knowledge:**	Utilize knowledge from the physical and biological sciences as abasis for understanding the role of food and nutrients in health and disease processes.
PO-02	**Implement Strategies:**	Implement strategies for food access, procurement, preparation,and safety for individuals, families, and communities.
PO-03	**Scientific Reasoning:**	Evaluate nutrition information based on scientific reasoning forclinical, community, and food service application.
PO-04	**Evaluate Information:**	Critically evaluate information on food science and nutrition issuesappearing in the popular press.
PO-05	**Technical Skills:**	Apply technical skills, knowledge of health behavior, clinical judgment, and decision-making skills when assessing and evaluating the nutritional status of individuals and communitiesand their response to nutrition intervention.
PO-06	**Management Skills:**	Perform food management functions in business, health-care,community, and institutional arenas.
PO-07	**Nutritional Ethics:**	Practice state-of-the-art nutrition care in collaboration with otherhealthcare providers in interdisciplinary settings within the bounds of ethical, legal, and professional practice standards.
PO-08	**Communicati on:**	Provide nutrition counseling and education to individuals, groups,and communities throughout the lifespan using a variety of communication strategies.
PO-09	**Creativity:**	Demonstrate creativity in the discipline in ways that have practicalbenefits.
PO-10	**Competence:**	Competence in the skills of assessment, planning, management and evaluation of food service, nutrition and dietetic services in institutional food, community nutrition, and clinical dieteticssettings.
PO-11	**Life-long learning**	Students will utilize advanced principles of health literacy, including critical thinking skills, literature searches, data collectionand interpretation, necessary for the implementation of food and nutrition services in professional settings.
PO-12	**Research and Analyze:**	Provide culturally competent nutrition services for individuals and communities. Accurately interpret data and research literature to solve complex problems and analyze the environmental dimensions of issues facing professionals.

Program Specific Outcomes (PSO's)

PSO1: Understanding, critically assessing and knowing how to use and apply informationsources related to nutrition, food, lifestyle and health.

PSO 2: Providing basic training of nutritional science and information about food intopractical dietary advice.

PSO 3: Understanding the importance and limitations of scientific thinking in the fields ofhealth and nutrition.

PSO 4: Apply knowledge in the field of personalized nutrition with reference tonutrigenetics and Nutrigenomics.

Program Educational Outcomes (PEO's)

PEO1: To be well familiar with the concepts of Nutrition & Dietetics for leading a successfulcareer in hospital industry or as entrepreneur or to pursue higher education.

PEO2: To develop applied-commercial skills for providing effective solutions to complexproblems using domain knowledge of Nutrition & Dietetics.

PEO3: To instill lifelong learning approach towards constantly evolving nutritional knowledgewith innovative and ethical mindset.

F. Pedagogy & Unique practices adopted:

"Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will emphasize on experiential learning:

Role Play & Simulation: Role- play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play& simulation exercises such as virtual share trading, marketing simulation etc. are being promoted for the practical-based experiential learning of our students.

Video Based Learning (VBL) & Learning through Movies (LTM): These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL& LTM, whereverpossible.

Field/Live Projects: The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

Industrial Visits: Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

MOOCs: Students may earn credits by passing MOOCs as decided by the college. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs. University allows students to undertake additional subjects /course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval. Keeping this in mind, University proposed andallowed a maximum of two credits to be allocated for each MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through only NPTEL could be given 2 credits for each MOOC course.

For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

a) It will necessary for every student to take at least one MOOC Course throughout the programmed.

b) There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.

c) The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalize a list of courses to be offered with 2 credits defined for each course and the mode of credit consideration of the student. The complete process shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in whichthe course is being offered. In case of MOOC course, the approval will be valid only for the semester on offer.

d) Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Coordinator MOOC through the Principal of the College.

e) After completion of MOOC course, Student will submit the photo copy of Completion certificate of MOOC Course to the Examination cell as proof.

f) Marks will be considered which is mentioned on Completion certificate of MOOC Course.

g) College will consider the credits only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

Special Guest Lectures (SGL) &Extra Mural Lectures (EMPL): Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and insights.

Student Development Programs (SDP): Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced excel training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

Industry Focused programmes: Establishing collaborations with various industry partners to deliver the programmed on sharing basis. The specific courses are to be delivered by industry experts to provide practice- based insight to the students.

Special assistance program for slow learners & fast learners: write the note how would you identify slow learners, develop the mechanism to correcting knowledge gap. Terms of advance topics what learning challenging it will be provided to the fast learners?

Induction program: Every year 3 weeks induction program is organized for 1st year students and senior students to make them, familiarize with the entire academic environment of university including Curriculum, Classrooms, Labs, Faculty/ Staff members, Academic calendar and various activities.

Mentoring scheme: There is Mentor-Mentee system. One mentor lecture is provided per week in a class. Students can discuss their problems with mentor who is necessarily a teaching faculty. In this way, student's problems or issues can be identified and resolved.

Competitive exam preparation: Students are provided with one class in every week for GATE/ Competitive exams preparation.

Extra-curricular Activities: Organizing& participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning & organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps themp build their wholesome personality.

Career & Personal Counseling: - Identifies the problem of student as early as possible and gives time to discuss their problems individually as well as with the parents. Counseling enables the students to focus on behavior and feelings with a goal to facilitate positive change. Its major role lies in giving: Advice, Help, Support, Tips, Assistance, and Guidance.

Participation in Flip Classes, Project based Learning(A2 Assignment), Workshops, Seminars & writing & Presenting Papers: Departments plan to organize the Flip Classes, Project based Learning(A2 Assignment), workshops, Seminars & Guest lecturers time to time on their respective topics as per academic calendar. Students must have to attend these programs. This participation would be count in the marks of general Discipline & General Proficiency which is the part of course scheme as non-credit course.

Formation of Student Clubs, Membership & Organizing & Participating events: Every department has the departmental clubs with the specific club's name. The entire student's activity would be performed by the club. One faculty would be the coordinator of the student clubs & students would be the members with different responsibility.

Capability Enhancement & Development Schemes: The Institute has these schemes to enhance the capability and holistic development of the students. Following measures/ initiatives are taken up from time to time for the same: Career Counseling, Soft skill development, Remedial Coaching, Bridge Course, Language Lab, Yoga and Meditation, Personal Counseling

Library Visit & Utilization of QLRC: Students may visit the library from morning10 AM to evening 8 PM. Library created its resources Database and provided Online Public Access Catalogue (OPAC) through which users can be accessed from any of the computer connected in the LAN can know the status of the book. Now we are in process to move from OPAC to KOHA.

Detailed Syllabus (Semester wise /course wise)

SEMPESTER 1 Year -1

ND4101	Title: Advance Nutritional Biochemistry	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	This subject is designed to impart fundamental knowledge of the structure and metabolic functions of Carbohydrate, Fats and Proteins	
Expected Outcome	Upon completion of this course the student should beabletoknowthemetabolismandfunctionsofdifferentnutrientsinourbody.	
Unit No.		No. of hours (per Unit)
Unit I	Biological Oxidation	10
Biological Oxidation-Theoryofbiologicaloxidation.Conceptoffreeenergy.Oxidationreductionreactions.Respiratorychain.Oxidativeand non-oxidative phosphorylation. High energy compounds.Carbohydrate metabolism: Glycolysis, Tricarboxylic Acid cycle, Gluconeogenesis , Hexose Mono phosphate pathway, Glycogenolysis, Glycogenesis. Disorders of carbohydrate metabolism: galactosemia, hereditary fructose intolerance, fructosuria and Glycogen storage disease (Von Gierke, Pompe, Cori and Mc Ardle diseases		
Unit II	Protein and Lipid Metabolism	10
Protein Metabolism: Review of general reaction of amino acid catabolism and urea cycle. Biosynthesis of proteins. Genetic codeLipid Metabolism: Fat storage, lipid transport and mobilization. Oxidation & biosynthesis of saturated and unsaturated fatty acids. Formation and utilization of ketone bodies.		
Unit III	Enzymes	10
Enzymes: Review of chemistry of enzymes (classification and enzyme specificity).Factors affecting enzyme activity, Derivation of MichaelisMenten, Line weaver-Burk equation. Enzyme inhibition & Regulatory enzymes: Competitive, non–competitive, uncompetitive, product and feedback inhibition.Regulatory enzymes: Covalent and allosteric. Involvement of enzymes in metabolic pathways. Applicationofenzymesindiagnostics(SGPT,SGOT,Creatinekinase&Alkalinephosphatase)		
Unit IV	Nucleic acids	9
Nucleic acids: Structure of DNA and RNA (mRNA, tRNA, and rRNA) Metabolism: Replication and transcription of nucleic acids. SPECTROPHOTO METRIC TECHNIQUES :Beer-Lambert' slaw,Calorimetry and spectro photometry, Atomic absorption spectroscopy, Flame photometry.		
Unit V	Bio-signaling and Hormone	9
Bio-signaling and Hormone: Concept of Hormones, Six types of signaling mechanisms, Biochemical mode of action of hormones of the thyroid, parathyroid, adrenal medulla, adrenal cortex and pancreas. Steroid hormones Regulation of blood sugar level. Regulation of body water and salt level.		
TextBook	1.Biochempistry,AlbertL.Lehninger,KalyaniPublishers,NewDelhi,2005.2.Biochempistry,Satyanarayan,BookandAppliedpublishers,Kolkata,2007.	

Reference Books	1. Introduction to Biochemistry, John W. Suttie, Holt Rinehartand Winston publishing Co., London, 1977. 2. Practical Clinical Biochemistry, Harold Varley, Arnold Heinemann Publishing, New Delhi, 1978. 3. Textbook of Biochemistry, West and Todd, Oxford and IBH Publishing Co., Calcutta, 1974. 4. Biochemistry, S.C. Rastogi, Tata McGraw Hill Publishing Co., New Delhi, 2003.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	13-04-2019
Date of approval By the Academic Council	13-07-2019

Course outcomes for: ND4101

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Enterpenureship (En)/None (use, for more than one)
CO1	Students should be able to understand complex biological oxidation-reduction reactions in human body.	**2**	Emp, S
CO2	Students should be able to understand the metabolic pathway of protein and lipid metabolism.	**3**	Emp, S
CO3	Students should be able to understand about chemistry of enzymes and the factors affecting enzymes function.	**2**	Emp , s
CO4	Students should be able to learn about structure and metabolism of nucleic acids along with Spectro photometric techniques.	**2**	Emp , S
CO5	Students should be able to learn about bio signaling of hormone along with regulation of body water and salt level.	**3**	Emp, S

CO-PO Mapping: ND4101

Course Outcomes	Program Outcomes(Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes			
	PO 1	**PO 2**	**PO 3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO9**	**PO10**	**PO 11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	2	3	2	1	3	3	3	0	2	2	3	0	1	2
CO2	1	2	0	3	1	2	2	0	3	2	1	1	3	1	2	1
CO3	2	2	1	3	0	1	2	2	3	0	0	3	0	1	1	2
CO4	0	3	2	2	1	0	2	0	1	1	2	0	3	0	3	3
CO5	3	1	0	2	0	3	2	1	3	1	3	2	2	3	2	2
AVEG.	1.4	2	1	2.6	0.8	1.4	2.2	1.2	2.6	0.8	1.6	1.6	2.2	1	1.8	2

ND4140	Title: Advance Nutritional Biochemistry Lab	L T P C 0021
Version No.	1.0	
Course Pre requisites	NIL	
Objectives	To impart fundamental knowledge on the structure and functions of the biochemical properties of the nutrients.etc.	
Expected Outcome	1. Students should be able to learn to prepare standard solutions , buffer system and measurement of pH. 2. Students should be able to demonstrate quantative test for carbohydrates, proteins and for lipids. 3. Students should be able to learn to isolate various enzymes such as amylase, protease etc and factors affecting enzyme activity.	
	List of Experiments	
1. Preparation of standards solutions, buffers and measurement of pH. 2. Tests for carbohydrates: Quantitative and qualitative estimation of sugars in food stuff. 3. Quantitative and qualitative estimation of amino acids by Ninhydrin Method. 4. Quantitative and qualitative estimation of proteins by Lowry and Biuret method. 5. Quantitative and qualitative analysis of lipids. 6. Isolation of total lipids. 7. Isolation and estimation of activity of enzymes. 8. Effect of temperature, pH and enzyme concentration on enzyme activity		
Mode of Evaluation	Internal & External	
Recommendation by Board of Studies on	13/04/2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for ND4140

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/Skill(S)/entrepreneurship(end)/None (use, for more than one)
CO1	Students should be able to learn the preparation methods of starch.	3	S
CO2	Students should be able to determine the acid value, iodine value and saponification value of fats to check there purity.	4	S
CO3	Students should be able to estimate the various vitamins and minerals through food sources.	3	S

CO PO Mapping of ND4140

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped-3 moderate - 2, Low- 1, Not related-0)										Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PSO1	PSO2	PSO3
CO1	2	0	2	3	1	1	2	2	3	3	3	2	3
CO2	1	3	2	3	2	1	2	0	1	0	2	2	2
CO3	2	1	2	2	3	0	0	2	3	3	2	0	2
AVEG.	1.6	1.3	2	2.6	2	0.6	1.3	1.3	2.3	2	2.3	1.3	2.3

ND4102	Title: Clinical And Therapeutic Nutrition I	L T P C 3 0 0 3
Version No.	1.0	
Course Pre requisites	NIL	
Objectives	To provide an overview of nutritional requirements in special conditions like cancer. Aids, liver disease etc.	
Expected Outcome	The student would be able to design diet plan for specific diseases	
Unit No.	Unit Title	No. of hours(per Unit)
Unit I	Diet Prescription and Nutritional Care Process	8
Diet prescription and nutritional care process–Essential components of diet prescription and steps involved in nutrition care process. Nutrition in hospitalized patients–Causes of malnutrition in hospitalized patients, identification of high risk patients, and assessment of nutritional status. Diet counseling: Definition, responsibilities of a counselor and tips for successful counseling, components of counseling process, formulation of a performa for diet counseling.		
Unit II	Aetiopathogenesis	8
Aetiopathogenesis,clinicalpicture,diagnostictests,treatment,preventiveaspects:- Pepticulcer,UlcerativecolitisAetiopathogenesis, clinical picture, diagnostic tests, treatment, preventive aspects:- Diarrhea, dysenteries, Malabsorption syndrome, IBS		
Unit III	Liver Diseases	8
Classification, etiology, clinical features, diagnostic tests, prevention and treatment. Liver disorders: Viral hepatitis types A and B, Cirrhosis of liver, Hepatic coma		
Unit IV	Immune Deficiency Disease	6
Nutritioncareinimmunedeficiencydiseases:HIVaidsNutritionCareduringCancers		
Unit V	Renal Diseases	6
Classification, etiology, clinical features, diagnostic tests, prevention and treatment. Renaldiseases:Glomerularnephritis,Nephroticsyndrome,Acuteandchronicrenalfailure–Dialysis		
Reference Books	1.Mahan,L.K.andEscott-Stump,S.,Krause'sFood,NutritionandDiet Therapy, W.B. Saunders Company, London. 2. Williams S.R.: Nutrition and Diet Therapy. Times Mirror/Mosby College Publishing, St. Louis. 3. Association of Physicians of India (1998). API Textbook of Medicine, Vol. I and II. Published by Association of Physicians of India. 4. Shills ME, OlsonJ A and ShikeN(1994).Modern Nutrition in Health and Disease. Fiebiger, Philadelphia 5. American Dietetic Association – Handbook of Clinical Dietetics (1981).Yale University Press, New Haven and London 6. Robinson CH, Laer MR, Chenoweth WL and Garovich AE (1998). Normal and Therapeutic Nutrition. Macmillan Publishing Company, New York 7. Mahan K L and Stump SE(2007). Krause's Food and Nutrition Therapy. Saunders Publishing	
Mode of Evaluation	Internal & External	

Recommendation by Board of Studies on	13/04/2019
Date of approval by the Academic Council	13-07-2019

Course outcomes for: ND4102

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/Skill(S)/ Enterpenureship (En)/None (use, for more than one)
CO1	Students should be able to learn about different types of special nutrition support feeding and when and why this type of nutrition plays important role in critically ill patients.	3	Emp, S
CO2	Students should be able to learn about different types of heart diseases and how it can be prevented or treated with nutritional intervention.	3	Emp, S
CO3	Students should be able to learn dietary management of different types of metabolic as well as degenerative diseases that occurs in old age. Students will also learn how body reacts in different types of stress.	3	Emp, S
CO4	Students should be able to learn about different types of diabetes mellitus and concept of Glycemic load & Glycemic index.	3	Emp, S
CO5	Students should be able to learn about nutritional management during special conditions & inborn errors.	3	Emp, S

CO-PO Mapping ND4102

Course Outcomes	Program Outcomes(Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	0	1	3	0	0	0	2	3	0	3	0	1	1	1
CO2	2	1	1	2	1	0	2	0	2	0	3	0	1	3	3	0
CO3	2	2	3	0	2	3	2	0	0	0	0	3	0	0	3	1
CO4	1	3	1	2	0	2	1	3	1	2	2	1	3	0	1	1
CO5	1	3	2	2	0	0	3	2	0	3	1	1	1	0	0	3
AVEG.	1.8	2.4	1.4	1.4	1.2	1	1.6	1	1	1.6	1.2	1.6	1	0.8	1.6	1.2

ND4141	Title: Clinical and Therapeutic Nutrition Lab I	L T P C 0 0 3 2
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To impart fundamental knowledge of planning diets	
Expected Outcome	1. Students should be able to plan and prepare various hospital diets and formulate a performa for diet counseling. 2. Students should be able to plan and prepare diets for various diseases related to gastrointestinal tract, liver problems and kidney problems. 3. Students should be able to learn about different enteral & parenteral formulas.	

List of Experiments

1. Planning, calculation and preparation of different hospital diets
   a. Gastro-intestinal
   b. Liver
   c. Renal
2. Visit to a dietetics department of a hospital and report presentation.
3. Market Survey for
   a. Nutrition/DietarySupplements
   b. Infant formulas/ foods/mixes
   c. Prebiotic and Probiotic commercialproducts
   d. Therapeutic food products

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31.05.22
Date of approval by the Academic Council	20.10.22

Course Outcome of ND4141

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship(Ent)/ None (*Use , for more than One*)
CO1	Students should be able to learn to plan various types of therapeutic diets used in hospitals.	6	Emp
CO2	Students should be able to learn to plan and prepare therapeutic diets for various basic diseases like Diarrhea, constipation, peptic Ulcers and different types of Fevers.	6	Emp
CO3	Students should be able to learn to calculate RDA,s according to individual patients for various basic diseases like Diarrhea, constipation, peptic Ulcers and different types of Fevers	3	Emp

CO PO Mapping of ND4141

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped-3 moderate - 2, Low- 1, Not related-0)										Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PSO1	PSO2	PSO3
CO1	2	0	2	3	1	1	2	2	3	3	3	2	3
CO2	1	3	2	3	2	1	2	0	1	0	2	2	2
CO3	2	1	2	2	3	0	0	2	3	3	2	0	2
AVEG.	1.6	1.3	2	2.6	2	0.6	1.3	1.3	2.3	2	2.3	1.3	2.3

ND4103	Title: Public Health Nutrition	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To understand the importance of nutrition for the communities.	
Expected Outcome	Students will be able to understand the role of nutrition in community and how govt. is helping the communities.	
Unit No.		No. of hours (per Unit)
Unit I	Public Health Nutrition	8
Public Health Nutrition: Aim, scope and content of Public health nutrition, Role of nutrition in national development Health Care Systems, Health –definition, dimensions, determinants and indicators, Health care systems in the community. National Nutrition Programmes: Objective and operations of:-ICDS, Mid Day Meal, School health program		
Unit II	Public Health Aspects	10
Public Health Aspects of Under nutrition: Clinical syndromes of Malnutrition (Chronic Energy Deficiency/PEMP/SAM), Severe Acute malnutrition and mortality, Prevention and management of: Malnutrition, Anemia ,Iodine Deficiency. Disorders. Approaches for control of under nutrition in India: National Programmes and guidelines for controlling under nutrition in India with emphasis on IYCF, NRHM, RCH and IMNCI. Role of new WHO standards in India, its importance and implications. National Nutrition Policy.		
Unit III	Nutrition and Health	10
ApproachesStrategiesforImprovingNutritionandHealthStatusoftheCommunity: Health based interventions including immunization, provision of safe drinking water/sanitation, Food based interventions including food fortification, dietary diversification, supplementary feeding and biotechnological approaches. Education based interventions including growth monitoring and promotion (GMP), health/ nutrition related behavior change communication. Diarrhea and Malnutrition: Diarrhea, morbidity, malnutrition and mortality, Prevention and management of Diarrhea.		
Unit IV	Nutrition, Agriculture and Food Security	10
Nutrition, agriculture and food Security: Food and nutrition security: definitions, concept and components of food and nutrition, Food and nutrition situation and food security in India. Food and nutrition security and programs: Foodinsecuritywarningandmappingsystempsfornutritionalvulnerability:PublicSectorprogrammesforimprovingoffoodand nutrition security, Right to Food act, Public Distribution System		
Unit V	Public Health	10
Public health implications and preventive strategies for Obesity, Hypertension, Coronary Heart Disease, Diabetes, Osteoporosis, Dental Caries. National nutrition monitoring and surveillance. Millennium development goals and its relationship with nutrition. New emerging public health problems of NCDs		
Text Book	1. GibneyM.J., Margetts, B.M., Kearney, J.M. Arab, I.,(2004)Public Health Nutrition, N S Blackwell Publishing 2. Gopalan, C.(1987)Combating Under nutrition-Basic Issues and Practical Approaches, Nutrition Foundation of India.	
Reference Books	1 Park,K.(2009)Park'sTextbookofPreventiveandSocialMedicine.JabalpurM/s. BanarsidasBhanot. 2 Sheila ChanderVir.(2011). Public Health Nutrition in Developing Countries.Part1andWood head Publishing India Pvt. Ltd.	
Mode of Evaluation	Internal and External Examinations	

Recommendation by Board of Studies on	13/04/2019
Date of approval by the Academic Council	13/07/2019

Course outcomes for: ND4103

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/Skill(S) / Enterpenureship (En)/None (use, for more than one)
CO1	Students should be able to learn about nutrition related health issues in large community	4	Emp, S
CO2	Students should be able to learn about health related acts across the world	3	Emp , S
CO3	Students should be able to get knowledge about national international organization which are working for health and nutrition	4	Emp , s , En
CO4	Students should be able to learn , understand and apply laws related to food and health	2	Emp , S
CO5	Students should be able to plan and execute community health campaign in local areas	4	Emp , S

CO-PO Mapping: ND4103

Course Outcomes	Program Outcomes(Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	0	2	1	3	1	1	2	0	3	0	2	0	1	0
CO2	0	2	2	0	2	3	2	1	3	1	2	0	2	3	1	3
CO3	1	1	1	1	0	0	1	2	1	1	0	1	3	0	3	0
CO4	1	1	3	1	0	2	1	3	0	3	2	2	3	2	2	1
CO5	0	2	3	1	3	0	1	1	3	0	1	1	2	0	3	0
AVEG.	1.6	1.8	1	1.2	1.6	1.2	1.6	1.8	1	1.6	0.8	2.4	1	2	0.8	1.4

ND4142	Title: Public Health Nutrition Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To understand the importance of nutrition for the communities.	
Expected Outcome	Students will be able to understand the role of nutrition in community and how govt. is helping the communities.	

List of Experiments

1. To plan and prepare low cost nutritious dishes/ menus for vulnerable groups.
2. Development of low cost recipes for infants, pre schoolers, elementary school children, adolescents, pregnant and lactating mothers.
3. Planning and preparation of diet/dishes for(PEMP/SAM/CED, Anemia)
4. Field visits to ongoing national nutrition programmes
5. Development of nutritious food supplements/ dishes for various vulnerable segments of population.
   Assessment of the type of nutritional problems and their determinants in different population groups through analysis of secondary data (such as NSSO,NFHS data)
7. Field visits to ongoing public health nutrition programmes.
8. Assessment of their needs and study the public health nutrition problems in an identified community.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course outcomes for: ND4142

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/Skill(S) /Enterpenureship (En)/None (use, for more than one)
CO1	Students should be able to prepare low cost recipes for the community people.	3	Emp, S
CO2	Students should be able to develop low cost and highly nutritious recipes.	3	Emp, S
CO3	students should be able to calculate nutritional value of the nutritious innovative recipes.	3	Emp, S, En

CO-PO Mapping: ND4142

Course Outcomes	Program Outcomes(Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes Program Educational Outcomes			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	1	2	1	0	1	0	3	2	0	2	1	2	3	3
CO2	0	3	0	1	0	2	1	0	0	3	1	3	1	0	1	3
CO3	1	0	0	3	3	1	0	0	1	1	0	1	3	3	1	1
AVEG	2	1	3	0	2	0	2	0	0	2	0	0	3	0	1	3

ND4104	Title: Human Nutrition	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To impart fundamental knowledge of proteins, carbohydrates, lipids and their daily requirements in human body.	
Expected Outcome	Students will be able to understand the importance of lipids, carbohydrates proteins, minerals and trace elements in the nutrition.	
Unit No.		No. of hours(per Unit)
UnitI	Energy	8
Energy needs–Assessment and requirements. Current approach for estimating RDA for energy intake of different age, sex groups and physiological conditions Metabolic regulation of food intake-weight management through life Clinical And biochemical manifestation of over and under nutrition. Disorders of metabolism– metabolic syndrome/ syndrome X and increased cardio metabolic risk.		
Unit II	Dietary Carbohydrate	7
Dietary carbohydrates– functions of starch, resistant starch, dietary fiber and sugar. Dietary fiber and its role in health and disease – obesity, satiety, hypertension, glucose tolerance, insulin response, diabetes, heart disease. Regulation of level of glucose in blood and hormonal control.		
Unit III	Protein and Antioxidants	8
Protein turnover, Methods of measuring protein turnover, "N" balance, obligatory loss Assessing protein And amino acid requirements–The current approach for various age, sex and physiological groups. Assessment of protein quality, Adaptation to fasting and starvation. Antioxidants in health and disease. Effects of oxidants on macromolecules–carbohydrates, proteins lipids, nucleic acids. Nutrient anti-oxidants with potent health effects. Non-nutritive food components with potential effects (Flavonoids – polyphenols and tannates, phytoestrogens, cyanogenic compounds).		
Unit IV	Physiology of Hunger	6
Physiology of Hunger:-Role of leptin and ghrelin in hunger and satiety and weight management, Nutrient-nutrient interrelationship and bioavailability. Causes and effect of deficiency. Causes and effect of excess.		
Unit V	Lipids	7
Functions and human requirements of essential fatty acids. Role of n3 and n6 fatty acids in health and disease. Phytochemicals & Plant sterols in human nutrition. Dietary factors and dyslipidemias- role of MUFA, trans fat, cholesterol, antioxidants, stanols and sterols. Lipoproteins-transport and metabolism.		
Text Book	1. Shubhangini A. Joshi, "Nutrition and Dietetics" Tata Mc Grow- Hill publishing Company Ltd, New Delhi. 2. Srilakshmi.B–"NutritionScience",VEdn,NewAgeInternational(P)Ltd,Publishers, Chennai. 3. Swaminathan.M-"Food&Nutrition"theBangalorepringting&publishingCo,LTD	

Reference Books	1. Passmone R and Eastwood M.A, "Human Nutrition and Dietetics", English language book Society/Churchill Livingstone, Hong Kong. 2. Neiman N. Catherine, "Nutrition" Wm. C. Brown Publishers.USA.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	13-04-2019
Date of approval by The Academic Council	13-07-2019

Course outcomes for: ND4104

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/Skill(S)/ Enterpenureship(En)/None (use, for more than one)
CO1	Students should be able to learn about energy needs ,RDA, Metabolic disorders and how it can be treated	3	Emp, S
CO2	students should be able to learn about carbohydrates and its effect on human body	4	Emp,, S
CO3	Students should be able to learn about Protein turnover, Assessment of protein quality, Adaptation to fasting and starvation and non nutritive components.	4	Emp,, S , En
CO4	Students should be able to learn about role of leptin and ghrelin in hunger and satiety and weight management.	4	Emp, S , En
CO5	Students should be able to learn about Role of n3 and n6 fatty acids in health and diseases , cholesterol, antioxidants, sterols. Lipoproteins-transport and metabolism	3	Emp,

CO-PO Mapping: ND4104

Course Outcomes	Program Outcomes(Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes Program Educational Outcomes			
	PO 1	**PO 2**	**PO 3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	0	1	2	0	1	3	3	0	2	2	1	3	3	3	0	1
CO2	0	3	3	2	2	0	2	1	0	0	2	1	1	3	2	1
CO3	2	2	3	2	1	0	0	2	0	1	0	0	3	2	0	2
CO4	2	2	1	3	3	3	0	1	3	1	2	3	2	3	1	0
CO5	2	0	2	1	2	1	1	1	1	1	1	3	0	3	2	0
AVEG.	1.2	1.6	2.2	1.6	1.8	1.4	1.2	1	1.2	1	1.2	2	1.8	2.8	1	0.8

ND4105	Title: Advanced Human Physiology	LT P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart knowledge related to human body systems and there Physiology.	
Expected Outcome	The student will gain a sound understanding of the human body systems and their role in health.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Blood	9
Blood :Composition of blood: Plasma, RBC, WBC, Platelets, Erythropoiesis, Blood Coagulation and Blood Groups, Cardiac cycle and cardiac output, Blood pressure and factors affecting it., Hypertension, ECG Immunology and Nutrition: Human Immunoglobulin, Cell mediated and humoral immunity – impact of malnourishment, innate immunity - Activation of WBC and production of Antibodies. T cells, B cells. Role of thymus, Acquired immunity related disease-AIDS, HIV, Autoimmune disorders– Role of antibodies in Pregnancy screening, Effects of Vitamins on immunity.		
Unit II	Respiratory and Excretory System	6
Respiratory system: Breathing mechanism, Exchange and transport of gases and its regulation, Lung Volumes and capacities Excretory System: Mechanism of urine formation. Role of the kidneys in maintaining water and electrolyte Balance.		
Unit III	Digestive System	6
DigestiveSystemp:-Functionsandregulationofthesalivaryglands,stomach,pancreas, Liver and the intestines. Mechanism of digestion and absorption of carbohydrates, proteins and fats. Role of enzymes indigestion of carbohydrates, proteins and fats.		
Unit IV	Reproductive System	9
Reproductive System: Structure and function of male and female sex glands and organs. Ovarian and menstrual cycle. Role of hormones in reproduction: FSH, LH, Estrogen, Progesterone, Testosterone and Human Chorionic Gonado-tropic hormone (HCG).Placenta. Physiology of pregnancy, parturition, lactation and menopause. Patho physiology of PCOD and Infertility. Nervous System and Senses: Basic properties of nerve and receptor organs Central Nervous System: Brain Spinal Cord. Transmission of Nerve impulse. Autonomic nervous system. Physiology of vision, hearing, taste and smell.		
Unit V	Endocrine System	6
Endocrine System:-Definition, functions and kinds of hormones, Structure and functions of the following glands: Thyroid, parathyroid, adrenal, pancreas, pituitary and pineal gland.		

Suggested Reference Books	1 Jain, AK.(2012).Textbook of Physiology. Avichal Publishing Company. Vol I and Vol II. 2 Best and Taylor's. Physiological Basis of Medical Practice. The Williams And Wilkins Company. 3 Chatterjee, C.C.(1997).HumanPhysiology.VolIandVolII.MedicalAppliedAgency.4 Ganong W.F. (2003)-Review of Medical Physiology. McGraw Hill. 5Guyton A.C. and Hall J.E(2000)Textbook of Medical Physiology. India: Harcourt Asia. 5 Tortora G.J and Grabowski S. R(2000)Principles of Anatomy and Physiology. John Wiley and Sons. Inc. 6 Chaudhari S K(2000) Concise Medical Physiology. Central .WestJ.B.(1996)PhysiologicalBasisofMedicalPractice.B.I.WaverlyPvt.Ltd.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course outcomes for: ND4105

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/Skill(S)/Enterpenureship(En)/None (use, for more than one)
CO1	Students should be able to learn about Blood composition, Erythropoiesis, Blood Coagulation and Blood Groups, Cardiac cycle and cardiac output, Blood pressure	2	Emp, S
CO2	Students should be able to learn about Respiratory and Excretory System in detail	2	Emp , S
CO3	Students should be able to learn about DigestiveSystem:-Functions and regulation, Mechanism of digestion and absorption of carbohydrates, protein ,fats	2	Emp , s , En
CO4	Students should be able to learn about Reproductive System: Structure and function of male and female sex glands and organs.	2	Emp , S
CO5	Students should be able to learn about Endocrine System:-Definition, functions and kinds of hormones, Structure and functions of the following glands	2	Emp , S

CO-PO Mapping: ND4105

Course Outcomes	Program Outcomes(Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes			
	PO 1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	3	1	3	2	1	1	1	1	0	1	2	3	2	2
CO2	3	0	0	0	0	1	2	2	1	2	0	2	2	0	1	3
CO3	0	1	1	2	1	1	1	1	3	3	3	1	3	1	1	0
CO4	2	3	0	3	3	2	1	0	1	3	1	2	2	1	1	3
CO5	3	1	0	1	1	2	2	1	0	3	1	1	0	0	2	2
AVEG.	2.2	1.4	0.8	1.4	1.6	1.6	1.4	1	1.2	2.4	1	1.4	1.8	1	1.4	2

ND4106	Title: Scientific Writing & Nutrition Communication	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of research and statistics.	
Expected Outcome	The student would acquire fundamental knowledge related to scope of research in the field of nutrition and how statically it can be represented.	
Unit No.	Unit Title	No. of hours(per Unit)
Unit I	Scientific Writing	4
Scientific Writing as a mean of communication: Different forms of scientific writings, articles in journals, research notes and reports, review articles, dissertation, and bibliographies.		
Unit II	Scientific Writing	5
Drafting titles, subtitles, tables, illustrations_ presenting data in rows and columns, formatting tables, presenting data in figures, formatting figures, appendices: information to be given and guidelines for writing, the writing process.		
Unit III	Research Report	5
Parts of dissertation/Researchreport/Article:introduction,reviewofliterature, method & material, result and discussion, summary and conclusion Communication:-concept, elements, models, and barriers.		
Unit IV	Information, Education and Communication	5
IEC(Information Education and communication):-Introduction & importance, relevance to programs, different media, There characteristics and uses, Audio-visual Aids		
Unit V	IEC Method, techniques and tools	5
IEC: Methods, techniques and tools. Planning effecting IEC programs. IEC for different large groups:-community, grass root functionaries, donor agencies, policy makers.		
Reference Books	1. Peat.J, Elliott E, Baur L&Keena. V "Scientific Writing: Easy when you Know How." By word viva publishers PVT Lmt 2. Dodd J.S "The ACS Style Guide:"A manual for authors and Editors "American Chemical Society	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	13-04-2019	
Date of approval By the Academic Council	13-07-2019	

Course outcomes for: ND4106

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/Skill(S)/Enterpenureship(En)/None (use, for more than one)
CO1	Students should be able to understand research and its methodology	2	S
CO2	Students should be able to learn , understand and memorize rules of research writing	1	Emp,
CO3	Students should be able to understand and implement creativity in research , report and seminars	1	En, s
CO4	Students should be able to develop a good project on genuine problems	2	S , En
CO5	Students should be able to design synopsis scientifically	2	S, En

CO-PO Mapping: ND4106

Course Outcomes	Program Outcomes(Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	2	3	0	3	0	3	2	3	0	3	1	3	2	1	1
CO2	3	2	3	0	1	3	1	2	3	2	1	2	0	1	3	1
CO3	3	0	2	2	3	2	1	1	0	3	0	2	2	1	1	3
CO4	1	1	3	2	3	1	0	3	3	3	3	1	2	0	2	1
CO5	3	3	0	2	3	0	2	0	3	2	1	2	2	2	2	3
AVEG.	2.4	1.6	2.2	1.2	2.6	1.2	1.4	1.6	2.4	2	1.6	1.6	1.8	1.2	1.8	1.8

ND4143	Title: Scientific Writing & Nutrition Communication Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To build competence in scientific writing skills, to develop understanding regarding the vitals aspects of nutrition communication and their use in nutrition and health education, To understand skills to plan &use IEC	
Expected Outcome	.	

List of Experiments

1. Preparation of tables and illustrations:-Writing a term paper, Writing an article for journal, Writing project proposal for grants
2. Preparation of IEC methods:-Charts, posters, power point slides, radio talks, T.V show(an Outline)
3. Preparation of IEC material on a specific topic for:- One to One, Group, mass communication.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course outcomes for: ND4143

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/Skill(S)/Enterpenureship(En)/None (use, for more than one)
CO1	Students should be able to build competence in scientific writing skills.	3	Emp,, S
CO2	Students should be able to develop understanding regarding the vitals aspects of nutrition communication and their use in nutrition and health education	3	Emp, S
CO3	Students should be able to understand skills to plan & use IEC.	3	Emp, S, En

CO-PO Mapping: ND4143

Course Outcomes	Program Outcomes(Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes			
	PO 1	**PO2**	**PO 3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO2**	**PSO 3**	**PSO 4**
CO1	2	2	2	2	3	3	2	3	1	0	2	1	0	1	3	3
CO2	1	0	0	0	0	2	3	3	2	2	2	1	1	0	3	1
CO3	1	2	3	2	1	2	2	1	3	2	0	0	1	0	0	3
AVEG	2	2	3	3	2	3	1	1.4	2	1	0	3	1	0	2	0

SEMESTER 2

ND4201	Title: Biochemical Food Analysis and Instrumentation	LT P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To impart knowledge related to food analysis.	
Expected Outcome	The student would acquire knowledge of separation of different nutrients from the foods with the help of biochemical instruments.	
Unit No.	Unit Title	No. of hours(per Unit)
Unit I	Biochemical Techniques and Principles	5
Biochemical Techniques Principles and applications of:- Homogenization and methods of disrupting cells and tissues. Cell fractionation, Spectroscopy-Beer-Lambert law, UV, Visible Spectrophotometry, Colorimetry BiochempicalTechniques:Principlesandapplicationsof:-pHmeter,Centrifugation (Preliminary introduction to various types of centrifuges)		
Unit II	Biochemical Application	5
Biochemical Techniques: Principle and applications of: Chromatography:Adsorption(Columnandthinlayer),Gelfiltration,Affinity,Ion-Exchange Electrophoresis: SDS PAGE and native electrophoresis, agarose electrophoresis, Protein separation &Characterization		
Unit III	Qualitative and Quantitative Analysis of Macronutrients	5
Carbohydrates: Qualitative and quantitative analysis of food carbohydrates, Dietary fiber, crude fiber Proteins: Methods of estimation of amino acids and proteins, Chemical and biological evaluation of nutritional quality of proteins.		
Unit IV	Fat and Enzymes	5
Fats : Physical and chemical characteristics of various fats and oils, Iodine value ,saponification value, acid value, Reichert- Meissel value of important oils. Storage changes in fats and oils Enzymes: Enzymes involved in food deterioration and preventive measures. Enzymes as aids in food processing operations and economical significance. Biotechnological applications of enzymes.		
Unit V	Proximate Analysis	4
Food analysis: Introduction, Titrable acidity, Moisture and ash, Principles of chemical and instrumental methods for the qualitative and quantitative analysis of moisture, minerals and vitamins.		

Reference Books	1. Official Methods of Analysis. Association of Official Analytical Chemists, (1990). 2. Official Methods and Recommended Practices, American Oil Chemists' Society,(1987) 3. Food Analysis: Theory and Practice. Pomeranz and Meloan, (1994)4.FoodAnalysis:PrinciplesandTechniques.GruenwedelandWhitaker,Vol. 1(1984),Vol 2,(1984) 5. FoodAnalysis,3rdedition,"S.S.Nielsen,Ed.,2003.KluwerAcadempic/ PlenumPublishers.,NewYork,NY 6. Practical Clinical Biochemistry, Harold Varley, 4thedition,ArnoldHeinempann Publishing,NewDelhi,1978. 7. Text book of Biochemistry, West and Todd, Oxford and IBH Publishing Co., Calcutta,1974. 8. Outlines of Biochemistry, Conn and Stumpf, John Wiley and Sons,2005.9.Biochempistry, Mathews, Van Holde, Ahern,Pearson Education10.Biochempical, Physiological, Molecular Aspects of Human Nutrition, Martha H. Stipanuk, Saunders Elsevier, USA,2000.
Mode of Evaluation	Internal &External
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course outcomes for: ND4201

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/Skill(S)/Enterpenureship(En)/None (use, for more than one)
CO1	Students will learn about various Biochemical techniques and its principles.	2	Emp, S
CO2	Students will learn about principles and applications of chromatography and Electrophoresis.	2	Emp, S
CO3	Students will be able to learn about qualitative and quantitative analysis of macronutrients.	2	Emp, S
CO4	Students will be able to learn about Physical and chemical characteristics of various fats and oils.	2	Emp, S
CO5	Students will be able to learn about proximate analysis of food.	1	Emp, S

CO-PO Mapping: ND4201

Course Outcomes	**Program Outcomes (Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)**												**Program Specific Outcomes**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	0	1	2	2	2	2	2	2	2	1	0	1	2	1	0
CO2	3	2	1	2	3	1	3	2	2	1	1	3	3	2	3	2
CO3	2	3	3	0	2	0	3	1	1	0	0	2	2	0	0	2
CO4	3	2	2	1	0	3	0	1	1	0	3	1	0	0	3	0
CO5	3	2	2	0	2	1	1	2	3	3	0	1	2	1	2	0
AVEG.	2.4	1.8	1.8	1	1.8	1.4	1.8	1.6	1.8	1.2	1	1.4	1.6	1	1.8	0.8

ND4240	Title: Biochemical Food Analysis and Instrumentation Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To impart fundamental knowledge of biochemical analysis of foods with the help of different instruments.	
Expected Outcome	The students will be able to learn how the nutrients are checked and separated from the food.	

List of Experiments

1. Estimation of moisture content and titrable acidity of food products.
2. Tests for carbohydrates:
   (i) Estimation of soluble and insoluble ash content
   (ii) Estimation of dietary fibre
3. Tests for proteins:
   (i) Quantitative estimation of proteins by Kjeldhal's Biuret method
   (ii) Separation of amino acids by paper chromatography.
   (iii)Isolation and estimation of Casein from milk.
   (iv)Demonstration of protein separation by gel electrophoresis.
4. Tests for Fats:
   (i) Estimation of free fatty acids
   (ii) Determination of acid and iodine value
   (iii) Determination of RM value
5. Tests for Vitamins &Minerals:
   (i) Estimation of calcium, phosphorous and iron
   (ii) EstimationofvitaminsB1,B2andascorbic acid
6. Isolation and estimation of phytic acid.
7. Isolation and estimation of trypsin inhibitors activity.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course outcomes for: ND4240

Unit-wise Course Outcome	Descriptions	BL Level	Empployability(Emp)/Skill(S)/Enterpenureship(En)/None (use, for more than one)
CO1	Students should be able to know about various food analyzers	2	S
CO2	Students should be able to conduct proximate analysis of antioxidants and micronutrients.	3	Emp,S
CO3	Student should be able to learn to implement these analysis in their research	3	Emp,S

CO-PO Mapping: ND4240

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes Program Educational Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS02	PSO3	PSO4
CO1	1	1	0	3	1	1	3	2	2	1	1	2	0	3	2	0
CO2	0	2	0	1	2	1	3	2	2	3	2	2	3	3	2	2
CO3	1	1	3	1	2	3	2	1	2	3	0	1	0	1	3	2
AVEG.	3	3	2	1	1	2	1	3	2	0	1	1	1	2	2	2

ND4202	Title: Clinical And Therapeutic Nutrition II	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of nutritional requirements in special conditions like cancer. Aids, liver disease etc.	
Expected Outcome	The student would be able to design diet plan for specific diseases	
Unit No.	Unit Title	No. of hours(per Unit)
UnitI	Diet Prescription and Nutritional Care Process	8
Diet prescription and nutritional care process–Essential components of diet prescription and steps involved in nutrition care process. Nutrition in hospitalized patients–Causes of malnutrition in hospitalized patients, identification of high risk patients, and assessment of nutritional status. Diet counseling: Definition, responsibilities of a counselor and tips for successful counseling, components of counseling process, formulation of a performa for diet counseling.		
Unit II	Aetiopathogenesis	8
Aetiopathogenesis,clinicalpicture,diagnostictests,treatment,preventiveaspects:- Pepticulcer,Ulcerativecolitis Aetiopathogenesis, clinical picture, diagnostic tests, treatment, preventive aspects:- Diarrhoea, dysenteries,Malabsorption syndrome, IBS		
Unit III	Liver Diseases	8
Classification,etiology,clinicalfeatures,diagnostictests,preventionandtreatment.Liverdisorders:Vir alhepatitistypesAand B, Cirrhosis of liver, Hepatic coma		
Unit IV	Immune Deficiency Disease	6
Nutritioncareinimmunedeficiencydiseases:HIVaidsNutritionCareduringCancers		
Unit V	Renal Diseases	6
Classification, etiology, clinical features, diagnostic tests, prevention and treatment. Renaldiseases:Glomerularnephritis,Nephroticsyndrome,Acuteandchronicrenalfailure–Dialysis		
Reference Books	1.Mahan,L.K.andEscott-Stump,S.,Krause'sFood,Nutrition andDiet Therapy, W.B. Saunders Company, London. 8. Williams S.R.: Nutrition and Diet Therapy. Times Mirror/Mos by College Publishing, St. Louis. 9. Association of Physicians of India (1998). API Textbook of Medicine, Vol. I andII. Published by Association of Physicians of India. Shills ME, Olson JA and ShikeN(1994). Modern Nutrition in Health and Disease. Fiebiger, Philadelphia 10. American Dietetic Association – Handbook of Clinical Dietetics (1981).YaleUniversityPress,NewHavenandLondon 11. Robinson CH, Laer MR, Chenoweth WL and Garovich AE (1998).Normal and Therapeutic Nutrition. Macmillan Publishing Company,NewYork. 12. Mahan K L and Stump S E(2007).Krause's Food and Nutrition Therapy. Saunders Publishing	
Mode of Evaluation	Internal &External	
Recommendation by Board of Studies on	13-04-2019	
Date of approval by the Academic Council	13-07-2019	

Course outcomes for : ND4202

Unit-wise Course Outcome	Descriptions	BL Level	Empployability(Emp)/Skill(S)/Enterpenureship(En)/None (use, for more than one)
CO1	Students should be able to learn about Nutritional support recent advances in techniques .	3	Emp,S
CO2	Students should be able to learn about Aetiopathogenesis of Heart disease treatment, preventive aspects, lifestyle and dietary management	4	Emp,S
CO3	Students should be able to learn about Nutritional Management in Trauma Conditions dietary management in Burns, Surgery, Stress and trauma	2	Emp,S
CO4	Students should be able to learn about Nutritional Management in Diabetes Mellitus	2	Emp,S
CO5	Students should be able to learn about Nutritional Management in Special Conditions Space travel, High altitudes, Inborn errors of metabolism	2	Emp,S

CO-PO Mapping: ND4202

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	1	1	3	1	2	3	2	3	2	3	0	2
CO2	2	3	1	1	3	1	2	3	2	3	2	2	1	1	2	2
CO3	2	2	2	2	2	2	1	2	3	2	1	1	2	2	1	2
CO4	1	1	2	2	3	1	2	1	2	1	0	3	3	3	2	3
CO5	3	2	3	3	1	3	1	2	3	3	3	3	2	1	1	1
AVEG.	2.2	2.2	2	2	2	1.6	1.8	1.8	2.4	2.4	1.6	2.4	2	2	1.2	2

ND4241	Title: Clinical and Therapeutic Nutrition Lab II	L T P C 0 0 3 2
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To impart fundamental knowledge of planning diets	
Expected Outcome	The students will be able to learn planning of diets according to different patients.	

List of Experiments

1. Planning and preparation of diets as per theory
2. Visit to a dietetics department of a hospital and report presentation.
3. Market Survey for
   a. Nutrition/Dietary Supplempents
   b. Infant formulas/foods/mixes
   c. Prebiotic and Probiotic commercial products
   d. Therapeutic food products

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course outcomes for : ND4241

Unit-wise Course Outcome	Descriptions	BL Level	Empployability(Emp)/Skill(S)/Enterpenureship(En)/None (use, for more than one)
CO1	Students should be able to plan diets for various diseases related to heart disease, diabetes mellitus, stress conditions etc..	6	Emp,S
CO2	Students should be able to prepare diets for various diseases related to heart disease, diabetes mellitus, stress conditions etc..	6	Emp,S
CO3	Students should be able to calculate diets for various diseases related to heart disease, diabetes mellitus, stress conditions etc..	3	Emp,S,En

CO-PO Mapping: ND4241

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	0	1	3	0	2	1	3	3	0	3	0	2	2	3	2
CO2	2	1	2	0	0	1	3	1	1	3	2	1	1	1	1	2
CO3	0	1	1	0	3	0	1	2	1	1	1	0	1	2	0	1
AVEG.	1.6	0.6	1.3	1	1	1	1.6	2	1.6	1.3	2	0.3	1.333	1.6	1.3	1.6

ND4203	Title: Advances in Nutrition	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of essential components of food and its role in nutrition.	
Expected Outcome	The student would acquire knowledge of different sources of Food products and its interaction with different nutrients in our body.	
Unit No.	Unit Title	No. of hours(per Unit)
Unit I	Nutrition Transition	6
Nutrition Transition–Indian scenario. Advances in food agriculture and technology. Changing trends in life style patterns in different population groups.		
Unit II	Pharmacology	8
Introduction to Pharmacology: Pharmacokinetics, Pharmacodynamics, Pharmacogenomics. Effects of food on drug therapy : Enteral nutrition interactions with medication, Drug distribution, Drug absorption, Drug metabolism and drug excretion.		
Unit III	Advances in Nutrition	8
Advancesinnutrition:Nutraceuticals,ActivecompoundinFunctionalfoodsandAntioxidants(BetaCarotene,Lutein,Lycopene ,Fiber,Omega3, Anthocyanin,Flavanoids,Selenium,Isoflavones,Lignans,VitaminA,VitaminC, Vitamin E, Biotin, Plant sterols). Prebiotic, Probiotic and Synbiotic. Molecular aspects of nutrition: Nutrigenomics and Nutrigenetics.		
Unit IV	Food Safety Measures	6
Understandingfoodsafetymeasuresinthefoodindustry:FSSAI,HACCP,TQM,GMP		
Unit V	Trends in Nutritional Labeling	8
Latest trends in nutritional labeling: Additives, Colors, Preservatives, Allergen Information, Sugar derivatives, Trans fats		
Reference	1. Gopalan C and Kaur S (1993). Towards better nutrition - ProblempsandPolicies. Special Publication Series No. 9. Nutrition Foundation of India,NewDelhi,India 2. Park K (2007). Park□s textbook of preventive and socialmedicine. M/s BanarsidasBhanot Publishers, Jabalpur3.PomeranzY(1991).Functionalpropertiesoffoodcomponents.Academp icPress, NewYork. 4. WildmanRobertEC(2001).HandbookofNutraceuticalsandFunctionalfoods. CRCseries 5. Mitchell Bebel Stargrove, Jonathan Treasure & Dwight L. Mckee,Chuchill Livingstone (2003). Herb, Nutrient and Drug Interactions– ClinicalImplicationsandTherapeuticStrategies 6. Mahan LK and Stump SE (2007). Krause'sFood,Nutrition and Diet Therapy (Hardcover), Saunderspublication	
Mode of Evaluation	Internal & External	
Recommendation by Board of Studies on	13-04-2019	

Date of approval by the Academic Council	13-07-2019

Course outcomes for: ND4203

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/Skill(S)/Enterpenureship(En)/None (use, for more than one)
CO1	Students should be able to learn about different food agriculture and new technologies for changing trends in life style patterns in different population groups.	2	Emp,S
CO2	Students should be able to learn about effects of food on drug therapy: enteral nutrition interactions with medication, drug distribution, drug metabolism and excretion in human body.	2	Emp,S
CO3	Students should be able to learn about nutraceuticals, nutrigenomics, nutrigenetics and active compound in functional food and antioxidants and how it can be prevent various types of diseases in human body.	2	Emp,S
CO4	Students should be able to learn about different food safety measures in the food industry.	2	Emp,S
CO5	Students should be able to learn about latest trends in nutritional labelling: additives, colors preservatives, allergen information and different types of sugar derivatives.	3	S

CO-PO Mapping: ND4203

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	0	3	2	3	0	3	0	1	0	0	0	2	1
CO2	3	1	2	2	0	0	1	2	0	1	3	3	3	1	2	1
CO3	3	2	3	0	0	1	0	2	2	0	3	2	1	1	3	0
CO4	1	3	3	1	0	0	1	1	2	0	1	2	0	2	0	3
CO5	1	1	0	2	2	2	0	2	2	3	2	3	2	3	3	3
AVEG.	2.2	1.8	2	1	1	1	1	1.4	1.8	0.8	2	2	1.2	1.4	2	1.6

ND4242	Title: Computer Application in Foods LAB	LT P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives		
Expected Outcome		

List of Experiments

1. Basic operation of MS office-MSWord/MS Excel/MS Power Point
2. Use of word processings of software for creating reports
3. Data entry in excel sheet format for data analysis and statistical tools application (t-test, Chi square, Correlation, Anova)
4. Use of Nutritional software diet cal and nautical for calculation of nutritive value of diets/foods.

Mode of Evaluation	Internal & External
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course outcomes for: ND4242

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/Skill(S)/Enterpenureship(En)/None (use, for more than one)
CO1	Students should be able to learn MS office operation	3	Emp, S
CO2	Students should be able to operate MS excel for various statistical test	3	S. Emp, En
CO3	Students should be able to learn software's operation in relation to nutrition	3	Emp, S, En

CO-PO Mapping: ND4242

	Program Outcomes (Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes			
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO 1	PS02	PSO 3	PSO 4
CO1	2	0	1	3	0	2	1	3	3	0	3	0	2	2	3	2
CO2	2	1	2	0	0	1	3	1	1	3	2	1	1	1	1	2
CO3	3	1	1	0	3	0	1	2	1	1	1	0	1	2	0	1
AVE G.	1.6	0.6	1.3	1	1	1	1.6	2	1.6	1.3	2	0.3	1.3	1.6	1.3	1.6

ND4204	Title: Nutrition For Fitness and Sports	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To learn the concepts of fitness, methods of assessing fitness, exercises for physical fitness and bioenergetics of exercise and role of macro- and micro-nutrients in sports performance with respect to nutrition for high performance sports, through the life-cycle and diet & Nutritional care of special groups of athletes.	
Expected Outcome	Understand concepts of fitness, its assessment and exercises for physical fitness training. Function effectively as a sports dietitian, with knowledge and skills ,to support recreational and competitive athletes	
Unit No.	Unit Title	No. of hours(per Unit)
Unit I	Introduction to Physical Fitness	5
Definition of physical fitness: Components of physical fitness, Methods of assessing physical fitness, Approaches to achieving physical fitness through the life cycle Fitness and nutritional assessment: Concepts and their inter relationship-Nutrition, exercise, physical fitness and health-Concept of-Nutritional status and Body composition, Fitness with reference to sports, Flexibility, Coordination, Equilibrium, Speed		
Unit II	Fundamentals of Sports Nutrition	4
Integrated approach to care for athletes, Assessment of Sports performance, Bioenergetics and body metabolism of physical activity and sports, Macro- and micro nutrients for sport performance, Temperature regulation, fluid balance, fluid requirements of athletes and rehydration strategies for sports		
Unit III	Nutrition for Athletes	5
Recommendedallowancesandnutritionalguidelinesfordifferentcategoriesofhighperformancesports,Nutritionalcare during Training, weight management and day-today recovery, Nutrition for the Pre-competition, Competition and post competition recovery phase, Supplements in Sport :performance enhancing substances ,drugs, ergogenic aids and herbs in sports performance		
Unit IV	Challenges in Sports in Nutrition	5
Nutritional care for children and adolescent athletes, Athletes with special needs- Paralympics & special Olympics, vegetarian athletes, Athletes with eating disorders, athletes with diabetes and other medical conditions, management of Red-S. Management of the following conditions among sports persons: Aerobic and anaerobic activity, Vegetarian athletes ,Female sports person-Menarche and Menstruation-Amenorrhea and Anemia, Energy requirements for: Strength and power athletes, Endurance athletes		
Unit V	Dietary supplements and Ergonomic saids	5
Dietary supplements and Ergonomic aids: Definition and concept-Ergogenic Aids, Dietary/commercial supplements-use and abuse of sports/energy drinks and sports/energy bars, Brief overview of laws governing the use of ergogenic aids.		

Effects of specific Nutrients on sports performance and physical fitness: Caloric needs and expenditure, B complex Vitamins, Minerals(Na, K, Ca, Cl, Zn, Fe),Sweat mineral loss EffectsofspecificNutrientsonsportsperformanceandphysicalfitness:Roleofantioxidantsandexerciseinducedoxidativestress,Water: Functions, electrolyte balance and role during exercise	
Reference Books	1. ILSI,NIN&SAI.(2017)Nutritionalrecommendationsforhighperformanceathletes. 2. Mahan, L.K.andEscottStumpS.(2016)Krause's Food&NutritionTherapy. Saunders-Elsevier. 3. HicksonJFandWolinkskyI.(1997)NutritionforexerciseandSport.CRCPress, 4.BurkeLM andDeakinV.(2002) ClinicalSportsNutrition, PublishersMcGrawHill
Mode of Evaluation	Internal &External
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course outcomes for: ND4204

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/Skill(S)/ Enterpenureship(En)/None (use, for more than one)
CO1	Students should be able to understand requirements and needs of athlete	3	Emp, S
CO2	Students should be able to learn how to calculate diet for athlete	3	S
CO3	Students should be able to learn how to examine level of nutrition in healthy and unhealthy person at various levels	2	S
CO4	Students should be able to learn to provide best diet counseling to athlete as well as health conscious people	2	Emp, S
CO5	Students should be able to motivate others towards healthy lifestyle	2	Emp, S

CO-PO Mapping: ND4204

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped-3 moderate -2, Low- 1, Not related-0)												Program Specific Outcomes			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	0	1	3	3	2	3	2	3	1	0	3	1	2	2	0	0
CO2	1	2	2	1	2	3	2	1	0	0	1	3	0	3	2	3
CO3	2	3	2	2	0	3	2	3	3	0	1	1	1	0	2	3
CO4	1	2	2	3	0	0	0	0	0	1	0	3	3	1	3	1
CO5	0	1	0	2	3	3	2	2	0	3	1	0	2	0	1	3
AVEG.	0.8	1.8	1.8	2.2	1.4	2.4	1.6	1.8	0.8	0.8	1.2	1.6	1.6	1.2	1.6	2

ND4301	Title: Advanced Food Science	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview for different disciplines of food science.	
Expected Outcome	Students will learn about science behind different foods and how it can help in getting different nutrients as well as learn about processing and preservation principles.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Technology of Cereals, Legumes & Oils	9
Nutritional importance of cereals, legumes and oilseeds. Introduction to Wheat: Structure, types/varieties, harvesting, physical &chempical properties, composition and commercial value. Introduction to other cereals and millets: Rice, maize, oats, rye, corn, pearl millet; their nutritional importance and commercial value (Puffed rice, Rice flakes, parboiling of rice, extruded and fortified rice).Milling of wheat: Roller milling process, flour grade, flour treatments (bleaching, maturing), flour for various purposes, Products and By-products. Introduction to Baking technology: Types of bakery products, nutritional quality and safety of products, pertinent standards & regulations. Bread, cakes, biscuits /crackers: Role of ingredients & processes, equipment used, product quality characteristics, scoring of quality parameters, faults and corrective measures. Breakfast cereals, macaroni products and malt. Production and quality of breakfast cereals and macaroni products. Effect of cooking and steeping on legumes. Classification of oilseeds and factors affecting the nutrient availability of oilseeds. Extraction of oilseeds.		
Unit II	Technology of Meat, Fish, Poultry, Egg and their products	10
Meat: Composition, variety, pre-slaughter handling, slaughtering and related practices, hygiene and sanitation practices of slaughter houses, grading, ageing, curing, smoking and tenderizing of meat, meat pigments and colour changes and methods of preservation for value addition and concerns of antibiotic residues. Poultry: Production considerations, Processing plant operations (slaughter, bleeding, scalding, defeathering, eviscerating, chilling and packaging), tenderness and storage. Eggs: Composition, quality factors, storage, bacterial infection and pasteurization, freezing, drying and egg substitutes. Fish: Composition, on-board handling & preservation, drying and dehydration, curing, smoking, marinades, fermented products, canning, Modified Atmosphere Packaging, and quality factors.		
Unit III	Technology Of Milk & Milk Products	10
Introduction to market milk: Indian standards, Composition, factors affecting composition of milk, physico-chemical properties of milk and its constituents. Milk processing: Clean milk practices, buying and collection, platform tests, pre-heating, filtration, clarification, standardization, bactofugation, homogenization, pasteurization, cooling, packaging and storage. Cleaning and sanitization of dairy equipment including CIP and COP. Processing of toned and double milk. Milk products (Cream, butter, ice cream, curd, cheese, khoa and ghee)-Introduction, definition, classification, methods of manufacture, quality aspects		
Unit IV	Technology Of Fruits & Vegetables and their Products	10

Classification of fruits and vegetables, general composition, climacteric and non climacteric fruits, enzymatic browning and its prevention. Post-harvest changes and management of fruits and vegetables- Climacteric rise, horticultural maturity, physiological maturity, maturity indices and process of ripening- physiological changes, physical and chemical changes. Causes of post-harvest losses, farm heat, measures to reduce post –harvest losses in F & V, Controlled atmosphere storage, modified atmosphere storage, ,zero energy cool chambers.

Preservation of fruits and vegetable

Canning: Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, containers of packing, lacquering, syrups and brines for canning, spoilage in canned foods.

Fruit Beverages: Introduction, Processing of fruit juices (selection, juice extraction, desecration, straining, filtration and clarification), preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation), processing of squashes.

Jams, jellies and marmalades: Introduction, Jam: Constituents, selection of fruits, processing & technology, Jelly: Essential constituents (Role of pectin, ratio), Theory of jelly formation and defects in jelly.

Pickles, chutneys and sauces: Processing, Types, role of ingredients, causes of spoilage in pickling.

Tomato products: Selection of tomatoes, pulping & processing of tomato juice, tomato puree, paste, ketchup, sauce and soup.

Unit V	**Processing Techniques**	9

Processing and preservation by heat:-Principle, theory and effect of blanching, pasteurization, sterilization, UHT, canning, extrusion cooking and frying on food.

Processing and preservation by low temperature:-Principle, theory and effect of refrigeration, chilling, freezing, freeze-drying (lypholization) and freeze-concentration on food.

Processing and preservation by non-thermal technologies:-Principle, theory and effect of irradiation, high pressure, pulsed electric field and other innovative technologies on food

Processing and preservation by other method:-Principle, theory and effect on food of drying, osmotic dehydration, concentration, evaporation and distillation, Hurdle technology, use of chemicals and biological methods of food preservation.

Reference	• Branen AL, Davidson PM &Salminen S. (2001) Food Additives. 2nd Ed. Marcel Dekker. • Fellows P J (2002) Food Processing Technology- Principles and Practices, 2nd Edition. Woodhead Publishing Ltd. • Food and Agriculture Organization (1980) Manual of Food Quality Control, Additive Contaminants Techniques. Rome. • Fuller, G.W. (1999) New Food Product Development. From concept to market place. CRC press, New York. • Mahindru, S N (2000) Food Additives- Characteristics Detection and Estimation. Tata McGraw Hill Publishing Co. Ltd.• Siddapa, G S (1986) Preservation of Fruits and Vegetables, ICAR Publication • Van Loesecke HW (1998) Food Technology Series Drying and Dehydration of foods. Allie Scientific Publishers • Salikhe D K and Kadam S S (1995) Handbook of fruit science and technology. Production Composition, Storage and processing. Marcel Decker inc, New York • Marriott N G (1985) Principles of Food Sanitation 1st Edition. A VI publication USA. • De SK (2001) Outlines of Dairy Technology, Oxford University Press, New Delhi • Akoh C C and Swanson B.G. Carbohydrates Polyesters as Fat Substitutres, MarcalDeker, Inc, New York. • Fabriani, G and Lintas C. (1988) Durum Wheat Chempistry and Technology. American Association of Cereal Chempistry Inc. • Kent N L.(1993) Technology of Cereals. 4th Edi. Pergamon Press. • Olson, V M; Shempwell G A and Pasch, S (1998) Egg and Poultry Meat Processing, VCH P, New York • Winton & Winton, (1991) Techniques of Food Analysis. Applied Scientific Publishers. • Balachandran K K. (1941) Post Harvest Technology of Fish and Fish Products. Daya Publishing House, NewDelhi. • Stadelman WJ. (1998). Egg and Poultry Meat Processing. VCH, New York. • Bechtel, PJ. (1986). Muscle as Food. Academpic Press, Orlando, FL. • Matz A Samuel, Bakery Technology and Engineering. • PomeranzYeshuraj, Food Analysis: Theory and Practice.
Mode of Evaluation	Internal & External
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for: ND4301

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to learn about the nutritional importance of cereals, legumes and oilseeds and also learn about various new technologies of baking	3	Emp
CO2	Students should be able to learn about various technologies of meat, fish, poultry, egg and their products.	2	Emp
CO3	Students should be able to learn about various new technologies of milk and milk products.	2	Emp
CO4	Students should be able to learn about classification and new technologies of fruits & vegetables and their products	2	Emp
CO5	Students should be able to learn about various processing & preservation techniques of food.	3	Skill

CO-PO Mapping : ND4301

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3	PSO4
CO 1	2	1	1	1	2	3	0	3	0	1	2	3	2	3	1	0
CO 2	1	2	2	3	0	1	3	3	3	1	1	1	2	1	2	3
CO 3	2	3	0	1	0	3	0	2	1	1	0	2	1	0	2	1
CO 4	1	3	1	2	3	0	2	0	2	0	0	2	2	3	3	3
CO 5	2	3	2	3	2	2	2	0	0	0	1	2	0	1	0	0
Avg	1.6	2.4	1.2	2	1.4	1.8	1.4	1.6	1.2	0.6	0.8	2	1.4	1.6	1.6	1.4

ND4302	Title: Advanced Food Microbiology	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of essential components of food Microbiology.	
Expected Outcome	The student would acquire different sources of microorganisms and how they causes disease and there beneficial effects.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction and scope of food microbiology	9
Importance and significance of microorganisms in food science. Micro-organisms importance in food - Factors affecting the growth of microorganisms in food - Intrinsic and Extrinsic parameters that affect microbial growth.		
Unit II	Characterization of microorganisms and microbial metabolites	10
Determination of microorganisms and their products in food: Sampling, sample collection, transport and storage, sample preparation for analysis. Microscopic and culture dependent methods- Direct microscopic observation, culture, enumeration and isolation methods; Chemical and Physical methods-Chemical, immunological and nucleic acid based methods; Culture independent techniques – PCR Based, DGGE, Metagenomics, etc.; Analytical methods for microbial metabolites- microbial toxins and metabolites.		
Unit III	Microbial safety	10
Cultural Protection and preservation of Foods: Chemical, Modified atmosphere, Radiation in foods from the microbiological angle. Indicators of water and food safety and quality: Microbiological criteria of foods and their Significance. The HACCP and ISO systems for food safety.		
Unit IV	Food spoilage	9
Food spoilage: characteristic features, dynamics and significance of spoilage of different groups of foods - Cereal and cereal products, vegetables and fruits, meat poultry and sea foods, milk and milk products, packed and canned foods.		
Unit V	Food borne diseases and food intoxication	10
Food borne diseases: Bacterial food borne diseases (Staphylococcal intoxification, Botulism, Salmonellosis, Shigellosis, Enteropathogenic Escherichia Coli Diarrhoea, Clostridium Perfringens gastroenteritis, Bacillus cereus Gastroenteritics) Food Borne Viral Pathogens (Norwalk virus, Norovirus, Reovirus, Rotavirus, Astrovirus, Adenovirus, Parvovirus, Hepatitis A Virus) Food Borne Animal Parasites Protozoa – Giardiasis, Amebiasis, Toxoplasmosis, Sarcocystosis, Crypotosporiodiosis. Cysticercosis/Taeniasis. Roundworm – Trichinosis, Anisakiasis. Mycotoxins: Aflatoxicosis, DeoxynivalenolMycotoxicosis, Ergotism		
Reference	1. Pelezar, M.I and Reid, R.D. (1993) Microbiology McGraw Hill Book Company, New York, 5th Edition. 2. Jay, James, M(2000) Modern Food Microbiology, 2nd Edition. CBS Publisher 3. Adams, M.R. and M.G. Moss (1995): Food Microbiology, 1st Edition, New Age International (P) Ltd. 4. Frazier, W.C. (1988) Food Microbiology, McGraw Hill Inc. 4th Edition. 5. Doyle, P. Bonehat, L.R. and Mantville, T.J-(1997): Food Microbiology, Fundamentals and Frontiers, ASM Press, Washington DC.	
Mode of Evaluation	Internal & External	
Recommendation by Board of Studies on	13-04-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for: ND4302

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to learn about the interaction of microorganisms with food. The scope and importance of Food microbiology.	2	Emp
CO2	Students should be able to learn about the various parameters of microbial analysis like sampling, culturing and transport of microbial culture along with the identification methods.	2	Skill
CO3	Students should be able to learn about protection and preservation of foods. They will also learn about microbial standard such as HACCP.	2	Emp
CO4	Students should be able to learn about the spoilage, contamination along with the prevention methods of different food groups.	2	Emp
CO5	Students should be able to acquire knowledge about the different food borne diseases caused by various causative agents such as salmonella, listeria, clostridium etc.	2	Emp

CO-PO Mapping For ND4302

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	2	2	0	2	1	0	1	0	2	2	0	2	3	3	1
CO 2	2	0	0	2	2	3	1	0	0	2	0	0	3	1	2	2
CO 3	1	1	1	0	2	1	0	1	0	2	1	2	0	2	2	0
CO 4	0	1	0	0	1	2	2	3	1	3	2	1	1	3	3	0
CO 5	1	1	2	1	1	2	0	2	0	2	1	1	2	1	2	2
Avg	1	1	1	0.6	1.6	1.8	0.6	1.4	0.2	2.2	1.2	0.8	1.6	2	2.4	1

ND4303	Title: Advance Food Service Management	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of food service system and its application.	
Expected Outcome	Students will learn catering management and menu planning at different food service units.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction to Food Service System	9
Introduction to Food Service Systems: - Evolution of the food service industry - Broad categories of catering services; commercial and Institutional - Characteristics of the various types of food service units – Canteens, Hostels, Hospitals and Restaurants. Principles of Institutional food Management - Management functions - Management tools: Tangible, Intangible tools		
Unit II	Space Organization	10
Space Organization - Space requirements for kitchen and service areas -Types of Kitchens -Layout of service areas f. Equipment -Types of equipment - Selection of equipment - Maintenance of equipment g. Time and Energy Management - Importance of time and energy management - Types of energy – Human and fuel energy. - Measures for utilization and conservation h. Management of Finance - Sources of finance - Budgets i. Cost accounting/analysis: - Food cost analysis - Labour cost analysis - Cost Control Techniques		
Unit III	Menu Planning	10
Menu Planning -Types of menus - Considerations in menu planning - Steps in Menu planning - Planning menus for canteens, cafeterias, boarding school, hostel mess and old age homes. Food Service -Styles of food service in restaurants - Food service in hospitals -Food service in institutions. Food management -Purchasing: principles, purchasing process and methods -Receiving: receiving process delivery methods and procedure - Issuing process		
Unit IV	Food Storage & Safety	9
Food Storage -Layout of stores -Storage procedure -Inventory management -Store Records. Food Production Management - Food production process -Large quantity cooking techniques -Holding food f Hygiene, Sanitation and food standards - Sources of Food Contamination -Food handling practices - Food standards -Personal Hygiene -Waste disposal. Safety: - General safety rules -Types of accidents -Accident prevention -Review of first aid		
Unit V	Personal Management &Labour Laws	10
Personnel Management - Manpower planning - Recruitment, selection and orientation - Training and motivation d. Legal Aspects - Labour Laws - Welfare policies and schemes for employees		
Reference	• Food Service in Institutions – Wood& West, Bessin, Brooks. • Handbook of Food Preparations – A.M. Home Economics Association. • Food Selection and Preparations – Sweetman, M.D., 4, Mackeller. • School Lunch Room Service – Oliver B. Watson. • Food service Planning: layout Equipment – Lender H. Ketshevar and Marget E. Terrel. • Human Nutrition and Dietetics – Davidson and Passmore	
Mode of Evaluation	Internal & External	
Recommendation by Board of Studies on	13-04-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for ND4303

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to learn about different food service systems and principles of working there	3	Skill
CO2	Students should be able to learn about importance of space organization in an institute various procedures of cost accounting and cost analysis	3	Emp
CO3	Students should be able to learn about different types of menu planning, purchasing principles in any food industry	3	Skill
CO4	Students should be able to learn about sanitation and hygiene, techniques to overpower accidents in the kitchen and various rules and regulations required for working in a kitchen	3	Emp
CO5	Students should be able to learn about various labor laws, welfare schemes for employees and staff member.	3	Emp

CO-PO Mapping for ND4303

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	0	1	0	0	3	0	0	0	2	2	3	0	0	2	3	0
CO2	3	1	2	2	2	0	0	3	0	3	2	3	0	1	2	1
CO3	2	2	1	2	0	2	2	1	1	0	1	1	2	1	3	1
CO4	0	1	1	2	3	2	1	2	0	1	0	1	3	3	0	0
CO5	3	1	1	3	2	2	3	3	0	0	2	2	2	3	2	1
Avg	1.6	1.2	1	1.8	2	1.2	1.2	1.8	0.6	1.2	1.6	1.4	1.4	2	2	0.6

ME4307	Title: Research Methodology	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Understand some basic concepts of research and its methodologies Select and define appropriate research problem and parameters Write a research report and thesis	
Expected Outcome	To know about the types of research and also how to write a report and thesis.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	4
Objectives of Research – Limitations in Research – Qualities of a Good Research Worker – Criteria of Good Research – Limitations of Research Concept of Applied and Basic research – Quantitative and Qualitative Research Techniques – Need for theoretical frame work – Hypothesis development – Hypothesis testing with quantitative data. Research design – Purpose of the study: Exploratory, Descriptive, Hypothesis Testing.		
Unit II	Experimental Design	5
Laboratory and the Field Experiment – Internal and External Validity – Factors affecting Internal validity. Measurempent of variables – Scales and measurements of variables. Developing scales – Rating scale and attitudinal scales – Validity testing of scales – Reliability concept in scales being developed – Stability Measures.		
Unit III	Data Collection	5
Interviewing, Questionnaires, etc. Secondary sources of data collection. Guidelines for Questionnaire Design – Electronic Questionnaire Design and Surveys. Special Data Sources: Focus Groups, Static and Dynamic panels. Review of Advantages and Disadvantages of various Data-Collection Methods and their utility. Sampling Techniques – Probabilistic and non-probabilistic samples. Issues of Precision and Confidence in determining Sample Size. Hypothesis testing, Determination of Optimal sample size.		
Unit IV	Multivariate Statistical Techniques	5
Data Analysis – Factor Analysis – Cluster Analysis -Discriminant Analysis – Multiple Regression and Correlation – Canonical Correlation – Application of Statistical(SPSS) Software Package in Research		
Unit V	Research Report	5
Purpose of the written report – Concept of audience – Basics of written reports. Integral parts of a report – Title of a report, Table of contents, Abstract, Synopsis, Introduction, Body of a report – Experimental, Results and Discussion – Recommendations and Implementation section – Conclusions and Scope for future work		
Text Books	1. C R Kothari, Research Methodology, New Age International 2. C. Murthy, Research Methodology, Vindra Publications Ltd.	
Reference Books	1. Donald Cooper and Pamela Schindler, Business Research Methods, TMGH 2. Alan Bryman and Empma Bell, Business Research Methods, Oxford University Press 3.Ranjit Kumar, Research Methodology, Sage Publications, London	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	13-04-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for ME4307

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the objectives of research, qualities of a good researcher and meaning og hypothesis.	2	Emp
CO2	Student should be able to understand the various experimental designs that are formulated during research and its scales.	2	Emp
CO3	Student should be able to gain knowledge about various methods of data collection and its importance.	2	Skill
CO4	Student should be able to gain knowledge about various methods of data analysis and its techniques	2	Emp
CO5	Student should be able to create a research report.	2	Skill

CO-PO Mapping For ME4307

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4
CO 1	1	2	3	1	1	0	2	3	2	2	3	0	1	2	3	3
CO 2	1	3	1	2	1	1	3	1	0	0	1	0	2	0	1	3
CO 3	1	0	2	3	0	3	2	0	3	1	3	3	1	0	0	3
CO 4	0	1	2	1	3	0	2	0	1	1	0	2	0	0	0	1
CO 5	3	0	1	0	1	3	3	1	2	1	0	1	2	0	1	2
Avg	1.2	1.2	1.8	1.4	1.2	1.4	2.4	1	1.6	1	1.4	1.2	1.2	0.4	1	2.4

ND4304	Title: Food Product Development, Safety and Quality Evaluation	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview for the development of new food products by the applications of food science and technology.	
Expected Outcome	Students will learn about the quality and safety aspects for new food product development.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Food needs and consumer preference	9
Food needs and consumer preference: market survey and its importance in; designing a questionnaire to find consumer needs for a product or a concept; advantages of processed foods in urbanized modern society; why people buy processed foods. Developing a product to meet the requirempents		
Unit II	Designing of new product development	10
Designing new products new food product development(NPD)process and activities, NPD success factors, new product design, food innovation case studies , market –oriented NPD methodologies, organization for successful NPD ; recipe development; use of traditional recipe and modification; recent development in food ingredients\additives flavorings, colorings, emulsifiers, stabilizer and sweeteners; Involvement of consumers, chefs and recipe experts; selection of materials\ingredients for specific purposes ; modifications for production on large Scale , cost effectiveness, nutritional needs or uniqueness		
Unit III	Standardization and statistical analysis	10
Standardization & large scale production: process design, equipment needed and design; establishing process parameters for optimum quality; sensory evaluation; lab requirements; different techniques and test; statistical analysis; application in product development and comparison of market samples; stages of the integration of market and sensory analysis.s		
Unit IV	Quality and safety aspects for new product development	9
Quality , safety and regulatory aspects: product stability ; evaluation of shelf life; changes in sensory attributes and effects of environmental conditions; accelerated shelf life determination; developing packaging systemps for maximum stability and cost effectiveness; interaction of package with food; regulatory aspects; whether standard product and conformation to standards; approval for proprietary product.		
Unit V	Advertisement and marketing	10
Advertisement, marketing and case studies; product performance testing; market positioning, marketing; developing test market strategies; various tools and methodologies to evaluate consumer attitudes, preferences and market acceptance factors; case studies of some successes and failures – factors that influence NPD success, innovation case studies to highlight best practice in terms of the integration of technological and marketing approaches to NPD; food choice models and new product trends.		
Reference	1. Lyon, D.H.; Francombe, M.A.; Hasdell, T.A.; Lawson, K. (eds) (2002): Guidelines for Sensory Analysis in Food Products Development and Quality Control. Chepman and Hall, London. 2. Lawless, H.T. and Klein, B.P. (2001): Sensory Science Theory and Applications in Foods. Marcel Dekker Inc. New York. 3. Piggott, J.R. (ed) (2008): Sensory Analysis of Foods. Elservier Applied Science, London. 4. Ranganna S. 2006. HandBook of Analysis and Quality Control for Fruits and Vegetables Products 2nd Ed. Tata McGraw- Hill Publishing company Limited. New Delhi.	
Mode of Evaluation	Internal & External	
Recommendation by Board of Studies on	13-04-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for ND4304

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to learn about food needs and consumer preferences and also learn about market survey and its importance for new products development (NPD).	2	Emp
CO2	Students should be able to learn about the process, activities, success factors and market- oriented methodologies for designing of new product development.	3	Emp
CO3	Students should be able to learn about standardization, statistical analysis and stages of integration of market and sensory analysis and evaluation.	2	Skill
CO4	Students should be able to learn about quality and safety aspects for new product development (NPD).	2	Emp
CO5	Students should be able to learn about advertisement and marketing for new product development (NPD).	3	Skill

CO-PO Mapping For ND4304

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	3	3	2	2	3	2	3	3	1	1	3	3	2	3	1	3
CO 2	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO 3	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO 4	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO 5	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
Avg	3	3	2	2	3	2	2	3	1.8	1.8	3	3	2.8	3	1.8	3

ND4340	Title: Advanced Food Science Lab	L T P C 0 0 3 2
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of food science and processing techniques	
Expected Outcome	Students will gain the practical knowledge of different processing aspects of foods.	
Experiment No.	List of Experiments	

1. Evaluation of food grains for their physical characteristics.
2. To prepare jam & jelly and TSS measuring by Refractometer.
3. To prepare tomato ketchup & sauce and TSS measuring by Refractometer.
4. Evaluation of egg quality.
5. Extraction and estimation of gluten from cereals.
6. Assessment of milk quality by microbiological and platform testing.
7. To determine the effect of various treatments and prolonged cooking time on the texture and pigments present in different fruits and vegetables.
8. To determine the best method of combining ingredients in preparation of cream of tomato soup.
9. To observe the effect of different added ingredients on the foaming quality and stability of egg white.
10. To study the effect of soaking duration, germination and light on increase in weight, length as well as texture upon cooking for specific length time of different pulses and legumes.
11. To assess the browning reaction of fruits and vegetables and its prevention.
12. To analyze different properties of packaging material.

Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	13-04-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for ND4340

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to learn about various processing techniques and their application on different food products.	3	Skill
CO2	Students should be able to learn about evaluation of different food grains and their packaging.	5	Emp
CO3	Students should be able to gain the practical knowledge of different processing aspects of foods.	3	Emp

CO-PO Mapping For ND4340

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3	PSO4
CO 1	0	2	0	2	3	1	3	1	0	2	2	1	3	1	2	1
CO 2	0	2	2	3	3	2	0	3	2	3	0	2	1	0	1	3
CO 3	0	3	0	0	3	0	1	0	3	2	1	3	0	3	3	3
Avg	2	2	0	3	2	2	2	2	2	2	3	2	1	1	1	2

ND4341	Title: **Advanced Food Microbiology Lab**	L T P C 0 0 3 2
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of characterization of different microbes.	
Expected Outcome	Students will learn the practical aspects and growth of microorganisms by the different analytical process.	
Experiment No.	List of Experiments	

1. Preparation of common laboratory media and special media.
2. Staining: Gram's staining, acid-fast, spore, capsule and flagellar staining, Motility of bacteria, Staining of yeast and molds.
3. Identification of important molds and yeast.
4. Microbiology of milk.
5. Microbiology of water.
6. Microbiology of hand and effect of sanitation on the hand microbiology in a small food joint.
7. Microbiological analysis of typical processed food.
8. Microbiological analysis of a typical unprocessed food.
9. Isolation of specific culture

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for ND4341

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to learn to prepare culture media for the growth and enumeration of microorganisms.	**6**	Skill
CO2	Students should be able to acquire knowledge for microbiological analysis of processed and unprocessed food.	**4**	Emp
CO3	Students should be able to learn to assess the microbiological quality of milk and water etc.	**3**	Skill

CO-PO Mapping For ND4341

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3	PSO4
CO 1	2	2	0	1	0	2	0	0	1	2	0	0	0	0	3	1
CO 2	2	2	0	3	0	3	2	3	0	0	2	3	3	2	3	0
CO 3	1	2	3	0	3	1	2	1	3	0	3	1	2	0	1	0
Avg	1.6	2	1	1.3	1	2	1.3	1.3	1.3	0.6	1.6	1.3	1.66	0.6	2.3	0.3

ND4342	Title: Advance Food service Management Lab	L T P C 0 0 4 2
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of practical knowledge of catering management.	
Expected Outcome	Students will learn the various equipments, kitchen layouts, handling, cost analysis and practical experience by running cafeteria.	
Experiment No.	List of Experiments	
1. Market survey of Food service equipment. 2. Layout analysis of Kitchens of different food service Institutions. 3. Standardizing recipes for 100 servings/ persons 4. Cost analysis of menus in • -College canteen • -Hostel mess • -Hospitals (private, charitable, govt.) 5. In plant training in Cafeteria – Running cafeteria based on the recipes standardized.		
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	13-04-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for ND4342

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to analysis the different layouts of kitchen.	4	Skill
CO2	Students should be able to standardize various recipes and have in-house training of food service management and also learn the cost analysis.	6	Skill
CO3	Students should be able to gain knowledge of various food service equipments used in catering management.	3	Emp

CO PO mapping for ND4342

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcome			
	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO 3	PS O4
CO 1	1	0	1	0	2	2	3	2	2	3	1	3	3	0	2	3
CO 2	3	2	3	1	1	1	3	2	3	0	3	1	3	2	2	0
CO 3	1	1	1	1	2	0	3	0	2	0	3	0	0	0	3	0
Avg	1.6	1	1.6	0.6	1.6	1	3	1.3	2.3	1	2.3	1.3	2	0.6	2.3	1

ND4343	Title: **Food Product Development, Safety& QualityControl Lab**	L T P C 0 0 3 2
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of organoleptic properties required for product development.	
Expected Outcome	Students will learn about the methodology and evaluation required for new product development	
Experiment No.	List of Experiments	

- Product development

1. Permutation combination method
2. Response surface methodology

- Evaluation of product

3. Analysis of physical properties
4. Analysis of chempical properties

- Sensory evaluation

5. Selection of panel
6. Threshold test

- Collection and analysis of sensory data

7. Statistical analysis
8. Interpretation
9. Reporting

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for ND4343

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to learn about the methodology and evaluation required for new product development	5	Emp
CO2	Students should be able to learn about analysis physical & chemical properties of new product development	4	Emp
CO3	Students should be able to gain knowledge about various aspects of sensory evaluation of a new product.	3	Emp

CO PO mapping for ND4343

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	2	2	3	2	1	0	0	0	0	3	3	1	0	1	1	2
CO 2	2	3	3	1	3	2	0	3	3	1	0	3	0	1	0	2
CO 3	2	0	3	1	1	0	3	3	2	3	2	1	2	3	0	2
Avg	2	1.6	3	1.3	1.6	0.6	1	2	1.6	2.3	1.6	1.6	0.6	1.6	0.3	2

ME4340	Title: Research Methodology Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To learn to prepare reports and charts	
Expected Outcome	On successful completion of this course the student will have knowledge to analyze and prepare reports	

List of Experiments

1. Basics of Excel- data entry, editing and saving, establishing and copying a formula.
2. Functions in excel, copy and paste and exporting to MS word document
3. Graphical presentation of data -Histogram, frequency polygon, pie-charts and bar diagrams.
4. SPSS, opening SPSS, layout, menu and icons analyzing the data using different statistical techniques.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academpic Council	13-07-2019

Course Outcome for ME4340

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to search and frame a good review on any problem of statement.	3	Emp
CO2	Students should be able to understand how to design a research project, and demonstrate any task at community level.	6	Emp
CO3	Students should be able to write synopsis, report , thesis and dissertation.	3	Skill

CO PO mapping for ME4340

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4
CO 1	2	1	1	1	3	3	2	0	2	3	2	0	1	2	2	3
CO 2	1	2	3	3	3	0	1	3	3	1	0	3	0	1	0	1
CO 3	1	3	0	1	0	0	2	3	0	3	2	3	1	1	3	0
Avg	1.3	2	1.3	1.6	2	1	1.6	2	1.6	2.3	1.3	2	0.6	1.3	1.6	1.3

Program Electives

ND4216	Title: Nutrition Epidemiology Pediatric and Geriatric Nutrition	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To understand the principles of nutrition epidemiolo0gy and its importance in community and public health.	
Expected Outcome	Students will be able to initiate studies in nutrition epidemiology.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Nutrition Epidemiology	8
Nutrition epidemiology: Introduction, aims and purposes, Principles of nutritional epidemiology, types of epidemiology and source of information. Descriptive epidemiology, cross sectional analysis, prevalence and incidence, risk factors, socio demographic and psychosocial variables.		
Unit II	Pediatric Nutrition	8
Pediatric Nutrition:- Nutrition during infancy; breast feeding –colostrum, composition and importance, initiation of breast feeding and duration, advantage of breast feeding. Introduction of complementary foods – initiation and management of weaning, mixed feeding. Management of problems. Preterm and low birth children. Nutritional needs of toddlers, preschool and school going children. Feeding children with special needs		
Unit III	Therapeutic Care and Management of Children	6
Therapeutic Care and Management of Pediatric:-diarrhea, juvenile diabetes, Infection, Nephrotic syndrome, Malnutrition etc. To plan and calculate nutrient dense, complementary foods for 6-12 months old infants/ promote catch up growth, School going children. To plan & calculate diets to promoter catch up growth after diarrhea/ infection and other common diseases.		
Unit IV	Geriatric Nutrition	8
Geriatric Nutrition:- the ageing process- chronological and physiological ageing, changes in bodycomposition Explanation of the terms- and pause, menopause- hormonal interplay during menopause and its consequences. HRT (Hormonal therapy) and food based interventions in post menopausalwomen. Nutritional factor, conducive to healthy ageing- general consideration in the nutrition of the aged, recipes for the Elderly		
Unit V	Therapeutic Care and Management of Elderly	6
Therapeutic Care and Management of Arthritis, Dementia, Parkinson's disease, Cataracts. Kidney and bladder problems. To plan and calculate diet for elderly in health, To plan and prepare dental soft diet for elderly, To plan and calculate diet for elderly during ill health.		
Reference Books	1. Dave, Nilambari (2004). Nutrition and Diet Therapy, Dr. Nilambari Dave, Head, Dept. of Home Science, Saurashtra University, Rajkot. 2.Mahan, L.K. and Escott-stump S. (2000): Krause's food nutrition and diet therapy, W.B. Saunders Ltd., 2. Shills, M.E. Olson, J.A. Shilke, M. and Ross. A.C. (1999). Modern Nutrition in Health and Disease, Williams and Wilkins. 3. Escott-Stump, S. (1998) : Nutrition and Diagnosis RelatedCare, Williams and Wilkins. 4. Ronald E. Kleinman, " Pediatric Nutrition"; 8th Edition, American Adacedy of Pediatrics 5. Pallavi M. Metha , Komal B. Chauhan," Ageing, Nutrition and Health"; Kalpaz Publishers	
Mode of Evaluation	Internal and External Examinations	

Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome forND4216

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/Entrepreneurship(En)/ None (*Use,formorethan One*)
CO1	Students will be able to learn about the type of epidemiological studies and various variables	2	Emp
CO2	Students will be able to learn about pediatric nutrition and management of related problems	3	Emp
CO3	Students will be able to learn about therapeutic care and management of children.	2	Skill
CO4	Students will be able to learn about various geriatric changes, consequences and related nutrition.	2	Emp
CO5	Students will be able to learn about therapeutic care and management of elderly.	3	Skill

CO-PO Mapping ForND4216

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3,Moderate-2,Low-1, Not related-0)												ProgramSpecific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	2	3	3	1	1	3	3	2	3	1	3
CO2	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO3	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO 4	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO 5	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
Avg	3	3	2	2	3	2	2	3	1.8	1.8	3	3	2.8	3	1.8	3

ND4217	Title: Food Processing Technology	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To gain in depth knowledge of technological aspects involved in processing of cereals, bakery products, meat, fish, poultry and eggs.	
Expected Outcome	Understand the basic concepts of properties of foods and basic food engineering concepts Acquire the knowledge of various unit operations in food processing technology. Gain the knowledge of food packaging and its interaction with food products.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction to Baking Technology	6
Types of bakery products, nutritional quality and safety of products, pertinent standards & regulations. Bread, cakes, biscuits /crackers: Role of ingredients & processes, equipment used, product quality characteristics, scoring of quality parameters, faults and corrective measures. Breakfast cereals, macaroni products and malt. Production and quality of breakfast cereals and macaroni products		
Unit II	Respiratory and Excretory System Technology of meat, fish, poultry,egg and their products	8
Unit operations in food processing: Cleaning, sorting, grading, peeling, Size reduction, mixing and forming, Separation techniques, Process Plant design-Meat: Composition, variety, pre-slaughter handling, slaughtering and related practices, hygiene and sanitation practices of slaughter houses, grading, ageing, curing, smoking and tenderizing of meat, meat pigments and colour changes and methods of preservation for value addition and concernsof antibiotic residues. Poultry: Production considerations, Processing plant operations (slaughter, bleeding, scalding, de feathering, eviscerating, chilling and packaging), tenderness and storage. Eggs: Composition, quality factors, storage, bacterial infection and pasteurization, freezing, drying and egg substitutes. Fish: Composition, on-board handling & preservation, drying and dehydration, curing, smoking, marinades, fermented products, canning, ModifiedAtmosphere Packaging, and quality factors.		
Unit III	Introduction to Fruits and Vegetables	6
Classification, general composition, enzymatic browning and its prevention. Post- harvest changes and management. Climacteric rise, horticultural maturity, physiological maturity, maturity indices and processof ripening- post-harvest losses, farm heat, measures to reduce post –harvest losses in F & V, Controlled atmosphere storage, zero energy cool chambers.		
Unit IV	Milk and Milk products	8
Introduction to market milk: Indian standards, Composition, factors affecting composition of milk, physico-chemical properties of milk and its constituents. Milk processing: Clean milk practices, buying and collection, platform tests, pre-heating, filtration, clarification, standardization, bactofugation, homogenization, pasteurization, cooling, packaginganc storage. Cleaning and sanitization of dairy equipment including CIP and COP. Milk products (Cream, butter, ice cream, curd, cheese, khoa and ghee)-Introduction, definition, classification, methods of manufacture, quality aspects.		
Unit V	Preservation of Fruits and Vegetables	8

Canning spoilage in canned foods. Fruit Beverages: Introduction, Processing of fruit juices, preservation of fruit juices , processing of squashes. Jams, jellies and marmalades: Introduction, Jam: Constituents, selection of fruits, processing & technology, Jelly: Essential constituents (Role of pectin, ratio), Theory of jelly formation and defects in jelly. Pickles, chutneys and sauces: Processing, Types, role of ingredients, causes of spoilage in pickling..	
Reference Books	• P J Fellow, Food processing Technology 4th Edison, Woodhead publishing, 2016. • R.P. Srivastava & Sanjeev kumar, Fruit & vegetable Preservation: Principles &Practices,CBS Publishers & Distributors, 2002. • Norman N. Potter & Joseph H. Hotchkiss, Food Science Vth Edison, CBS Publishers & distributors. 2007. • Encyclopedia of Food Science and Technology, Academic Press,1993. • Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S. Basic Food Preparation – A Complete Manual. Orient Longman, 2005 • B. Sivasankar, Food processing & Preservation 1st Edison PHI Learning Pvt. Ltd. , 2009. • Avantina Sharma, Textbook of Food Science & Technology, CBS Publishers & Distributors Pvt Ltd, India,2006. • Subbalakshmi G, Udipi SA. Food Processing and Preservation. New Age International Publishers, Delhi 2007. • Ramaswamy H and Marcott M. Food Processing Principles and Applications. CRC Press, 2005.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome forND4217

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/ Skill(S)/Entrepreneurship(En)/None (*Use,formorethan One*)
CO1	Students will be able to learn the detailing related to baking technology.	2	Emp
CO2	Students will be able to learn in detail related to processing technology used in Non-Vegetarian food items.	3	Emp
CO3	Students will be able to learn in detail related to processing technology used in Fruits and vegetables food items.	2	Skill
CO4	Students will be able to learn in detail related to processing technology used in Milk & Milk Products food items.	2	Emp
CO5	Students will be able to learn in detail related to preservation methods used in fruits & vegetables food items.	3	Skill

CO-PO Mapping For ND4217

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3,Moderate-2,Low-1, Not related-0)												ProgramSpecific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	2	3	3	1	1	3	3	2	3	1	3
CO2	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO3	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO4	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO5	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
Avg	3	3	2	2	3	2	2	3	1.8	1.8	3	3	2.8	3	1.8	3

ND4317	Title: Functional Foods & Nutraceuticals	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To provide an overview for the properties to evaluate functional foods & Nutraceuticals	
Expected Outcome	1. Students should be able to learn about history, concept, evolution of nutraceuticals & functional foods. They will also learn about different types of nutraceuticals. 2. Students should be able tolearn about different Phytochemicals, antioxidants, flavanoids and their role in health and diseases. 3. Students should be able to learn about the various methods used to isolate, extract and purify the various bioactive compounds. 4. Students should be able to learn about pre & probiotics and their health benefits in various diseases 5. Students should be able to learn about different functional foods and other new technologies or nutraceuticals that will be making new trends	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Nutraceuticals	9
Nutraceuticals–Definition, concept, history and market; Evolution of nutraceuticals and functional foods market. Classification of nutraceuticals. Significance and relevance of nutraceuticals in the management of diseases and disorders.		
Unit II	Phytochemicals, Antioxidants & Flavonoids	10
Natural occurrence of certain phytochemicals- Antioxidants and flavonoids: omega – 3 fatty acids, carotenoids, dietary fiber, phytoestrogens; glucosinates; organosulphur compounds. Dosage for effective control of disease or health benefit with adequate safety; studies with animals and humans; acute and chronic studies. Regulatory issues.		
Unit III	Isolation of Phytochemicals	9
Isolation of phytochemicals from plant materials: Care in handling and storage of raw materials with minimal damage to sensitive bioactive compounds; Extractive methods for maximum recovery and minimal recovery and minimal destruction of active material; stability studies. Recent developments in the isolation, purification and delivery of phytochemicals.		
Unit IV	Prebiotics, Probiotics & Symbiotics	10
Prebiotics, probiotics and symbiotics- Probiotics: Definition, types and relevance; Usefulness in gastro intestinal health and other health benefits; development of a probiotic products; recent advances in probiotics; Challenges and regulatory issues related to probiotic products. Prebiotics: Prebiotic ingredients in foods; types of prebiotics and their effects on gut microbes; health benefits of prebiotics; recent development in prebiotics. Symbiotics.		
Unit V	Functional Foods	10
Functional foods - Definition, classification, significance and development of functional foods,Native functional foodsavailable in Uttrakhand region. use of bioactive compounds in appropriate form with protective substances and activators; Effect of environmental condition and food matrix; Delivery of immunomodulators /vaccines through functional foods. Nutrigenomics- concept of personalized medicine.		
Text & Reference Books	• Wildman, R.E.C. (2007) Handbook of Nutraceuticals and Functional Foods, second edition. CRCPress. • Gibson GR & William CM. *Functional Foods - Concept to Product.*2000. • Goldberg I. *Functional Foods: Designer Foods, Pharma Foods.*2004. • Brigelius-Flohé, J &Joost*HG. Nutritional* Genomics: Impact on Health and Disease. Wiley VCH.*2006.* • Cupp J & Tracy TS. *Dietary Supplements: Toxicology and Clinical Pharmacology*. Humana Press.2003.	
Mode of Evaluation	Internal and External Examinations	

Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome forND4317

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/ Skill(S)/Entrepreneurship(En)/None (*Use,formorethan One*)
CO1	Students should be able to learn about history, concept, evolution of nutraceuticals & functional foods. They will also learn about different types of nutraceuticals.	2	Emp
CO2	Students should be able to learn about different Phytochemicals, antioxidants, flavanoids and their role in health and diseases.	3	Emp
CO3	Students should be able to learn about the various methods used to isolate, extract and purify the various bioactive compounds.	2	Skill
CO4	Students should be able to learn about pre & probiotics and their health benefits in various diseases	2	Emp
CO5	Students should be able to learn about different functional foods and other new technologies or nutraceuticals that will be making new trends	3	Skill

CO-POMappingForND4317

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3,Moderate-2,Low-1, Not related-0)												ProgramSpecific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	2	3	3	1	1	3	3	2	3	1	3
CO2	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO3	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO4	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO5	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
Avg	3	3	2	2	3	2	2	3	1.8	1.8	3	3	2.8	3	1.8	3

ND4318	Title: Food Toxicology	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of toxic components present in foods.	
Expected Outcome	1. Students should be able to learn about food toxicology and its evaluation. 2. Students should be able to learn about various food toxicants 3. Students should be able to learn about various food allergens 4. Students should be able to learn about various environmental contaminants and drug residues in food. 5. Students should be able to learn about various safety aspects of food.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Food toxicology and its evaluation	9
Principles of Toxicology: Classification of toxic agents; characteristics of exposure; spectrum of undesirable effects; interaction and tolerance; biotransformation and mechanisms of toxicity. Evaluation of toxicity: Risk vs. benefit: Experimental design and evaluation: Prospective and retrospective studies: Controls Statistics (descriptive, inferential): Animal models as predictors of human toxicity: Legal requirements and specific screening methods: LD50 and TD50: In vitro and in vitro studies; Clinical trials.		
Unit II	Food toxicants	10
Natural Toxins in Food: Natural toxins of importance in food- Toxins of plant and animal origin; Microbial toxins (e.g. Algal toxins, bacterial toxins and fungal toxins). Natural occurrence, toxicity and significance. Food poisoning; Mycotoxicoses of significance. Determination of toxicants in foods and their management.		
Unit III	Food allergens	10
Food allergies and sensitivities: Natural sources and chemistry of food allergens; true/untrue food allergies; handling of food allergies; food sensitivities (anaphylactoid reactions, metabolic food disorders and idiosyncratic reactions); Safety of Genetically Modified food: potential toxicity and allergenisity of GM foods. Safety of toys and children consumables.		
Unit IV	Environmental Contaminants and Drug Residues in Food	9
Environmental Contaminants and Drug Residues in Food: Fungicide and pesticide residues in foods; heavy metal and their health impacts; use of veterinary drugs (e.g. Malachite Green in fish and β- agonists in pork); other contaminants in food. Radioactive contamination of food, Food adulteration and potential toxicity of food adulterants.		
Unit V	Safety aspects of food	10
Food Additives and toxicants added or formed during Food Processing: Safety of food additives; toxicological evaluation of food additives; food processing generated toxicants: nitroso- compounds, heterocyclic amines, Dietary Supplements and Toxicity related to Dose: Common dietary supplements; relevance of the dose; possible toxic effects.		
Reference	1. Helferich, W., and Winter, C.K. Food Toxicology CRC Press 2001Shibamoto, T. and Bjeldanes, L. 2009. Introduction to Food Toxicology, 2nd Ed. Elsevier Inc., Burlington, MA. 2. Duffus, J.H. and Worth, H.G. J. Fundamental Toxicology The Royal Society of Chemistry 2006. 3. Stine, K.E. and Brown, T.M. Principles of Toxicology (2nd ed.)CRC Press 2006. 4. Tönu, P. 2007. Principles of Food Toxicology. CRC Press, LLC. Boca Raton, FL. 5. Tönu, P. 2007. Principles of Food Toxicology. CRC Press, LLC. Boca Raton, FL.	
Mode of Evaluation	Internal & External	
Recommendation by Board of Studies on	13-04-2019	

Date of approval by the Academic Council	13-07-2019

Course Outcome forND4318

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp)/ Skill(S)/Entrepreneurship(En)/None (*Use,formorethan One*)
CO1	Students should be able to learn about food toxicology and its evaluation.	2	Emp
CO2	Students should be able to learn about various food toxicants	3	Emp
CO3	Students should be able to learn about various food allergens	2	Skill
CO4	Students should be able to learn about various environmental contaminants and drug residues in food.	2	Emp
CO5	Students should be able to learn about various safety aspects of food	3	Skill

CO-PO Mapping For ND4318

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3,Moderate-2,Low-1, Not related-0)												Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	2	3	3	1	1	3	3	2	3	1	3
CO2	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO3	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO4	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO5	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
Avg	3	3	2	2	3	2	2	3	1.8	1.8	3	3	2.8	3	1.8	3

ND4319	Title: Nutrition Anthropology	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of food anthropology.	
Expected Outcome	1. Students should be able to learn about the research tools used in anthropology. 2. Students should be able to learn about anthropology and its relevance. 3. Students should be able to learn about cultural interpretation of Malnutrition and Rural Urban and its differences. 4. Students should be able to learn about comparing rural vs urban differences in anthropology. 5. Students should be able to learn about applications of Operations Research in anthropology.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Research Tools In Anthropology	9

Research tools in anthropology for formulation of research and programme design: Focus GroupDiscussion**.** Various Types ofinterviews.Observationmethods

Research tools in anthropology for formulation of research and programme design: Participatory Research methods. Triangulation of methods.Steps for ensuring effective planning and use of these methods.Examples of recent studies relevant to above topics

Unit II	Introduction to Anthropology & its Relevance	10

Introduction to Anthropology and Its Relevance toNutrition

Definition and Application of the Discipline of Anthropology as applied to:

Health andDisease, Nutrition and Nutritional status, Direct and Indirect parameters of nutritional/health assessment used in community surveys, Emic vs Etic Perspective

Factors Affecting Food choices and household level practices: Ecological andGeographical, Poverty, economic status, Socio cultural; education, ethnic and religious factors.Sensory Qualities of Foods and culture, Gender Discrimination, Intra Household Distribution of Food

Unit III	Cultural Interpretation of Malnutrition and Rural Urban differences	10

Cultural Interpretation of Malnutrition and Rural Urban differences

Community beliefs about cause prevention and treatment of under nutrition and micro nutrient deficiencies (PEM,IDA, VAD, IDD) in children and women in developed and developing countries.Ethno-physiology: cultural perceptions of body physiology in different stages of the life cycle (child, adolescent, adult) and its impact on home level nutrition and health care.

Unit IV	Comparing rural vs urban differences	9

Comparing rural vs urban differences as regards:

Time and activity patterns; workload of men and women and its impact on food intake and nutritional status (especially vulnerable groups). Health care seeking behaviors – treatment ofillness.Complementary feeding and breast feeding practices; familysupport

Unit V	Application of Operations Research	10

Application of Operations Research (Qualitative: Participatory) to Strengthen Interventions for Nutritional improvements Experiences in use of qualitative and participatory research approaches in India and other countries for:

Interdisciplinary understanding of nutrition-health issues, Rapid Rural Appraisals and Program Design, Experiences in use of qualitative and participatory research approaches in India and other countries for:Urban malnutrition control in urban health systems, Women's reproductive health and related problems like anemia

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	Community Medicine. CBSPublication • "Listening to Women Talk about their Health- Issues and Evidence from India" byJoelGittelsohn, et.al., Har-anand Publications, The Ford Foundation,1994. • Korrie de Koning & Marion Martin . (1996)."Participatory Research in Health:Issues and Experiences" ZedBook. • Joel Gittelsohn et al . (1998). Rapid Assessment Procedures (RAP):Ethnographic Methods to Investigate Women□s Health. International NutritionFoundation. • Nevin S.Scrimshaw and Gary R. Gleason. (1992). "RAP: Rapid Assessment Procedures– Qualitative Methodologies for Planning and Evaluation of Health Related Programs" by, International Nutrition Foundation for Developing Countries,USA. • Richard Heaver. (1991). Participative Rural Appraisal: Potential Applications to Family Planning, Health and Nutrition Programs. Asia Technical Department, Departmental Papers Series,No.3. • Michel Dibble and VpulSenaratu(2010) Special section on IYCF practices in 4 Countries in South Asia: SAsia
Mode of Evaluation	Internal & External
Recommendation by Board of Studies on	13-04-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome forND4319

Unit-wiseCourseOutcome	Descriptions	BL Level	Employability(Emp)/ Skill(S)/Entrepreneurship(En)/None (*Use,formorethanOne*)
CO1	Students should be able to learn about the research tools used in anthropology.	2	Emp
CO2	Students should be able to learn about anthropology and its relevance.	3	Emp
CO3	Students should be able to learn about cultural interpretation of Malnutrition and Rural Urban and its differences.	2	Skill
CO4	Students should be able to learn about comparing rural vs urban differences in anthropology.	2	Emp
CO5	Students should be able to learn about applications of Operations Research in anthropology	3	Skill

CO-PO Mapping ForND4319

Course Out comes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3,Moderate-2,Low-1, Not related-0)												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PS O1	PS O2	PS O3	PS O4
CO1	3	3	2	2	3	2	3	3	1	1	3	3	2	3	1	3
CO2	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO3	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO 4	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
CO 5	3	3	2	2	3	2	2	3	2	2	3	3	3	3	2	3
Avg	3	3	2	2		2	2	3	1.8	1.8	3	3	2.8	3	1.8	3