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

[Applicable for 2022-2024]

Version 2022

[As per CBCS guidelines given by UGC]

Approved in BOS	Approved in BOF	Approved in Academic Council
31/05/2022	08/08/2022	20/10/2022 vide agenda No. 8.4.5

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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)			
Mid Semester Examination	60 Marks		
Assignment –I	30 Marks		
Assignment-II	30 Marks		
Attendance	30 Marks		
Internal Evaluation Components (Practical Papers)			
Quiz One	30 Marks		
Quiz Two	30 Marks		
Quiz Three	30 Marks		
Lab Records/ Mini Project	30 Marks		
Attendance	30 Marks		
End Semester Evaluation (Practical Papers)			
ESE Quiz	40 Marks		
ESE Practical Examination	40 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 the basis 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.*

Program Structure –Master of Science in Nutrition and Dietetics

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 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 (2022-2024) Version 2022

Quantum School of Health Sciences

Master of Science in Nutrition and Dietetics– PC: –06-4-01

BREAKUP OF COURSES

Sr. No.	CATEGORY	CREDITS
1	Program Core (PC)	72
2	Program Electives (PE)	06
3	Seminar	04
4	Internship	10
5	Value Added Programs (VAP)	02
6	General Proficiency(GP)	03
	TOTAL NO. OF CREDITS	**97**

BREAKUP OF CATEGORY

	Program Core	Program Elective	Sub Total	%
Sciences	72	06	78	80.6.0
Seminar			04	4.08
Internship			10	10.20
VAPs			02	2.04
GP			03	3.06
Grand Total	72	06	**97**	100

SEMESTER-WISE BREAKUP OF CREDITS

Sr.No	CATEGORY	SEM 1	SEM 2	SEM 3	SEM 4	TOTAL
1	Program Core	24	17	21	10	72
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	24	27	20	**97**

SEMESTER 1

Course Code	Category	COURSE TITLE	L	T	P	C	Version
ND4101	PC	Advanced Nutritional Biochemistry	4	0	0	4	2.0
ND4104	PC	Human Nutrition	3	0	0	3	2.0
ND4105	PC	Advanced Human Physiology	3	0	0	3	2.0
ND4106	PC	Scientific Writing & Nutrition Communication	2	0	0	2	2.0
ND4103	PC	Public Health Nutrition	4	0	0	4	2.0
ND4108	PC	Clinical and Therapeutic Nutrition I	3	0	0	3	2.0
ND4140	PC	Advance Nutritional Biochemistry Lab	0	0	2	1	2.0
ND4142	PC	Public Health Nutrition Lab	0	0	2	1	2.0
ND4144	PC	Clinical and Therapeutic Nutrition Lab I	0	0	3	2	2.0
ND4145	PC	Scientific Writing & Nutrition Communication Lab	0	0	2	1	2.0
VP4102	VP	Personality Development Program I	0	0	2	1	2.0
GP4101	P	General Proficiency	0	0	0	1	2.0
		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	2.0
ND4206	PC	Advances in Nutrition	3	0	0	3	2.0
ND4204	PC	Nutrition for Fitness and Sports	2	0	0	2	2.0
ND4207	PC	Research Methodology and Biostatistics	2	0	0	2	2.0
ND4205	PC	Clinical and Therapeutic Nutrition II	3	0	0	3	2.0
----	PE	Program Elective I	3	0	0	3	2.0
ND4240	PC	Biochemical Food Analysis and Instrumentation Lab	0	0	3	2	2.0
ND4241	PC	Clinical and Therapeutic Nutrition Lab II	0	0	3	2	2.0
ND4243	S	Seminar I	2	0	0	2	2.0
ND4244	PC	Research methodology & Computer Application Lab	0	0	2	1	2.0
VP4202	VP	Personality Development Program-II	0	0	2	1	2.0
GP3201	GP	General Proficiency	0	0	0	1	2.0
		TOTAL	**17**	**0**	**10**	**24**	

Contact Hrs: 27

SEMESTER 3

Course Code	Category	COURSE TITLE	L	T	P	C	Version
ND4301	PC	Advance Food Science	4	0	0	4	2.0
ND4302	PC	Advanced Food Microbiology	3	0	0	3	2.0
ND4303	PC	Advance Food Service Management	3	0	0	3	2.0
ND4304	PC	Food Product Development, Safety and Quality Development	3	0	0	3	2.0
ND4340	PC	Advance Food Science Lab	0	0	3	2	2.0
ND4341	PC	Advanced Food Microbiology Lab	0	0	3	2	2.0
ND4342	PC	Advance Food Service Management Lab	0	0	4	2	2.0
ND4343	PC	Food Product Development, Safety and Quality Development Lab	0	0	3	2	2.0
--	PE	Program Elective II	3	0	0	3	2.0
ND4345	S	Seminar II	2	0	0	2	2.0
GP4302	GP	General Proficiency	0	0	0	1	2.0
		TOTAL	**18**	**0**	**13**	**27**	

Contact hrs-31

SEMESTER 4

Course Code	Category	COURSE TITLE	L	T	P	C	Version
ND4441	FW	Hospital Internship*	0	0	0	8	2.0
ND4442	FW	Food Industry Internship**	0	0	0	2	2.0
ND4401	PC	Dissertation	0	0	0	10	2.0
		Total	**0**	**0**	**0**	**20**	

*Student has to attend Hospital Internship for a period of 12-16 weeks and having at least 2 case studies in-case of hospital internship.
**Student has to attend the Food Industry Internship for a period of 4-6 weeks.

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	3	0	0	3	2.0
	ND4217	PE	Food Processing Technology	3	0	0	3	2.0
	ND4218	PE	Clinical Psychology	3	0	0	3	2.0
Program Elective II	ND4317	PE	Functional Food and Nutraceuticals	3	0	0	3	2.0
	ND4318	PE	Food Toxicology	3	0	0	3	2.0
	ND4319	PE	Food Anthropology	3	0	0	3	2.0

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 allied 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 M.Sc. (Nutrition & Dietetics)

PO-01	**Nutrition Knowledge:**	Utilize knowledge from the physical and biological sciences as a basis 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 for clinical, community, and food service application.
PO-04	**Evaluate Information:**	Critically evaluate information on food science and nutrition issues appearing 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 communities and 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 other healthcare 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 practical benefits.
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 dietetics settings.
PO-11	**Life-long learning**	Students will utilize advanced principles of health literacy, including critical thinking skills, literature searches, data collection and 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 information sources related to nutrition, food, lifestyle and health.

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

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

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

Program Educational Outcomes(PEO's)

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

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

PEO3: To instill lifelong learning approach towards constantly evolving nutritional knowledge with 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, wherever possible.

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 and allowed 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 which the 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	1. Students should be able to understand complex biological oxidation-reduction reactions in human body. 2. Students should be able to understand the metabolic pathway of protein and lipid metabolism. 3. Students should be able to understand about chemistry of enzymes and the factors affecting enzymes function. 4. Students should be able to learn about structure and metabolism of nucleic acids along with Spectrophotometric techniques. 5. Students should be able to learn about biosignaling of hormone along with regulation of body water and salt level.	
Unit No.		
Unit I	Biological Oxidation and Carbohydrate metabolism	
Biological Oxidation- Theory of biological oxidation. Concept of free energy. Oxidation – reduction reactions. Respiratory chain. Oxidative and non-oxidative phosphorylation. High energy compounds. Carbohydrate metabolism: Glycolysis, Tricarboxylic Acid cycle and its significance, Gluconeogenesis, Hexose Monophosphate pathway, Glycogenolysis, Glycogenesis. Regulation of blood glucose level. Disorders of carbohydrate metabolism: galactosemia, hereditary fructose intolerance, fructosuria and Glycogen storage disease (Von Gierke, Pompe, Cori and McArdle diseases		
Unit II	Protein and Lipid Metabolism	
Protein Metabolism: Classification and structure of amino acids. Review of general reaction of amino acid catabolism and urea cycle. Biosynthesis of proteins. Lipid Metabolism: Classification of lipids. Biological importance of lipids. Fat storage, lipid transport and mobilization. Oxidation & biosynthesis of saturated and unsaturated fatty acids. Formation and utilization of ketone bodies. Ketosis		
Unit III	Enzymes	
Enzymes: Introduction and definition. Review of chemistry of enzymes (classification and enzyme specificity). Factors affecting enzyme activity, Derivation of Michaelis – Menten equation, Lineweaver-Burk plo. Enzyme inhibition & Regulatory enzymes: Competitive, non–competitive, uncompetitive, product and feedback inhibition. Regulatory enzymes: Covalent and allosteric. Involvement of enzymes in metabolic pathways Application of enzymes in diagnostics (SGPT, SGOT, Creatine kinase & Alkaline phosphatase)		
Unit IV	Nucleic acids	
Nucleic acids: Structure of DNA and RNA (mRNA, tRNA ,rRNA) Metabolism: Replication, transcription and translation of nucleic acids. Nucleotide metabolism. Genetic code. SPECTROPHOTOMETRIC TECHNIQUES: Beer-Lambert's law, Colorimetry and spectrophotometry, Atomic absorption spectroscopy, Flame photometry		

Unit V	Bio-signaling and Hormone
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.	
Text Book	1.Biochemistry, Albert L. Lehninger, Kalyani Publishers, New Delhi, 2005. 2.Biochemistry, Satyanarayan, Book and Allied publishers, Kolkata, 2007.
Reference Books	1.Introduction to Biochemistry, John W. Suttie, Holt Rinehart and Winston publishing Co., London, 1977. 2Practical Clinical Biochemistry, Harold Varley, Arnold Heinemann Publishing, New Delhi, 1978. 3Text book of Biochemistry, West and Todd, Oxford and IBH Publishing Co., Calcutta, 1974. 4.Biochemistry, S.C. Rastogi, Tata MacGraw Hill Publishing Co. , New Delhi, 2003.
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 outcomes for:ND4101

Unit-wise Course Outcome	Descriptions	BL Level	Employability(Emp) /Skill(S)/Enterpenurship(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 Spectrophotometric techniques.	**2**	Emp , S
CO5	Students should be able to learn about biosignaling 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**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**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

ND4108	Title: Clinical And Therapeutic Nutrition I	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	1. 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. 2. Students should be able to learn about the nutrition care process and importance of diet counceling. 3. Students should be able to learn about different gastro-intestinal diseases and malabsorption diseases and there management. 4. Students should be able to learn about different types of liver diseases and its management. 5. Students should be able to learn about different types of renal diseases and its nutritional management.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Nutrition Support and Therapeutic Diet	8
Types of therapeutic diets, Prescriptions, details, nutritional assessment. Principles and importance, types of feeding, Enteral nutritional, Parental nutritional, recent advantages in techniques and feeding substrates.		
Unit II	Nutrition Care process	8
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 III	Nutrition in Gastro-intestinal diseases	8
Aetiopathogenesis, clinical picture, diagnostic tests, treatment, preventive aspects:- Peptic ulcer, Ulcerative colitis Aetiopathogenesis, clinical picture, diagnostic tests, treatment, preventive aspects:- Diarrhoea, Constipation, dysenteries. Malabsorption syndrome, IBS		
Unit IV	Nutrition in Liver diseases	6
Classification, etiology, clinical features, diagnostic tests, prevention and treatment. Liver disorders: Jaundice, Viral hepatitis types A and B, Cirrhosis of liver, Hepatic coma		
Unit V	Nutrition in Renal diseases	6
Classification, etiology, clinical features, diagnostic tests, prevention and treatment. Renal diseases: Glomerular nephritis, Nephrotic syndrome, Acute and chronic renal failure –Dialysis. Metabolic and nutritional implications in Kidney transplant, renal calculi.		

Reference Books	1. Mahan, L.K. and Escott-Stump, S., Krause's Food, Nutritionand Diet Therapy, W.B.SaundersCompany,London. 2. WilliamsS.R.:NutritionandDietTherapy.TimesMirror/MosbyCollege Publishing, St.Louis. 3. Association of Physicians of India (1998). API Textbook ofMedicine, Vol. I and II. Published by Association of Physicians ofIndia. 4. Shills ME, Olson JA and Shike N (1994). Modern Nutrition in Health and Disease. Fiebiger,Philadelphia 5. American Dietetic Association – Handbook of Clinical Dietetics (1981). Yale University Press, New Haven andLondon 6. Robinson CH, Laer MR, Chenoweth WL and Garovich AE (1998). Normal and Therapeutic Nutrition. Macmillan Publishing Company,New York 7. Mahan KL and Stump SE (2007). Krause's Food and NutritionTherapy. SaundersPublishing
Mode of Evaluation	Internal & External
Recommendation by Board of Studies on	31.05.22
Date of approval by the Academic Council	20.10.22

Course outcomes for: ND4108

Unit- wise Course Outcome	Descrittions	BL Level	Employability(Emp)/Skill(S)/ Enterpenureship(En)/Non e (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 aboutnutritional management during special conditions & inborn errors.	3	Emp,S

CO PO Mapping: ND4108

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**	**PO 9**	**PO 10**	**PO11**	**PO12**	**PSO1**	**PSO 2**	**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

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	1. Students should be able to learn about nutrition related health issues in large community 2. Students should be able to learn about health related acts across the world 3. Students should be able to get knowledge about national international organization which are working for health and nutrition 4. Students should be able to learn, understand and apply laws related to food and health and will learn about RMNCH+A services. 5. Students should be able to learn about various population monitoring agencies working in India and to plan and execute community health campaign in local areas	
Unit No.		No. of hours (per Unit)
Unit I	Public Health Nutrition	8
Public Health Nutrition: Aim, scope and concept 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, MidDay Meal, School health program		
Unit II	Public Health Aspects	10
Public Health Aspects of Under nutrition: Clinical syndromes of Malnutrition (Chronic Energy Deficiency/ PEM/ 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
Approaches/ Strategies for Improving Nutrition and Health Status of the Community: 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.		
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: Food insecurity warning and mapping systems for nutritional vulnerability: Public Sector programmes for improving of food and nutrition security, Right to Food act, Public Distribution System. Introduction to the RMNCH+A services – historical context, evolution, coverage and innovations • Various components of service delivery under RMNCH+A (including GoI programs) • Maternal, New-born and Child Health (MNCH) services in the country • Adolescent health • Role of gender in public health programs • Evolution of RCH services in the country – Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) • Innovations in service delivery • Framework for evaluation of services		
Unit V	Public Health	10

Role of non-governmental organizations in health care 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 Risk measurement, Measurement of morbidity and mortality: Incidence, Prevalence, Age-adjustment and survival analysis, use of morbidity and mortality data.	
Text Book	1. Gibney M. J., Margetts, B.M., Kearney, J. M. Arab, I., (2004) Public Health Nutrition, NS 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's Textbook of Preventive and Social Medicine. JabalpurM/s. BanarsidasBhanot. 2 Sheila ChanderVir. (2011). Public Health Nutrition in Developing Countries. Part 1 and Woodhead Publishing India Pvt.Ltd.
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 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:PublicHealthNutrition Lab	L T P C 0 0 2 1
VersionNo.	1.0	
CoursePrerequisites	NIL	
Objectives	Tounderstandtheimportanceofnutritionforthecommunities.	
ExpectedOutcome	Students will be able to understand the role of nutrition in community andhowgovt. ishelpingthe communities.	

ListofExperiments

1. Toplanandpreparelowcostnutritiousdishes/ menus forvulnerablegroups.
2. Developmentoflowcostrecipesforinfants,pre schoolers, elementaryschoolchildren,adolescents,pregnantandlactatingmothers.
3. Planningandpreparationofdiet/dishesfor(PEMP/SAM/CED, Anemia)
4. Fieldvisitstoongoingnationalnutritionprogrammes
5. Development of nutritious food supplements/ dishes for various vulnerable segments of population.
   Assessmentofthetypeofnutritional problemsandtheirdeterminantsindifferentpopulationgroupsthroughanalysisofsecondarydata (suchasNSSO,NFHS data)
7. Fieldvisitstoongoingpublichealthnutritionprogrammes.
8. Assessmentoftheirneedsandstudythepublic healthnutrition problemsinanidentifiedcommunity.

ModeofEvaluation	InternalandExternalExaminations
Recommendation by Board of Studies on	31.05.22
Date of approval by the Academic Council	20.10.22

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 for:ND4142

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	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:HumanNutrition	L T P C 3 003
VersionNo.	1.0	
CoursePrerequisites	NIL	
Objectives	Toimpartfundamentalknowledgeofproteins,carbohydrates,lipidsand their daily requirementsinhumanbody.	
ExpectedOutcome	Studentswillbeabletounderstandtheimportanceoflipids,carbohydratesproteins,mineralsandtrace elementsinthenutrition.	
UnitNo.		No.ofhours(per Unit)
UnitI	Energy	8
Energyneeds–Assessmentand requirements.CurrentapproachforestimatingRDAforenergyintakeofdifferentage,sexgroupsandphysiological conditions Metabolicregulationoffood intake-weight managementthroughlifeClinical And biochemicalmanifestationofoverand under nutrition. Disordersofmetabolism– metabolicsyndrome/syndromeXandincreasedcardiometabolicrisk.		
UnitII	DietaryCarbohydrate	7
Dietarycarbohydrates– functionsofstarch,resistantstarch,dietaryfiberandsugar.Dietaryfiberanditsroleinhealthanddisease – obesity,satiety,hypertension,glucosetolerance,insulinresponse,diabetes,heartdisease. Regulationoflevelofglucoseinbloodandhormonalcontrol.		
UnitIII	ProteinandAntioxidants	8
Proteinturnover,Methodsofmeasuringproteinturnover, "N"balance,obligatorylossAssessingprotein Andaminoacid requirements– Thecurrentapproachforvariousage,sexandphysiologicalgroups.Assessmentofproteinquality,Adaptationto fastingandstarvation. Antioxidantsinhealthanddisease.Effectsofoxidantsonmacromolecules–carbohydrates,proteinslipids,nucleicacids. Nutrient anti-oxidants with potent health effects. Non-nutritive food components with potential effects(Flavonoids – polyphenolsand tannates, phytoestrogens,cyanogenic compounds).		
UnitIV	PhysiologyofHunger	6
PhysiologyofHunger:-Roleofleptinandghrelininhungerandsatietyand weight management,Nutrient-nutrientinterrelationshipand bioavailability.Causesand effectofdeficiency.Causesand effectofexcess.		
UnitV	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,stanolsand sterols. Lipoproteins-transportandmetabolism.		
TextBook	1. Shubhangini A. Joshi, "Nutrition and Dietetics"TataMc Grow- Hill publishingCompanyLtd, NewDelhi. 2. Srilakshmi.B–"NutritionScience",VEdn,NewAgeInternational(P)Ltd,Publishers, Chennai. 3. Swaminathan.M-"Food&Nutrition"theBangalorepriting&publishingCo,LTD	

ReferenceBooks	1. Passmone R and Eastwood M.A, "Human Nutrition and Dietetics", EnglishlanguagebookSociety/ChurchillLivingstone, HongKong. 2. NeimanN.Catherine, "Nutrition" Wm.C.BrownPublishers.USA.
Mode ofEvaluation	InternalandExternalExaminations
Recommendation by Board of Studies on	31.05.22
Date of approval by The Academic Council	20.10.22

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			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**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:AdvancedHumanPhysiology	LTPC 3 003
VersionNo.	1.0	
CoursePrerequisites	Nil	
Objectives	Toimpartknowledgerelatedto humanbody systemsandthere Physiology.	
ExpectedOutcome	The student will gain a sound understanding of the human body systemsandtheirrole inhealth.	
UnitNo.	UnitTitle	No.ofhours (perUnit)
UnitI	Blood	9
Blood :Composition of blood: Plasma, RBC, WBC, Platelets, Erythropoiesis, Blood Coagulation and BloodGroups, Cardiac cycle and cardiac output, Blood pressure and factors affecting it., Hypertension, ECGImmunology and Nutrition: Human Immunoglobulin, Cell mediated and humoral immunity – impact ofmalnourishment, innate immunity - Activation of WBC and production of Antibodies. T cells, B cells. Role ofthymus,Acquiredimmunityrelated disease-AIDS, HIV,Autoimmunedisorders– Roleofantibodiesin Pregnancyscreening,Effects ofVitaminsonimmunity.		
UnitII	Respiratoryand ExcretorySystem	6
Respiratory system: Breathing mechanism, Exchange and transport of gases and its regulation, Lung Volumesand capacities Excretory System:Mechanismofurine formation.Roleofthekidneysinmaintainingwaterandelectrolyte Balance.		
UnitIII	DigestiveSystem	6
DigestiveSystemp:-Functionsandregulationofthesalivaryglands,stomach,pancreas, Liver and the intestines. Mechanism of digestion and absorption of carbohydrates, proteinsand fats.Role ofenzymesindigestionofcarbohydrates,proteinsand fats.		
UnitIV	ReproductiveSystem	9
Reproductive System: Structure and function of male and female sex glands and organs. Ovarian and menstrualcycle.Roleofhormonesinreproduction:FSH,LH,Estrogen,Progesterone,TestosteroneandHumanChorionicGonado-tropic hormone (HCG).Placenta.Physiologyofpregnancy,parturition,lactationandmenopause. Pathophysiology of PCOD and Infertility. Nervous System and Senses: Basic properties of nerve and receptororgansCentralNervous System:BrainSpinalCord.TransmissionofNerveimpulse.Autonomicnervous system. Physiologyofvision,hearing,tasteandsmell.		
UnitV	EndocrineSystem	6
Endocrine System:-Definition, functionsand kindsofhormones,Structureandfunctionsofthe following glands: Thyroid,parathyroid,adrenal,pancreas,pituitaryandpinealgland.		

SuggestedReferenceBooks	1 Jain,AK.(2012).TextbookofPhysiology. AvichalPublishingCompany.VolIandVolII. 2 BestandTaylor's.PhysiologicalBasisofMedicalPractice.TheWilliams AndWilkinsCompany. 3 Chatterjee,C.C.(1997).HumanPhysiology.VolIandVolII.MedicalAlliedAgency.4 GanongW.F. (2003)-ReviewofMedicalPhysiology.McGrawHill. 5Guyton A.C.and HallJ.E(2000)TextbookofMedical Physiology.India:HarcourtAsia. 5 TortoraG.JandGrabowskiS.R(2000)PrinciplesofAnatomyandP hysiology.JohnWileyandSons.Inc. 6 Chaudhari S K(2000) Concise Medical Physiology. Central .WestJ.B.(1996)PhysiologicalBasisofMedicalPractice.B.I.WaverlyPvt.Ltd.
ModeofEvaluation	InternalandExternalExaminations
Recommendation by Board of Studies on	31.05.22
Date of approvalby the Academic Council	20.10.22

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 Digestive System:- 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 for:ND4105

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	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:ScientificWriting&NutritionCommunication	L T P C 2 002
VersionNo.	1.0	
CoursePre requisites	NIL	
Objectives	Toprovideanoverviewofresearchand statistics.	
ExpectedOutcom e	The student would acquire fundamental knowledge related to scope of research in the field ofnutritionandhowstaticallyitcanbe represented.	
UnitNo.	UnitTitle	No.ofhou rs(per Unit)
UnitI	ScientificWriting	4
ScientificWritingasameanof communication: Differentformsofscientificwritings,articlesinjournals,researchnotesandreports,reviewarticles,dissertation, and bibliographies.		
UnitII	ScientificWriting	5
Drafting titles, subtitles, tables, illustrations_ presenting data in rows and columns, formatting tables, presenting datainfigures,formattingfigures,appendices:informationtobegivenandguidelinesforwriting,the writingprocess.		
UnitIII	ResearchReport	5
Partsofdissertation/Researchreport/Article:introduction,reviewofliterature, method&material,resultanddiscussion, summaryandconclusion Communication:-concept, elements, models,andbarriers.		
UnitIV	Information,EducationandCommunication	5
IEC(InformationEducationandcommunication):-Introduction&importance,relevancetoprograms,differentmedia, Therecharacteristicsanduses,Audio-visualAids		
UnitV	IECMethod, techniquesand tools	5
IEC:Methods,techniquesand tools. PlanningeffectingIECprograms.IECfordifferentlargegroups:-community,grassrootfunctionaries,donor agencies,policymakers.		
ReferenceBooks	1. Peat.J,ElliottE,BaurL&Keena.V"ScientificWriting:EasywhenyouKnowHow." BywordvivapublishersPVTLmt 2. DoddJ.S"TheACSStyleGuide:"Amanual for authorsandEditors"American Chemical Society	
ModeofEvaluatio n	InternalandExternalExaminations	
Recommendation by Board of Studies on	31.05.22	
Date of approval By the Academic Council	20.10.22	

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		S
CO2	Students should be able to learn , understand and memorize rules of research writing		Emp,
CO3	Students should be able to understand and implement creativity in research , report and seminars		En,s
CO4	Students should be able to develop a good project ongenuine problems		S , En
CO5	Students should be able to design synopsis scientifically		S,En

CO-PO Mapping for: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

ND4145	Title:ScientificWriting&NutritionCommunicationLab	L T P C 0 0 2 1
VersionNo.	1.0	
CoursePrerequisites	NIL	
Objectives	Tobuildcompetenceinscientific writingskills,todevelopunderstandingregardingthe vitals aspects of nutrition communication and their use in nutrition and healtheducation, Tounderstand skillstoplan&use IEC	
ExpectedOutcome	.	

ListofExperiments

1. Preparationoftablesand illustrations:-Writingatermpaper, Writinganarticlefor journal,Writingprojectproposal forgrants
2. PreparationofIEC methods:-Charts,posters,powerpointslides,radiotalks,T.Vshow(anOutline)
3. PreparationofIEC materialonaspecifictopic for:-OnetoOne,Group, masscommunication.

ModeofEvaluation	InternalandExternalExaminations
Recommendation by Board of Studies on	31.05.22
Date of approval by the Academic Council	20.10.22

Course outcomes for: ND4145

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 for:ND4143

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**	**PSO2**	**PSO3**	**PSO4**
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:BiochemicalFoodAnalysisandInstrumentation	LTPC 2002
VersionNo.	1.0	
CoursePrerequisites	NIL	
Objectives	Toimpart knowledge relatedtofoodanalysis.	
ExpectedOutcome	The student would acquire knowledge of separation of differentnutrientsfromthefoodswiththehelp ofbiochemical instruments.	
UnitNo.	UnitTitle	No.ofhours(per Unit)
UnitI	BiochemicalTechniquesandPrinciples	5
Biochemical Techniques Principles and applications of:- Homogenization and methods of disrupting cells andtissues. Cellfractionation,Spectroscopy-Beer-Lambertlaw,UV,VisibleSpectrophotometry, Colorimetry BiochempicalTechniques:Principlesandapplicationsof:- pHmeter,Centrifugation(Preliminaryintroductiontovarioustypesofcentrifuges)		
UnitII	BiochemicalApplication	5
BiochemicalTechniques:Principleandapplicationsof: Chromatography:Adsorption(Columnandthinlayer),Gelfiltration,Affinity,Ion-Exchange Electrophoresis: SDS PAGE and native electrophoresis, agarose electrophoresis, Protein separation &Characterization		
UnitIII	QualitativeandQuantitativeAnalysisof Macronutrients	5
Carbohydrates:Qualitativeandquantitativeanalysisoffoodcarbohydrates,Dietary fiber,crudefiber Proteins: Methods of estimation of amino acids and proteins, Chemical and biological evaluation ofnutritionalqualityofproteins.		
UnitIV	FatandEnzymes	5
Fats:Physicalandchemicalcharacteristicsofvariousfatsandoils,Iodinevalue,saponificationvalue,acid value, Reichert-Meisselvalueofimportantoils. Storagechangesinfatsand oils Enzymes: Enzymes involved in food deterioration and preventive measures. Enzymes as aids in food processingoperationsand economicalsignificance. Biotechnological applicationsofenzymes.		
UnitV	ProximateAnalysis	4
Foodanalysis:Introduction,Titrableacidity,Moistureandash,Principlesof chemicalandinstrumentalmethodsfor thequalitativeand quantitativeanalysisof moisture,mineralsand vitamins.		

ReferenceBooks	1. Official Methods of Analysis. Association of OfficialAnalytical 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.Kluwer Academpic/PlenumPublishers.,NewYork,NY 6. PracticalClinical Biochemistry,HaroldVarley,4th edition,ArnoldHeinempannPublishing,NewDelhi,1978. 7. Text book of Biochemistry, West and Todd, Oxford and IBHPublishingCo., 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,MarthaH.Stipanuk, SaundersElsevier, USA,2000.
ModeofEvaluation	Internal&External
Recommendation by Board of Studies on	31.05.22
Date of approval by the Academic Council	20.10.22

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						
	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12	PSO1	PSO2	PSO3	PSO 4
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:BiochemicalFoodAnalysisandInstrumentationLab	L T P C 0 0 3 2
VersionNo.	1.0	
CoursePrerequisites	NIL	
Objectives	To impart fundamental knowledge of biochemical analysis of foods with the help ofdifferentinstruments.	
ExpectedOutcome	The students will be able to learn how the nutrients are checked and separated fromthefood.	

ListofExperiments

1. Estimationofmoisturecontentandtitrableacidityoffoodproducts.
2. Testsforcarbohydrates:
   (i) Estimationofsolubleandinsolubleashcontent
   (ii) Estimationofdietaryfibre
3. Testsforproteins:
   (i) QuantitativeestimationofproteinsbyKjeldhal'sBiuretmethod
   (ii)Separation of amino acids by paper chromatography.
   (iii)Isolation and estimation of Casein from milk.
   (iv)Demonstrationofproteinseparationbygel electrophoresis.
4. TestsforFats:
   (i) Estimationof freefattyacids
   (ii) Determinationofacidandiodinevalue
   (iii) DeterminationofRM value
5. TestsforVitamins&Minerals:
   (i) Estimationofcalcium,phosphorousandiron
   (ii) EstimationofvitaminsB1,B2andascorbic acid
6. Isolationand estimationofphyticacid.
7. Isolationand estimationoftrypsininhibitorsactivity.

ModeofEvaluation	InternalandExternalExaminations
Recommendation by Board of Studies on	31.05.22
Date of approval by the Academic Council	20.10.22

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 for: ND4240

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	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

ND4205	Title: Clinical and Therapeutic Nutrition II	L T P C 3 0 03
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The course is aimed at giving advanced knowledge in the field of clinical nutrition and dietetics	
Expected Outcome	1. Students should be able to learn about Nutritional support recent advances in techniques. 2. Students should be able to learn about Aetiopathogenesis of Heart disease treatment, preventive aspects, lifestyle and dietary management 3. Students should be able to learn about Nutritional Management in Trauma Conditions dietary management in Burns, Surgery, Stress and trauma 4. Students should be able to learn about Nutritional Management in Diabetes Mellitus 5. Students should be able to learn about Nutritional Management in Special Conditions Space travel, High altitudes, Inborn errors of metabolism	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Nutrition in Immune Diseases	6
Nutrition care in immune deficiency diseases: HIV aids Nutrition Care during Cancers		
Unit II	Nutrition of Heart disease	8
Aetiopathogenesis, clinical picture, diagnostic tests, treatment, preventive aspects, lifestyle and dietary management- Cardio Vascular Disease and Atherosclerosis, Ischemic Heart Disease, Hyperlipidemia, Hypertension Concept of: Nutritional significance of fatty acids – SFA, MUFA, PFA, Role of n-3 and n-6 fatty acids; Trans fatty acids, Role and mechanism of action of Dietary Fiber in CVD, Electrolyte imbalance w.r.t Sodium, Potassium		
Unit III	Nutrition in Trauma Conditions	8
Aetiopathogenesis, clinical picture, diagnostic tests, treatment, preventive aspects, lifestyle and dietary management: Gout, Arthritis, Osteoporosis. Etiology, clinical features and dietary management: Burns, Surgery, Stress and trauma		
Unit IV	Nutrition in Diabetes Mellitus	6
Classification, etiology, clinical features, diagnostic tests, prevention and treatment, lifestyle and dietary management: Diabetes Mellitus Concept of: Glycemic Index, Glycemic Load, Nutritional significance of Dietary Fiber – Types, sources, role and mechanism of action		
Unit V	Nutrition in Special Conditions	8
Nutritional management during special conditions: Space travel, High altitudes, Inborn errors of metabolism – Phenylketonuria, Galactosemia		

Reference	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.
Mode of Evaluation	Internal & External
Recommendation by Board of Studies on	31.05.22
Date of approval by the Academic Council	20.10.22

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 for: ND4202

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped-3 moderate -2, Low-1, Not related-0)												Program Specific Outcomes			
	PO 1	PO 2	PO3	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	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 make student aware of diet counseling.	
Expected Outcome	Student will learn to plan and preparation of diets for patients with common multiple disorders.	
Experiment No.	List of Experiments	
	1. Market survey of commercial nutritional supplements and nutritional support substrates. 2. Interpretation of patient data and diagnostic tests and drawing up of patient diet prescription, using a case study approach. 3. Preparation of diet counseling aids for common disorders. 4. Planning and preparation of diets for patients with common multiple disorders and complications and discharge diet plans.	
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 outcomes for : ND4141

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 for: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	PO10	PO11	PO12	PSO1	PS02	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

ND4206	Title: Advances in Nutrition	L T P C 3 0 03
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide an overview of essential components of food and its role in nutrition.	
Expected Outcome	1. 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. 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. 3. Students should be able to learn about nutraceutical, nutrigenomics, nutrigenetics and active compound in functional food and antioxidants and how it can be prevent various types of diseases in human body. 4. Students should be able to learn about different food safety measures in the food industry. 5. Students should be able to learn about latest trends in nutritional labeling: additives, colors preservatives, allergen information and different types of sugar derivatives.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Nutrition Transition with pharmacology concept	6
Nutrition Transition – Indian scenario. Advances in food agriculture and technology. Changing trends in life style patterns in different population groups. 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 II	Micronutrients- Vitamins	8
Introduction, Classification, Functions, Sources, Therapeutic use or role.		
Unit III	Micronutrients- Minerals	8
Introduction, Classification, Functions, Sources, Therapeutic use or role.		
Unit IV	Nutraceuticals and Antioxidants	6
Advancesinnutrition:Nutraceuticals,ActivecompoundinFunctionalfoodsandAntioxidants(BetaCarotene,Lutein, Lycopene, Fiber, Omega 3, Anthocyanin, Flavanoids, Selenium, Isoflavones, Lignans, Vitamin A, Vitamin C, Vitamin E, Biotin, Plant sterols). Prebiotic, Probiotic and Synbiotic. Molecular aspects of nutrition:Nutrigenomics andNutrigenetics.		
Unit V	Food Safety Measures andTrends in Nutritional Labeling	8
Understanding food safety measures in the food industry: FSSAI, HACCP, TQM, GMP 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 - Problemsand Policies. Special Publication Series No. 9. Nutrition Foundation of India, New Delhi,India 2. Park K (2007). Park□s textbook of preventive and social medicine. M/s BanarsidasBhanot Publishers, Jabalpur 3.Pomeranz Y (1991). Functional properties of foodcomponents. Academic Press, NewYork. 4. Wildman Robert EC (2001). Handbook of Nutraceuticalsand Functional foods. CRCseries 5. Mitchell Bebel Stargrove, Jonathan Treasure & Dwight L. Mckee, Chuchill Livingstone (2003). Herb, Nutrient and Drug Interactions– Clinical Implications and TherapeuticStrategies 6. Mahan LK and Stump SE (2007). Krause'sFood, Nutrition and Diet Therapy (Hardcover), Saunders publication
Mode of Evaluation	Internal & External
Recommendation by Board of Studies on	31.05.22
Date of approval by the Academic Council	20.10.22

Course outcomes for: ND4206

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 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 for: ND4206

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	PO7	PO 8	PO 9	PO10	PO11	PO 12	PSO1	PSO 2	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

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
Recommended allowances and nutritional guidelines for different categories of high performance sports, Nutritional care 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 sportsperson-Menarche and Menstruation-Amenorrhea and Anemia, Energy requirements for: Strength and power athletes, Endurance athletes		
Unit V	Dietary supplements and Ergonomics aids	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. Effects of specific Nutrients on sports performance and physical fitness:Role of antioxidants and exercise induced oxidative stress,Water: Functions, electrolyte balance and role during exercise		

Reference Books	1. ILSI, NIN &SAI. (2017) Nutritional recommendations forhighperformanceathletes. 2. Mahan, L. K. and Escott Stump S. (2016) Krause's Food &NutritionTherapy. Saunders-Elsevier. 3. HicksonJFandWolinkskyI.(1997)NutritionforexerciseandSport.CRCPress, 4.Burke LM and Deakin V. (2002) Clinical Sports Nutrition, Publishers McGraw Hill
Mode of Evaluation	Internal & External
Recommendation by Board of Studies on	31.05.22
Date of approval by the Academic Council	20.10.22

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. Allied 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	31.05.22
Date of approval by the Academic Council	20.10.22

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 for 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	PO10	PO11	PO12	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, Cryptosporiodiosis. 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	31.05.22	
Date of approval by the Academic Council	20.10.22	

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			
	PO 1	PO2	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	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	31.05.22	
Date of approval by the Academic Council	20.10.22	

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			
	PO 1	PO2	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	1	0	0	3	0	0	0	2	2	3	0	0	2	3	0
CO 2	3	1	2	2	2	0	0	3	0	3	2	3	0	1	2	1
CO 3	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

ND4304	Title: Food Product Development, Safety and Quality Development	L T P C 3 0 03
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	31.05.22	
Date of approval by the Academic Council	20.10.22	

Course Outcome For ND4304

Unit-wise Course Outcome	Description	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 newproduct development (NPD).	2	Emp
CO5	Students should be able to learn about advertisement and marketing fornew 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	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	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
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

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	31.05.22	
Date of approval by the Academic Council	20.10.22	

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	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	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 bythe 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	31.05.22
Date of approval by the Academic Council	20.10.22

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	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	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	31.05.22	
Date of approval by the Academic Council	20.10.22	

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: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& Quality Development 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 newproduct 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	31.05.22
Date of approval by the Academic Council	20.10.22

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	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	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

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			
	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

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 concerns of 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, Modified Atmosphere 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 process of 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, packaging and 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

ND4218	Title: **Clinical Psychology**	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to impart the knowledge about the clinically handling the psychological conditions of the patients.	
Expected Outcome		
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	**Introduction to Clinical Field of Psychology**	8
Introduction: normality and abnormality? Criteria of Abnormality, Causal Factors,Mind and Body Relationship, Components of Health: Relationship Between Health and Psychology, Cultural Construction of Health,Bio-Psychosocial Model of Health. Classification of Diseases/ Disorders, Clinical Assessment, Diagnosis Intervention, Rehabilitation; Brief idea Of Psychopathology and ICD		
Unit II	**Health behaviours and Stress**	8
Behaviour and Health: Characteristics of Health Behaviour; Barriers to Health Behaviour; Theories of Health Behaviour (Health –Belief Model, Theory of Planned Behaviour, Stages of Change Model) Stress: Models of Stress, Stress and diseases: CADs, Pain, Diabetes, Obesity, Immune related diseases Lifestyle related: Alcohol, Smoking, Sex		
Unit III	**Prevention, Promotion and Management**	6
Health Prevention, Health Promotion and Management: Prevention types, Health and community, Nutrition and Diet, Exercise, Doctor–patient communication and the role of health Professionals' health beliefs, Placebos and the interrelationship between beliefs, behaviour and health		
Unit IV	**Interventions**	8
Biological- Supplementation, Medicinal, Vaccination, Biofeedback; **Behavioural**- Health promotions, Education, Media. **Psychological**- Psychotherapies, Mindfulness, Complementary and Alternative Therapies,		
Unit V	Counseling	6
Counselling- Definition, meaning & scope. The effective Counsellor- personal, educational and systemic factors. Nature and Goals; Professional Ethics, Counselling Process **Applications**: Child Counselling; Family Therapy;Crisis Intervention: Suicide, Grief, and Sexual Abuse, mental health counselling, disability counselling, and community counselling		
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	13-07-2019	

Council	

Course Outcome forND4218

Unit-wiseCourseOutcome	Descriptions	BL Level	Employability(Emp)/ Skill(S)/Entrepreneurship(En)/None (*Use,formorethanOne*)
CO1	Student will be able to understand the basics of clinical field of psychology.	2	Emp
CO2	Students will be able to learn the behaviour of the person in different health conditions.	3	Emp
CO3	Students will be able to understand the procedures of prevention, promotion and management of psychological disorders	2	Skill
CO4	Students will be able to learn the different intervention methods for psychological disorders	2	Emp
CO5	Students will be able to learn the counseling techniques.	3	Skill

CO-PO MappingForND4218

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

ND4316	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 forND4216

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-POMappingForND4216

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: 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 forND4217

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 ND4217

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
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

ND4318	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

Reference	• Pelto GH, Pelto RJ and Masser E (1989). Research Methods in Nutritional Anthropology, Tokyo, Japan: The United NationsUniversity • MotherCare (1990). Behavioural Determinants of Maternal Health Care Choices in Developing Countries, Mother Care,USA. • Koblinsky M (1993). The Health of Women : A Global Perspective. (1993)NCIH, Washington, DC, USA. • Lawrence, M. (2008).Public Health Nutrition Lal S. (2009). Textbook of 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 forND4218

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 ForND4218

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	PO1 0	PO1 1	PO1 2	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	3	2	2	3	1.8	1.8	3	3	2.8	3	1.8	3